



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)



Approved by AICTE, Recognized by UGC & Affiliated to Anna University Accredited by
NBA-AICTE, NAAC-UGC with 'A++' Grade
Saravanampatti, Coimbatore – 641035.

**REGULATION 2023 CURRICULAM
I – VIII SEMESTER**

CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF CIVIL ENGINEERING

B.E – CIVIL ENGINEERING



SNS COLLEGE OF TECHNOLOGY

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COIMBATORE-35



DEPARTMENT OF CIVIL ENGINEERING

R 2023 – SUGGESTED CURRICULUM

B.E – CIVIL ENGINEERING

Description / Semester	AICTE	SNSCT – Suggested	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
Humanity, Social Science & Mandatory (HSMC)	12	11	3	4	2	0	0	0	2	0
Basic Science (BSC)	25	26	8	8	5	5	0	0	0	0
Engineering Sciences (ESC)	24	18	8	8	2	0	0	0	0	0
Programme Core (PCC)	48	63	0	3	13	16	13	13	5	0
Programme Elective (PEC)	18	15	0	0	0	0	3	3	3	6
Open Elective (OEC)	18	9	0	0	0	0	3	3	3	0
Project/Seminar/Internship (EEC)	15	30	3	1	1	3	5	3	2	12
Mandatory Courses (MC)	(Non-Credit)									
TOTAL	160	172	22	24	23	24	24	22	15	18

SEMESTER I										
S.No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	
Theory Courses										
1	23MAT101	Matrices and Calculus	3	1	0	4	4	40/60	BSC	
2	23PYT101	Engineering Physics	3	0	0	3	3	40/60	BSC	
3	23MET101	Engineering Mechanics	3	0	0	3	3	40/60	ESC	
4	23EET101	Basics of Electrical and Electronics Engineering	3	0	0	3	3	40/60	ESC	
5	23GET103	Heritage of Tamils	1	0	0	1	1	40/60	HSMC	
Theory Integrated Practical Courses										
6	23GEB101	Design Thinking and Innovation	1	0	4	5	3	50/50	EEC	
Practical Courses										
7	23PYP101	Physics Laboratory	0	0	2	2	1	60/40	BSC	
8	23ENP101	Professional Communication Laboratory	0	0	4	4	2	60/40	HSMC	
9	23GEP101	Workshop Practices	0	0	4	4	2	60/40	ESC	
Mandatory Course										
10	23CHT103	Environmental Science and Sustainability	2	0	0	2	0	100/0	MC	
11	23HST101	3 Weeks Induction Program								
Total			16 / 1 / 14			31		22		

SEMESTER II										
SNo.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1	23MAT102	Complex Analysis and Laplace Transforms	3	1	0	4	4	40/60	BSC	
2	23CHT102	Chemistry of Engineering Materials	3	0	0	3	3	40/60	BSC	
3	23ENT101	Communicative English	3	0	0	3	3	40/60	HSMC	
4	23ITT101	Programming in C and Data Structures	3	0	0	3	3	40/60	ESC	
5	23MET102	Engineering Drawing	1	0	4	5	3	40/60	ESC	
6	23CET101	Engineering Geology	3	0	0	3	3	40/60	PCC	
7	23GET104	Tamils and Technology	1	0	0	1	1	40/60	HSMC	
Practical courses										
8	23CHP101	Chemistry Laboratory	0	0	2	2	1	60/40	BSC	
9	23ITP101	Programming in C and Data Structures Laboratory	0	0	4	4	2	60/40	ESC	
10	23CEP101	Internship-I	2 Weeks			-	1	100/0	EEC	
Mandatory Course										
11	23HST103	Indian Constitution	2	0	0	2	0	100/0	MC	
Total			19 / 1 / 10			30		24		

SEMESTER III										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1	23MAT201	Partial Differential Equations and Transforms	3	0	0	3	3	40/60	BSC	
2	23CET201	Construction Techniques, Equipment and Practices	2	0	0	2	2	40/60	PCC	
3	23CET202	Mechanics of Solids	3	0	0	3	3	40/60	PCC	
4	23GET275	VQAR-I	2	0	0	2	2	40/60	BSC	
Theory Integrated Practical Courses										
5	23CEB201	Construction Materials	2	0	2	4	3	50/50	PCC	
6	23CEB202	Surveying	2	0	2	4	3	50/50	PCC	
7		Language Elective	1	0	2	3	2	50/50	HSMC	
Practical Courses										
8	23CEP201	Civil CAD Drawing	0	0	4	4	2	60/40	PCC	
9	23ITP204	Programming in Python	0	0	4	4	2	60/40	ESC	
10	23CEP202	Mini Project - I	0	0	2	2	1	100/0	EEC	
Total			15 / 0 / 16			31	23			

SEMESTER IV											
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites	
Theory Courses											
1	23MAT205	Probability, Statistics and Numerical Methods	3	0	0	3	3	40/60	BSC		
2	23CET203	Mechanics of Materials	3	0	0	3	3	40/60	PCC	23CET202	
3	23CET204	Highway and Railway Engineering	3	0	0	3	3	40/60	PCC		
4	23CET205	Irrigation and Water Resource Engineering	2	0	0	2	2	40/60	PCC		
5	23GET276	VQAR-II	2	0	0	2	2	40/60	BSC		
Theory Integrated Practical Courses											
6	23CEB203	Mechanics of Fluids and Machinery	3	0	2	5	4	50/50	PCC		
7	23CEB204	Environmental Engineering	3	0	2	5	4	50/50	PCC		
Practical Courses											
8	23GEP275	Personal Branding	0	0	4	4	2	60/40	EEC		
9	23CEP203	Internship-II	2 Weeks					1	100/0	EEC	
Total			19 / 0 / 8			27	24				

SEMESTER V										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1	23CET301	Structural Analysis - I	3	0	0	3	3	40/60	PCC	
2	23CET302	Design of RC Structural Elements	3	0	0	3	3	40/60	PCC	
3	23CET303	Concrete Technology	2	0	0	2	2	40/60	PCC	
4		Professional Elective – I	3	0	0	3	3	40/60	PEC	
5		Open Elective - I	3	0	0	3	3	40/60	OEC	
Theory Integrated Practical Courses										
6	23CEB301	Soil Mechanics	3	0	2	5	4	50/50	PCC	
7		Career Course - I	2	0	4	6	4	50/50	EEC	
Practical Courses										
8	23CEP301	Concrete and Highway Laboratory	0	0	2	2	1	60/40	PCC	
9	23CEP302	Mini Project – II	0	0	2	2	1	100/0	EEC	
		Total	19 / 0 / 10			29	24			

SEMESTER VI										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1	23CET304	Design of Steel Structures	3	0	0	3	3	40/60	PCC	
2	23CET305	Structural Analysis - II	3	0	0	3	3	40/60	PCC	23CET301
3	23CET306	Foundation Engineering	3	0	0	3	3	40/60	PCC	23CEB301
4		Open Elective - II	3	0	0	3	3	40/60	OEC	
5		Professional Elective - II	3	0	0	3	3	40/60	PEC	
Theory Integrated Practical Courses										
6	23CEB302	Construction Management	2	0	2	4	3	50/50	PCC	
7		Career Course - II	1	0	2	3	2	50/50	EEC	
Practical Courses										
8	23CEP302	Design of Concrete and Steel Structures	0	0	2	2	1	60/40	PCC	
9	23CEP303	Internship-III	2 Weeks				1	100/0	EEC	
Mandatory Course										
10	23HST105	Essence of Indian Traditional knowledge	2	0	0	2	0	100/0	MC	
		Total	20 / 0 / 6			26	22			

SEMESTER VII

S.No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1	23CET401	Estimation, Costing and Valuation	3	0	0	3	3	40/60	PCC	
2	23CET402	Prefabricated Structures	2	0	0	2	2	40/60	PCC	
3	23GET401	Universal Human Values	2	0	0	2	2	40/60	HSMC	
4		Professional Elective – III	3	0	0	3	3	40/60	PEC	
5		Open Elective - III	3	0	0	3	3	40/60	OEC	
Practical courses										
6	23CEP401	Design Project	0	0	4	4	2	60/40	EEC	
Total			13 / 0 / 4			17	15			

SEMESTER VIII

S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	Pre-Requisites
Theory Courses										
1		Professional Elective - IV	3	0	0	3	3	40/60	PEC	
2		Professional Elective - V	3	0	0	3	3	40/60	PEC	
Practical courses										
3	23CEP402	Project Work	0	0	24	24	12	60/40	EEC	
Total			6 / 0 / 24			30	18			

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)

Sl. No	CourseCode	Course	L	T	P	Contact hrs/week	Credits	Semester
1	23GET103	Heritage of Tamils	1	0	0	1	1	I
2	23ENP101	Professional Communication Laboratory	0	0	4	4	2	I
3	23ENT101	Communicative English	3	0	0	3	3	II
4	23GET104	Tamils and Technology	1	0	0	1	1	II
5		Language Elective	1	0	2	3	2	III
6	23GET401	Universal Human Values	2	0	0	2	2	VII

BASIC SCIENCE COURSES (BSC)

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits	Semester
1	23MAT101	Matrices and Calculus	3	1	0	4	4	I
2	23PYT101	Engineering Physics	3	0	0	3	3	I
3	23PYP101	Physics Laboratory	0	0	2	2	1	I
4	23MAT102	Complex Analysis and Laplace Transforms	3	1	0	4	4	II
5	23CHT102	Chemistry of Engineering Materials	3	0	0	3	3	II
6	23CHP101	Chemistry Laboratory	0	0	2	2	1	II
7	23MAT201	Partial Differential Equations and Transforms	3	0	0	3	3	III
8	23GET275	VQAR – I	2	0	0	2	2	III
9	23MAT205	Probability, Statistics and Numerical Methods	3	0	0	3	3	IV
10	23GET276	VQAR – II	2	0	0	2	2	IV

ENGINEERING SCIENCE COURSES (ESC)

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits	Semester
1	23MET101	Engineering Mechanics	3	0	0	3	3	I
2	23EET101	Basics of Electrical and Electronics Engineering	3	0	0	3	3	I
3	23GEP101	Workshop Practices	0	0	4	4	2	I
4	23ITT101	Programming in C and Data Structures	3	0	0	3	3	II
5	23MET102	Engineering Drawing	1	0	4	5	3	II
6	23ITP101	Programming in C and Data Structures Laboratory	0	0	4	4	2	II
7	23ITP204	Programming in Python	0	0	4	4	2	III

PROFESSIONAL CORE COURSES (PCC)

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits	Semester
1	23CET101	Engineering Geology	3	0	0	3	3	II
2	23CET201	Construction Techniques, Equipments and Practices	2	0	0	2	2	III
3	23CET202	Mechanics of Solids	3	0	0	3	3	III
4	23CEB201	Construction Materials	2	0	2	4	3	III
5	23CEB202	Surveying	2	0	2	4	3	III
6	23CEP201	Civil CAD Drawing	0	0	4	4	2	III
7	23CET203	Mechanics of Materials	3	0	0	3	3	IV
8	23CET204	Highway and Railway Engineering	3	0	0	3	3	IV
9	23CET205	Irrigation and Water Resource Engineering	2	0	0	2	2	IV
10	23CEB203	Mechanics of Fluids and Machinery	3	0	2	5	4	IV

11	23CEB204	Environmental Engineering	3	0	2	5	4	IV
12	23CET301	Structural Analysis – I	3	0	0	3	3	V
13	23CET302	Design of RC Structural Elements	3	0	0	3	3	V
14	23CET303	Concrete Technology	2	0	0	2	2	V
15	23CEB301	Soil Mechanics	3	0	2	5	4	V
16	23CEP301	Concrete and Highway Laboratory	0	0	2	2	1	V
17	23CET304	Design of Steel Structures	3	0	0	3	3	VI
18	23CET305	Structural Analysis – II	3	0	0	3	3	VI
19	23CET306	Foundation Engineering	3	0	0	3	3	VI
20	23CEB302	Construction Management	2	0	2	4	3	VI
21	23CEP302	Design of Concrete and Steel Structures	0	0	2	2	1	VI
22	23CET401	Estimation, Costing and Valuation	3	0	0	3	3	VII
23	23CET402	Prefabricated Structures	2	0	0	2	2	VII

PROFESSIONAL ELECTIVE – I

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits
1	23CEE301	Airport, Harbour and Docks Engineering	3	0	0	3	3
2	23CEE302	Remote Sensing and GIS	3	0	0	3	3
3	23CEE303	Traffic Engineering and Management	3	0	0	3	3
4	23CEE304	Solid and Hazard Waste Management	3	0	0	3	3
5	23MEE305	Principles of Management	3	0	0	3	3

PROFESSIONAL ELECTIVE – II

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits
1	23CEE305	Machine Learning for Civil Engineers	3	0	0	3	3
2	23CEE306	Biology for Civil Engineers	3	0	0	3	3
3	23CEE307	Introduction to Green Building Structures	3	0	0	3	3
4	23CEE308	Earthquake Resistant Structures	3	0	0	3	3
5	23MEE405	Total Quality Management	3	0	0	3	3

PROFESSIONAL ELECTIVE – III

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits
1	23CEE401	AR VR in Civil Engineering	3	0	0	3	3
2	23CEE402	Disaster management and mitigation	3	0	0	3	3
3	23CEE403	Town planning and Building Bye Laws	3	0	0	3	3
4	23CEE404	Engineering Economics and cost Analysis	3	0	0	3	3
5	23CEE405	Sustainable and Lean Construction	3	0	0	3	3

PROFESSIONAL ELECTIVE – IV

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits
1	23CEE406	Building Services	3	0	0	3	3
2	23CEE407	IoT in Civil Engineering	3	0	0	3	3
3	23CEE408	Hydrology	3	0	0	3	3
4	23CEE409	Repair and Rehabilitation of Structures	3	0	0	3	3
5	23CEE410	Ground Improvement Techniques	3	0	0	3	3

PROFESSIONAL ELECTIVE – V

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits
1	23CEE411	Intelligent Transportation Systems	3	0	0	3	3
2	23CEE412	Environmental Impact Assessment	3	0	0	3	3
3	23CEE413	Advanced Reinforced Concrete Design	3	0	0	3	3
4	23CEE414	3D Printing for Civil Engineers	3	0	0	3	3
5	23CEE415	Smart Cities	3	0	0	3	3

OPEN ELECTIVE COURSES (OEC)

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits	Semester
1	23CEO301	Environmental and Social Impact Assessment	3	0	0	3	3	
2	23CEO302	Bye-Laws in Building Construction	3	0	0	3	3	
3	23CEO303	Industrial Waste Management	3	0	0	3	3	
4	23CEO304	Building Maintenance	3	0	0	3	3	
5	23CEO305	Natural Calamity Management	3	0	0	3	3	
6	23CEO306	Drinking water supply and Treatment	3	0	0	3	3	

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	Course Code	Course	L	T	P	Contact hrs/week	Credits	Semester	
1	23GEB101	Design Thinking and Innovation	1	0	4	5	3	I	
2	23CEP101	Internship - I	2 Weeks					1	II
3	23CEP202	Mini Project – I	0	0	2	2	1	III	
4	23CEP203	Internship – II	2 Weeks					1	IV
5	23GEP275	Personal Branding	0	0	4	4	2	IV	
6		Career Course - I	2	0	4	6	4	V	
7	23CEP302	Mini Project – II	0	0	2	2	1	V	
8		Career Course - II	1	0	2	3	2	VI	

9	23CEP303	Internship – III	2 Weeks				1	VI
10	23CEP401	Design Project	0	0	4	4	2	VII
11	23CEP402	Project Work	0	0	24	24	12	VIII

LANGUAGE ELECTIVE COURSES

S.No	Course Code	Courses Offered	L	T	P	C
1	23GEB202	Hindi	1	0	2	2
2	23GEB203	Japanese	1	0	2	2
3	23GEB204	German	1	0	2	2
4	23GEB205	French	1	0	2	2

CAREER COURSES (UG)

S.No	Course Code	Courses Offered	Semester	L	T	P	C
Track 1 Job (6 Credits)	23GEB375	Personnel Psychology and Technical Interviewing	V Semester	2	0	4	4
	23GEB379	Employable Skill Development	VI Semester	1	0	2	2
Track 2 Entrepreneurship (6 Credits)	23GEB376	Entrepreneurship and Business Canvas Model	V Semester	2	0	4	4
	23GEB382	Economics, Finance and Accounting and Intellectual Property Rights	VI Semester	1	0	2	2
Track 3 Higher Education (6 Credits)	23GEB377	Advanced Verbal Quantitative Aptitude and Reasoning and Networking	V Semester	2	0	4	4
	23GEB380	Higher Studies in Abroad and India	VI Semester	1	0	2	2
Track 4 Govt./RRB/ Bank (6 credits)	23GEB378	Foundation Course on Competitive Exams	V Semester	2	0	4	4
	23GEB381	Personnel Psychology for Govt. Jobs	VI Semester	1	0	2	2

MANDATORY COURSES (UG)

Course Code	Course Title	L	T	P	C
23HST101	Induction Program (3 Weeks)	0	0	0	0
23CHT103	Environmental Sciences and sustainability	2	0	0	0
23HST103	Indian Constitution	2	0	0	0
23HST105	Essence of Indian Traditional Knowledge	2	0	0	0

OTHER SPECIAL COURSES (UG)

Course Code	Course Title	L	T	P	C
23GEB101	Design Thinking and Innovation	1	0	4	3
23GET275	VQAR – I	2	0	0	2
23GET277	Biology for Engineers	2	0	0	2
23GEP275	Personal Branding	0	0	4	2
23GET276	VQAR - II	2	0	0	2
23GET201	Professional Ethics and Human Values	2	0	0	2

ONE CREDIT COURSE

Sl.No	Course Code	Course Title
1	23CEOC301	Advanced Techniques in Satellite Surveying
2	23CEOC302	Building plan Approval Process
3	23CEOC303	Green Energy Audit for Buildings
4	23CEOC304	Integrated MEP Systems in Construction
5	23CEOC305	Structural Steel Detailing

SEMESTER I

23MAT101

MATRICES AND CALCULUS

L T P C

(Common to all B.E. / B. Tech. Courses)

3 1 0 4

9+3

UNIT I MATRIX EIGENVALUE PROBLEM

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley Hamilton Theorem (statement only) and its applications – Eigenvalue problems arising from population models (Leslie model).

UNIT II ORTHOGONAL TRANSFORMATION OF A REAL SYMMETRIC MATRIX

9+3

Diagonalization of a real symmetric matrix – Quadratic form – Canonical form – Nature of the quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation – Applications: Stretching of an elastic membrane.

UNIT III DIFFERENTIAL CALCULUS

9+3

Curvature – Radius of Curvature in Cartesian co-ordinates – Centre of curvature and circle of curvature in Cartesian Co-ordinates – Evolutes – Envelopes.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

9+3

Partial derivatives – Homogeneous functions and Euler's theorem – Jacobians – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS

9+3

Double integrals (Cartesian co-ordinates) – Change of order of integration – Applications of double integrals (Area) – Triple integrals (Cartesian co-ordinates) – Applications: Volume of solids.

L : 45 T:15 P: 0 Total: 60 PERIODS

TEXT BOOKS

- 1 Kreyszig, E., Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi 2016.
- 2 James Stewart, Calculus, Cengage Learning, 8th Edition, New Delhi 2015.

REFERENCES

- 1 Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.
- 2 Bali, N.P, Goyal, M. and Watkins, C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
- 3 Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
- 4 Ramana, B.V., Higher Engineering Mathematics, McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
- 5 Thomas, G. B., Hass, J, and Weir, M.D, Thomas Calculus, 14th Edition, Pearson India, 2018.

COURSE OUTCOMES

At the end of the course students should be able to

- CO1 Know about Eigen values and Eigen vectors and its role in the system of equations.
- CO2 Transform the real symmetric matrix from quadratic form to canonical form by means of orthogonal transformation.
- CO3 Determine the radius, centre and circle of curvature of any curve.
- CO4 Use differential calculus ideas on several variable functions.
- CO5 Apply multiple integral ideas in solving areas, volumes and other practical problems.

(Common for AEROSPACE, AGRI, AUTO, CIVIL, FT,MECH & MCT)

3 0 0 3

UNIT I CRYSTAL STRUCTURE

9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances – coordination number and packing factor for SC, BCC, FCC, HCP structures; Crystal imperfections – point, line, surface and volume imperfections.

UNIT II QUANTUM PHYSICS

9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory — Properties of Matter waves –Physical significance of wave function-Schrödinger's wave equations: Time independent and time dependent equations– Particle in a one dimensional box–Electron microscope-Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM).

UNIT III ELASTICITY

9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - 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

UNIT IV PHYSICS OF ADVANCED MATERIALS

9

Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity. Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory. Nanomaterials: introduction and properties – synthesis – top-down process: Ball milling method - bottom-up approach: Physical Vapour deposition – applications.

UNIT V NON-DESTRUCTIVE TESTING

9

Introduction- Types of defects-Methods of NDT-Visual inspection- Liquid/Dye penetrant testing-Magnetic particle testing-Eddy current testing-Ultrasonic inspection method-Advantages-X-Ray radiography- X-ray fluoroscopy-Comparison of conventional and real time radiography.

L : 45 T:0 P: 0 Total: 45PERIODS

TEXT BOOKS

1. Gaur R.K. And Gupta S.L, "Engineering Physics", Dhanpat Rai publishers, 2013, (Unit I, II, III)
2. Dr. M.N. Avandhanulu, Dr. P.G. Kshirsagar, "A Text book of Engineering Physics", S. Chand, 2014 (Unit I, II, & V)
3. Murugesan R And Kiruthika Sivaprasath, "Modern Physics" 18th edition, S. Chand 2016 (Unit I, II, IV)

REFERENCES

1. Rajendran.V, Engineering Physics, Tata Mcgraw-Hill Publishing Company Limited, New Delhi. 2017. (Unit I, II, III, V)
2. "Engineering Physics", Wiley, 2013 (Unit I, II, III, V)
3. A.S. Vasudeva, "Modern Engineering Physics", S. Chand, 2001 (Unit I, II, III & V)
4. B.K. Pandey Chaturvedi, "Engineering Physics", Cengage Learning, 2012 (Unit I, II, & IV)
5. Charles Kittel, "Solid State Physics", Wiley (2009), Unit (I & II)
6. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 2010. (Unit I, IV, V)
7. C.P. Poole and F.J. Owens, Introduction to Nanotechnology, Wiley, New Delhi, 2007 (Unit V)

COURSE OUTCOMES

At the end of the course students should be able to

Co1: Understand the properties of Crystalline Materials.

Co2: learn the basic concepts of Quantum Mechanics

Co3: Analyze the elastic properties of materials.

Co4: Utilize the knowledge to identify and develop the materials for specific applications.

Co5: Make use of Knowledge on different Non-Destructive testing techniques.

Course	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO – I	S	M										M		
CO – II	S	M										M		
CO –III	S	M										M		
CO – IV	S	M		W								M		
CO – V	S	M			W							M		

23MET102 ENGINEERING MECHANICS **L T P C**
 (Common to Aero, Agri, Auto, Civil, Food, Mech and
 Mechatronics) **3 3 0 3**

UNIT I BASICS & STATICS OF PARTICLES 9

Introduction - Units and Dimensions - Vectorial representation of forces and moments –Coplanar Forces
 - Laws of Mechanics - Lamé's theorem, Parallelogram and triangular Law of forces -Resolution and
 Composition of forces -Equilibrium of a particle - Principle of transmissibility -Single equivalent force
 - Free body diagram

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Types of supports and their reactions -requirements of stable equilibrium -Moments and Couples -
 Moment of a force about a point and about an axis -Vectorial representation of moments and couples -
 Scalar components of a moment -Varignon's theorem -Equilibrium of Rigid bodies in two dimensions
 –Forces in space -Equilibrium of a particle in space - Equivalent systems of forces - Equilibrium
 of Rigid bodies in three dimensions -Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9

Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of
 inertia of plane and areas- Parallel axis theorem and perpendicular axis theorem, radius of gyration of
 area- product of inertia- mass moment of inertia.

UNIT IV DYNAMICS OF PARTICLES 9

Displacements, Velocity and acceleration, their relationship - Relative motion -Curvilinear motion -
 Newton's law -Work Energy Equation of particles -Impulse and Momentum -Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS 9

Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction -
 wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies - Velocity and acceleration
 - General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TEXT BOOKS

1. Beer, F.P and Johnston Jr. E.R. “Vector Mechanics for Engineers”, McGraw-Hill Education 11th Edition (India) Pvt Ltd. (2016). (Unit I,II,III,IV,V)
2. J.L.Meriam& L.G. Karidge, Engineering Volume I) and Engineering Mechanics: Dynamics, 8th edition, Wiley student edition, 2016. (I,II,III)

REFERENCES

1. Vela Murali, “Engineering Mechanics”, Oxford University Press (2010) (Unit I,II,III,IV,V)
2. D.P.Sharma “Engineering Mechanics”, Dorling Kindersley (India) Pvt. Ltd, New Delhi 2010. (Unit I,II,III,IV,V)
3. Dr.I.SGujral “Engineering Mechanical” second edition, 2011, Lakshmi Publication (P).Ltd. (Unit I,II,III,IV,V)
4. Arthur P. Boresi and Richard J. Schmidt, “Engineering Mechanics: Statics and Dynamics”, Thomson Asia Private Limited, Singapore, 2010. (Unit I,II,III,IV,V)
5. Hibbeler, R.C., “Engineering Mechanics”, 14th edition, Prentice hall (2016). (Unit I,II,III,IV,V)

WEB RESOURCES

1. <http://nptel.iitm.ac.in/video.php?subjectId=112103108>
2. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR / engg_mechanics /ui/TableofContents.html

COURSE OUTCOMES

At the end of the course students should be able to

- CO1** : Recognize the basics of equilibrium of particles in 2D and 3D
- CO2** : Review the requirements of equilibrium of rigid bodies in 2D and 3D
- CO3** : Compute the center of mass and moment of inertia of surfaces and solids
- CO4** : Predict displacement, velocity and acceleration of dynamic particles
- CO5** : Solve for friction force and rigid body dynamics

23EET101	BASIS OF ELECTRICAL AND ELECTRONICS ENGINEERING (Non-Circuit branches)	L	T	P	C
		3	0	0	3
UNIT I ELECTRICAL CIRCUITS					9
DC Circuits: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Simple problems: Nodal analysis, Mesh analysis with Independent sources only (Steady state)					
AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor (Simple problems only)					
UNIT II ELECTRICAL MACHINES					9
Construction, Principle of operation, Basic equations and applications of DC Generator, DC Motor- Elementary treatment of Single phase Transformer, Single and three phase Induction Motors, Synchronous Generator					
UNIT III WIRING, GROUNDING AND SAFETY					9
Wiring: General Rules, materials and accessories, Types of wiring - Conduit wiring –Wiring layout of Residential building, Grounding: Importance of grounding, Types of grounding - Safety: Causes of accidents, Accident prevention.					
UNIT IV ANALOG ELECTRONICS					9
Construction, working principle and VI characteristics of Diode, Zener diode, BJT, MOSFET, Applications: Bridge Rectifier, Voltage regulators, UPS, SMPS					

UNIT V DIGITAL ELECTRONICS AND MEASURING INSTRUMENTS

9

Boolean Algebra-Logic Gates - Half Adder and Full Adders - A/D and D/A Conversion (Any one concept)

Functional elements of an instrument, Construction and Operating Principle: Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Data acquisition

L: 45 T:0 P:0

TOTAL : 45 PERIODS

TEXT BOOKS

1. Muthusubramanian R, Salivahanan S, “Basic Electrical and Electronics Engineering”, TataMcGrawHillPublishers,2010
2. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020

REFERENCES

1. V.Mittle, “Basic Electrical Engineering”,Tata McGraw Hill Publishers,2017
2. Mehta VK, Mehta Rohit,“Principles of Electrical Engineering and Electronics”,S.Chand&CompanyLtd,2010
3. Black & Decker , “The complete guide to Electrical Wiring”, S.Chand& Company Ltd,2012
4. Nagrath. I.J, “Electronics: Analog and Digital”, Prentice Hall India Pvt. Ltd., 2013
5. Mehta V K, Mehta Rohit, “Principles of Electronics”, S.Chand& Company Ltd, 2005

WEB RESOURCES

- www.phyclips.com
- www.howstuffworks.com

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Familiarize the elementary concept of electric circuits

CO2 : Understand the construction, operation and applications of electrical machines

CO3 : Apply the concept of wiring and acquire the importance of grounding and safety

CO4 : Gain knowledge on electronic devices and its applications

CO5 : Acquire knowledge on basics of digital electronics and measurements

UNIT I LANGUAGE AND LITERATURE

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 – 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.

UNIT II HERITAGE – ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

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.

UNIT III FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

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.

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

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.

23GEB101	DESIGN THINKING AND INNOVATION	L	T	P	C
		1	0	4	3

UNIT I INTRODUCTION TO DESIGN THINKING 3+12

A brief insight to Design Thinking and Innovation- People Centered Design & Evoking the ‘right problem’- Purpose of Design Thinking- Design Thinking Framework

UNITII PROCESS IN DESIGN THINKING (EMPATHY, DEFINE) 3+12

Design Thinking Process – Empathy – Uncovering and Investigating Community Concerns - Define : Examine and Reflect on the problem

UNIT III CONCEPTING AND BUILDING (IDEA, CREATE) 3+12

Generating Ideas-Identifying top three ideas-Bundling the Ideas and create concepts-Rapid Prototyping

UNIT IV TESTING, REFINING AND PITCHING THE IDEAS 3+12

Importance & Testing the Design with People-Retest and Redefine Results-Creating a Pitch for the design

UNIT V VALUE PROPOSITION DESIGN 3+15

Business Vs Startup-Briefing the Problem-Problem Validation and User Discovery- Challenge Brief

L: 15 T:0 P: 60 TOTAL : 75 PERIODS

REFERENCE BOOKS

1. Robert A Curedale, Design Thinking Process & Methods 4th Edition, December 2017, Design Community College Inc.
2. Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.
3. Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Business
4. Idris Mootee, Design Thinking for Strategic Innovation - What They Can't Teach You at Business or Design School, First Edition, 2017, Wiley
5. Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos Alex Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want, 2015, Wiley

COURSE OUTCOMES

At the end of the course students should be able to

CO1:Learn new approach-design thinking—that enhances innovation activities in terms of market impact, value creation, and speed.

CO2:Feel the Empathy and can define their problems based on the Community Concerns

CO3:Strengthen their individual and collaborative capabilities to identify customer needs, create sound concept hypotheses, collect appropriate data, and develop a prototype that allows for meaningful feedback in a real-world environment

CO4:Translate broadly defined opportunities into actionable innovation possibilities and recommendations for client organization

CO5:Become an Entrepreneurs

ASSESSMENT

S.No	Item	Marks
1	Internal Reviews Problem Identification – 10 Empathy – 15 Define – 10 Ideate - 15	50
2	Report Evaluation & Testing	20
3	Prototype Exhibit & Pitching	30

BASIC MEASURING INSTRUMENT

1. Screw Gauge
2. Vernier Caliper
3. Travelling Microscope
4. Spectrometer

LIST OF EXPERIMENTS (ANY EIGHT) 30 hours

1. Determination of wavelength of mercury spectrum – Spectrometer grating.
2. Determination of Young’s modulus of the material – uniform bending.
3. Determination of viscosity of liquid – Poiseuille’s method.
4. (a) Particle size determination using Diode Laser.
(b) Determination of Laser parameters – Wavelength.
5. Determination of the Numerical Aperture and the acceptance angle of an optical fiber.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of dispersive power of a prism using spectrometer.
8. Determination of Young’s modulus of the material – non uniform bending.
9. Torsional Pendulum - determination of rigidity modulus of wire and moment of Inertia of disc.
10. Determination of Band gap of semiconductor material.

L :0 T: 0 P: 30 J: 0 T: 30 PERIODS

TEXT BOOK

1. Physics Laboratory Manual, Department of Physics, SNSCT, 2019.

REFERENCE BOOK

1. R.Jayaraman, V.Umadevi, S.Maruthamuthu, B.Saravanakumar “Engineering Physics Laboratory Manual”, Pearson Education India,2013.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Evaluate the young’s and Rigidity Modulus of the given material.

CO2: Utilize the concept of diffraction to determine the wavelength of given light source

CO3: Extend the knowledge on applying the principles of laser, fiber optics, viscosity and Band Gab of the Materials.

Course	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO – I	S	M							M			M		
CO – II	S	M							M			M		
CO –III	S	M							M			M		
CO – IV														
CO – V														

UNIT I LISTENING SKILLS 10

The process of Listening & Barriers of listening, Listening to TED Talks and note taking, – Listening to conversations for specific information, Listening to classroom lectures/ talks/documentaries.

UNIT II READING 10

Cloze exercises, Picture perception, Reading and paraphrasing, Reading and interpreting.

UNIT III PROFESSIONAL WRITING 10

Cover letter & Resume preparation, Email writing – formal & Informal, Content writing-planning-writing- editing and proof reading, Report writing- types of report, report format - Fire Accident & Road Accident.

UNIT IV COMMUNICATION & SOFT SKILLS 15

Communication & Barriers of Communication- Verbal & Nonverbal Communication, Time Management, Stress Management, Inter & Intra personal skills, Professional ethics, Basic Etiquettes- Social Etiquette- Telephone Etiquettes- Corporate Etiquette.

UNIT V SPEAKING 15

Introduction of self and others, Extempore Speech, Public Speaking, Art of Storytelling- Describing and Narrating, Presentation Skills- preparing PPT and Oral presentation, – Group Discussion – Team building- Mock GD, Interview skills- resume based questions- competency based question- Mock Interview.

L: 0 T: 0 P: 60 TOTAL:60 Periods

TEXT BOOKS

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.

REFERENCES

1. Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011
2. Mitra K. Barun, -Effective Technical Communication – A Guide for Scientists and Engineers, Oxford University Press, New Delhi, 2006.
3. Leo Jones, Richard Alexander, New International Business English, updated Edition, Cambridge University Press, NY, USA.
4. Smith—Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA.
5. Sharon J. Gerson, Steven M. Gerson, -Technical Writing – Process & Product. 3rd Edition, Pearson Education (Singapore) (P) Ltd., New Delhi.

COURSE OUTCOME

At the end of the course students should be able to

CO1: Make use of listening skills in both formal and informal contexts

CO2: Develop reading skill to comprehend ambiguity and complexity, and can articulate their own interpretations.

CO3: Demonstrate their writing skills for effective communication in both formal and informal situations

CO4: Discuss clearly, confidently, comprehensibly and communicate with one or many listeners using appropriate communicative strategies

CO5: Apply the various principles of communication in the work place environment

Course	Programme Outcomes / Programme Specific Outcomes														
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2	PSO3
CO-I															
CO-II															
CO-III															
CO-IV															
CO-V															

3- Strong contribution , 2-Medium Contribution , 1-Weak Contribution

LIST OF EXPERIMENT:

S.NO	EXPERIMENT
1	Listening Exercises
2	Reading Exercises
3	Cover letter & Resume
4	E-Mail writing
5	Content Writing
6	Report writing
7	Public Speaking
8	Presentation Skills
9	Group Discussion
10	Interview skills

23GEP101	WORKSHOP PRACTICES	L	T	P	C
	(Common to All B.E./B.Tech.Courses)	0	0	4	2

LIST OF EXPERIMENTS
GROUP A (CIVIL & MECHANICAL) 30

CIVIL ENGINEERING 12

1. Study of plumbing tools and
2. Components Preparation of threads in pipes
3. Preparation of single and multi-tap connections for domestic
4. Study of carpentry tools and its applications
5. Preparation of Cross Lap and Dove Tail Joints.

MECHANICAL ENGINEERING 18

1. Study of different types of Welding and its applications
2. Preparation of Butt, Lap and Tee joints
3. Study of sheet metal and its applications
4. Preparation of Rectangular, Square Trays and Funnel
5. Demonstration of Lathe and Drilling Operations
6. Demonstration of Smithy, Foundry tools and Power Tool Operations
7. Plastic Moulding and Glass Cutting

GROUP B (ELECTRICAL AND ELECTRONICS) 30

ELECTRICAL ENGINEERING PRACTICE 18

1. Residential house wiring using switches, fuse, miniature circuit breaker, indicator, Lamp and energy meter.
2. Fluorescent lamp wiring. Stair-case wiring.
3. Measurement of electrical quantities –voltage, current, power & power factor in RL Circuit.
4. Measurement of energy using single phase energy meter.
5. Measurement of insulation resistance to earth of electrical equipment.
6. Measurement of single and three phase voltages.
7. Study of Iron Box, Emergency Lamp and Fan.

1. Study of Electronic components and equipments –Resistor, color coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Verification of logic gates: AND, OR, Ex-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice–Components Devices and Circuits Using general purpose PCB.
5. Characteristics of a PN Junction diode

L: 0 T: 0 P: 60 Total:60 PERIODS

COURSEOUTCOMES

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

- CO1** DemonstrateplumbingsystemandCarpentryfortherequiredapplications.
- CO2** Relate the basic machining operations with engineering problems.
Apply different types of Welding processes and Sheet metal processes for the Industrial
- CO3** applications.
- CO4** Illustrate Residential House wiring and simple wiring circuits.
- CO5** Employ knowledge on measuring electrical quantities and usage of energy meters.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO I	3	2	2	2	3	3	2		3		2	3	3	3
COII	3	2	3	2	2	2	2		2			2	3	
COIII	3	2	2	2	3	2	2		3		3	3	3	2
COIV	3	3											1	
CO V	3				1									2

23CHT103 ENVIRONMENTAL SCIENCE & SUSTAINABILITY L T P C

(Common to all B.E / B.Tech) 2 0 0 0

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Introduction to biodiversity– Values of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex- situ conservation of biodiversity. Field visit on Biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHSASMS). Environmental protection, Environmental protection acts.

UNIT III RENEWABLE SOURCES OF ENERGY-NIT (Trichy) 6

Energy management and conservation, New Energy Sources: Need of new sources. Solar energy, Wind energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Case study on Present Energy resources in India and its sustainability.

UNIT IV SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Energy Cycles carbon cycle, emission and Sequestration, Sustainable urbanization and technological change.

UNIT V SUSTAINABILITY AND MANAGEMENT 6

Development, GDP, Sustainability - concept, needs and challenges-economic and social aspects of sustainability - millennium development goals and protocols Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry- A case study.

L :30 T: 0 P: 0 T: 30 PERIODS

TEXT BOOKS

- 1 Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
- 2 Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.
- 3 Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.

REFERENCES

- 1 G.Tyler Miller, "Environmental Science" Cengage Learning India Pvt.Ltd.New Delhi.2011

- 2 R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
- 3 Gilbert M. Masters and Wendell. P.Ela, "Introduction to Environmental Engineering and Science" PHI Learning Pvt. Ltd. New Delhi.2010.
- 4 Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
- 5 Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSE OUTCOMES :

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

- CO1** Understand the ecological balance and preservation of bio diversity.
- CO2** Know the role of human in prevention of pollution and making a clean environment.
- CO3** Explore the environmental impact of various energy resources and also get knowledge about conservation of non-conventional energy resources.
- CO4** Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
- CO5** Demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

SEMESTER II

23MAT102	COMPLEX ANALYSIS AND LAPLACE TRANSFORMS	L	T	P	C
	(Common to AEROSPACE,AGRI,AUTO,BME,CIVIL,ECE, EEE,FT,MECH,MCT)	3	1	0	4

UNIT I VECTOR CALCULUS 9+3

Derivatives: Gradient and Directional derivatives – Divergence and Curl of a vector field – Solenoidal and Irrotational of a vector – Green's, Gauss divergence and Stoke's theorems (statements only) – Verification of theorems and application in evaluating line, surface and volume integrals.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – Solution of system of simultaneous linear first order differential equations with constant coefficients.

UNIT III COMPLEX DIFFERENTIATION 9+3

Derivatives of $f(z)$ – Analytic function – Cauchy-Riemann Equations – Harmonic function – Harmonic conjugate – Construction of Analytic function – Conformal Mapping – Mapping by functions: $w = z + c$, cz , $1/z$ – Bilinear transformations – Application to flow problems.

UNIT IV COMPLEX INTEGRATION 9+3

Cauchy's integral theorem – Cauchy's integral formula – Taylor's series – Zeros of an analytic function – singularities – Laurent's series – Residues – Cauchy Residue theorem .

UNIT V LAPLACE TRANSFORMS 9+3

Definition, properties, existence conditions – Transforms of elementary functions – Shifting theorem – Transforms of derivatives and integrals – Periodic functions – Initial and final value theorem – Inverse transforms – Application to solution of linear second order ordinary differential equations with constant coefficients.

L : 45 T:15 P: 0 Total: 60 PERIODS

TEXT BOOKS

1. Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi 2016.
2. Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.

REFERENCES

1. Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. G.B.Thomas, Calculus, 12th Edition, Pearson Education India, 2015.
3. Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
4. Peter V.O Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning India Pvt Ltd, New Delhi, 2012.
5. Srimanta Pal, Subodh C Bhunia, "Engineering Mathematics", Oxford University Press,2015.

COURSE OUTCOMES

At the end of the course students should be able to

- CO1** Evaluate gradient, divergence and curl and solve engineering problems involving cubes, rectangular parallelepipeds by applying various integral theorems.
- CO2** Solve the higher order linear differential equations with various methods and apply them in some physical situations.
- CO3** Test the analyticity, construct the analytic function and transform complex functions from z-plane to w-plane graphically by using conformal mapping.
- CO4** Evaluate real and complex integrals over suitable closed path using various integral theorems.
- CO5** Understand the mathematical principles on Laplace transforms and would provide them the ability to formulate and solve some of the physical problems of engineering.

23CHT102	CHEMISTRY OF ENGINEERING MATERIALS	L	T	P	C
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(Common to MECH, MCT, AUTO, AERO,
AGRI, CIVIL & FT)

		3	0	0	3
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UNIT I	CORROSION AND ITS CONTROL				9
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Corrosion - Chemical corrosion (Oxidation corrosion)-Electrochemical corrosion-Types of electrochemical Corrosion -Corrosion control-Corrosion inhibitors- Cathodic protection (Sacrificial anodic protection and Impressed current Cathodic protection) – Protective coating-Paints and its constituents -Fire Retardant paint - Electroplating (Au)

UNITII	NANOMATERIALS				9
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Nano materials and Bulk materials - Size dependent properties (Optical, Electrical and Mechanical) –Synthesis - Sol gel method - Chemical Vapour Deposition, Solvothermal, laser ablation - Types of nanomaterials - Carbon nanotubes – Properties and uses - Application of Nanotechnology in Electronics Energy science and Medicine.

UNIT III	FUELS AND COMBUSTION				9
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Fuels- Solid Fuel-Coal-classification-manufacture of metallurgical coke by Otto-Hoffmann method-Liquid Fuel--Synthetic petrol-Fischer and Bergius method- - Gaseous fuels- CNG and LPG.- Bio fuels: Categories, Types –Biodiesel, Biogas.Combustion-Calorific value-Gross and Net calorific value - Definition -Flue gas analysis by Orsat Apparatus.

UNIT IV	WATER TECHNOLOGY				9
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Introduction-Hard water and Soft water-Hardness-Types-Boiler Troubles- Water Softening – External treatment-Demineralization-Internal Treatment- Water Quality parameters(pH,TDS,Chloride, Fluoride, Sulphate, Iron, BOD ,COD and Heavy metals)- Municipal water treatment - Desalination –Reverse osmosis.

UNIT V	ALLOYS AND ENGINEERING MATERIALS				9
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Alloys-classification -Ferrous alloys (Nichrome and stainless steel only)-Non-ferrous alloys (brass and bronze) Heat treatment of steel- Definition of light metals, Characteristics and applications of light metals-Super alloys - Lubricants –Solid lubricants (Graphite and Molybdenum disulphide)-Mechanism of Lubrications. Cement – Portland cement-Chemical composition of Portland cement. Functions and limitations of cement ingredients.

TEXT BOOKS

- 1 P.C.Jain&Monicka Jain, “Engineering Chemistry”, Dhanapat Rai Publising Company Pvt.Ltd. 2017.
2. Wiley, “Engineering Chemistry”, John Wiley &Sins.InC,USA (2014]

REFERENCES

- 1 B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2009).
- 2 Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, Second Edition, 2019.
- 3 Dr.Sivanesan and Nandagopal, “Engineering Chemistry-I” V.K.Pub.Pvt.Ltd. 2011.

23ENT101

COMMUNICATIVE ENGLISH

L	T	P	C
3	0	0	3

9

UNIT I

Grammar - Tenses - Verb forms, Spelling and Importance of Punctuation, **Vocabulary**- Word formation- Prefixes & Suffixes, One word Substitution, **Reading**-Reading and understanding the Context, **Writing**- Sentence completion- filling the gap, Instructions- Imperative Instructions

UNIT II

Grammar- Uses of Preposition, Active & Passive Voice- impersonal passive, Vocabulary- Technical Vocabulary- Synonyms-Antonyms-Compound words, Reading -Transfer of information (chart, pictures), Writing- Recommendations- writing suggestions, Preparing Checklist.

UNIT III

Grammar-Concord (Subject & Verb agreement), Definite & Indefinite Article, Vocabulary- Uses of Connectives and Linking words, Reading- Summarizing the given passage - Précis writing, Writing - Paragraph writing – Process writing, Analytical, Argumentative paragraphs.

UNIT IV

Grammar- Direct and Indirect speech, Cause and Effect Expression, Vocabulary- Logical sequence of words, Reading -Note-making using Linear method, Writing- Formal Letter writing- Permission letter for Industrial Visit & In-plant training.

UNIT V

Grammar- Clauses -If Conditionals, Vocabulary- Words often confused - Verbal Analogy, Reading- Writing a Book Review Writing - Business Letters- Letter of Quotations, Clarification, Placing orders & Complaint letter.

L: 45 T: 0 P: 0 TOTAL:45 Periods

TEXT BOOKS

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi,2005.

REFERENCES

1. Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011
2. Mitra K. Barun, —Effective Technical Communication – A Guide for Scientists and Engineers, Oxford University Press, New Delhi, 2006.

UNIT IV STACK AND QUEUE**9**

Stack ADT - Queue ADT - Array implementation of Queue and Stack ADT - Infix to Postfix conversion - Postfix expression evaluation

UNIT V TREES**7**

Trees - Binary Tree - Binary Search Tree - Insertion and Deletion Operation - Tree Traversal

L: 45 T: 0 P: 0 TOTAL : 45 PERIODS**TEXT BOOKS**

1. Kamthane Ashok, "Programming in C, Pearson Education India 3/e, 3rd Edition, 2015.
2. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe Augenstein, "Data Structures Using C", Prentice-Hall of India, 2003

REFERENCES

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2nd Edition, 2007. (Unit III-V)
2. E.Balagurusamy "Data Structures Using", McGraw-Hill Education (India) , 2013 (IV-V)
3. E.Balagurusamy, "Fundamentals of Computing and Computer Programming", Tata McGraw-Hill Publishing Company Limited, (2011). (UNIT I, II)

COURSE OUTCOMES

At the end of the course students should be able to

CO 1: Develop algorithms and draw flow chart for solving real world problems**CO 2:** Summarize decision making branching and looping statement.**CO 3:** Demonstrate functions, arrays and data structure.**CO 4:** Describe stack and queue data structure.**CO 5:** Have knowledge in tree and its operation.

23CET101	ENGINEERING GEOLOGY	L	T	P	C
		3	0	0	3
UNIT I	PHYSICAL GEOLOGY				9
Geology in civil engineering – branches of geology – structure of earth and its composition – weathering of rocks – scale of weathering – soils - landforms and processes associated with river,– relevance to civil engineering – Earthquake and its causes – Earthquake zones in India – Volcano and its causes					
UNIT II	MINEROLOGY				9
Physical properties of minerals – Quartz group, Feldspar group, Iron ore minerals – Hematite and Magnetite – Clay Minerals – Mica – muscovite and biotite, Calcite					
UNIT III	PETROLOGY				9
Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Sandstone, Limestone, Shale, Quartzite					
UNIT IV	STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS				9
Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.					
UNIT V	APPLICATION OF GEOLOGICAL INVESTIGATIONS				9
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, tunnels and highways- Coastal protection structures. Investigation of Landslides, causes and mitigation					

		L : 45	T: 0	P: 0		Total: 45 Periods
TEXT BOOKS						
1	Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing 2009					
2	Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010					
REFERENCES						
1	Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.					
2	Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011					
3	Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988.					
4	ChennaKesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009					
5	Gokhale KVGK, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2011					
COURSE OUTCOMES						
At the end of the course student should be able to:						
CO1	Carry out engineering investigations and study about Earthquakes and Volcano.					
CO2	Identify and study the properties important minerals					
CO3	Identify and classify rock using basic geologic classification systems.					
CO4	Study about different structural aspects and geophysical methods					
CO5	Realize the importance of this knowledge in projects such as dams, tunnels and highways					

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3						3					1		
CO - II		2							1					
CO - III				2			3						2	2
CO - IV	1							1		2				
CO - V			2	2		2	3				2			2
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23GET104

TAMILS AND TECHNOLOGY
(Common Branches)

L T P C
1 0 0 0

UNIT I WEAVING AND CERAMIC TECHNOLOGY

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

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 – 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.

UNIT III MANUFACTURING TECHNOLOGY

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 – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoomp of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

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.

23CHP101

CHEMISTRY LABORATORY (Common to All Branches)

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS (ANY EIGHT) 30 hours

1. Estimation of alkalinity of water sample by indicator method
2. Determination of hardness of water sample by EDTA method
3. Estimation of Dissolved oxygen in water sample by Winkler's method
4. Estimation of Chloride in water sample by Argentometric method
5. Estimation of copper in brass by EDTA method
6. Determination of strength of HCl and CH₃COOH present in a mixture conduct metrically
7. Estimation of strength of iron by potentiometric titration
8. Determination of molecular weight of given polymer by Ostwald's viscometer
9. Determination of Strength of HCl by pH metry
10. Determination of corrosion rate of mild steel by weight loss method

Demo Experiments

11. Synthesis of nanomaterials by chemical precipitation method
12. Estimation of strength of iron by spectrophotometry

L : 0 T: 0 P: 30 T: 30 PERIODS

TEXT BOOKS

1. Department of Chemistry "Chemistry Laboratory Manual", 2019

REFERENCE BOOKS

1. Vogel's "Text book of Quantitative Analysis", Jeffery G H, Basset J, Mentom J, Denney R.C., 6th edition, EBS, 2009.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyze the quality of water samples through basic techniques

CO2 Estimate the amount of metal ions in domestic and industry water

CO3: Determine the absolute viscosity and molecular weight of Organic solvents

CO4: Interpret the corrosion rate of metals

23ITP101	PROGRAMMING IN C AND DATA STRUCTURES LABORATORY	L	T	P	C
	(Common to BME, ECE and All Non Circuit Branches)	0	0	4	2

LIST OF EXPERIMENTS

- | | |
|----|--|
| 1 | Algorithms and Flow Chart
i) Sequential
ii) Branching and Looping |
| 2 | Operators & Expressions
i) Arithmetic
ii) Logical
iii) Relational |
| 3 | Condition Statements
i) Nested if else
ii) Else-if Ladder |
| 4 | Looping
i) For
ii) While
iii) Do-while |
| 5 | Functions
i) With and without arguments
ii) With and without return type
iii) Call by value and Call by reference |
| 6 | Arrays
i) Searching element in one dimensional array
ii) Matrix multiplication |
| 7 | Structures |
| 8 | Pointers |
| 9 | Implementation of Stack ADT |
| 10 | Implementation of Queue ADT |
| 11 | Implementation of Tree Traversal |
| 12 | Implementation of Binary Search Tree ADT |

L: 0 T: 0 P: 60

TOTAL: 60 PERIODS

HARDWARE / SOFTWARE REQUIRED

(For a Batch of 30 Students)

- | | |
|-----------------|--|
| Hardware | <ul style="list-style-type: none"> • 30 PCs with Processor-2.0 GHz or Higher • RAM-1 GB or Higher • Hard disk-20 GB or Higher |
| Software | <ul style="list-style-type: none"> • TURBO C version 3 (or) GCC version 3.3.4 • OS-Windows2000/Windows XP/NT |

COURSE OUTCOMES

At the end of the course students should be able to

- CO 1: develop algorithm and draw flow chart to solve problem.
- CO 2: write simple programs using basic concepts and control statements in C language.
- CO 3: write programs using arrays, structures and pointers.
- CO 4: implement stack and queue data structure
- CO 5: implement binary search tree ADT

23CEP101

INTERNSHIP - I

L T P C
- - - . 1

OBJECTIVE:

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

Two Week

COURSE OUTCOMES

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

- CO1** Determine the challenges and future potential
- CO2** Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
- CO3** Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3												2	2
CO - II		2	3	2										
CO - III				2									1	
CO - IV														
CO - V														
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23HST103

INDIAN CONSTITUTION

L T P C

(Common to All Non Circuit Branches)

2 0 0 0

UNIT I INTRODUCTION

6

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

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6

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

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6

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

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Center – State Relations – President’s Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

UNIT V ELECTION COMMISSION 6

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

L:30 T:0 P:0 TOTAL: 30 PERIODS

TEXT BOOKS

1. Durga Das Basu, “Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.
2. R.C.Agarwal, “Indian Political System”, S.Chand and Company, New Delhi. (1997)

REFERENCES

1. Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.
2. K.L.Sharma, “Social Stratification in India: Issues and Themes”, Jawaharlal Nehru University, New Delhi. (1997)
3. Sharma, Brij Kishore, “ Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
4. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar.
5. R.N. Sharma, “Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.

COURSE OUTCOMES

At the end of the course students should be able to

- CO1** : Understand the functions of the Indian government
- CO2** : Understand the structure and functioning of central government.
- CO3** : Understand the structure and functioning of state government
- CO4** : Understand functioning of Indian constituent.
- CO5** : Understand functioning of election commission.

SEMESTER III

23MAT201 PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L T P C
(Common to AEROSPACE,AGRI,AUTO,BME, CIVIL,ECE,EEE,FT,MECH,MCT)	3 0 0 3

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations – Solutions of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second order with constant coefficients of homogeneous types – Applications.

UNIT II FOURIER SERIES 9

Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval’s identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9

Classification of PDE – Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9

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

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9

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

L : 45 T:0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi 2016.
2. Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.

REFERENCES

1. Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
4. Wylie. R.C. and Barrett . L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
5. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.

UNIT I PRINCIPLES OF CONSTRUCTION**5**

Structural systems: Load Bearing Structure, Framed Structure, Load transfer mechanism. Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork – Foundation and Basement.

UNIT II CONSTRUCTION PRACTICE - SUPER STRUCTURE**7**

Brick Masonry – Stone masonry – Solid and Hollow block masonry – Composite masonry – Cavity walls, Flooring – Formwork, Shuttering, Centering, Staging and Scaffolding – Slip and moving forms – Roofs and roof covering – Joints in Concrete (Contraction, Construction and Expansion) – Plastering and Pointing (its purpose) – Introduction on Flat slab, off shore platforms and special forms for shells.

UNIT III CONSTRUCTION PRACTICE - SUB STRUCTURE**6**

Shoring – dewatering – Diaphragm wall – underpinning – Techniques of Box jacking – Pipe Jacking – under water construction – Tunneling techniques – Piling techniques – well and caisson – sinking cofferdam.

UNIT IV MISCELLANEOUS TECHNIQUES AND SERVICE REQUIREMENTS**6**

Pre cast and Prefabricated panels and structures - Cladding – Sound insulations – Ventilations – Air conditioning – Drainage Systems, Sewage Treatment and Refuse Disposal – Sanitary Fitments and Appliances: Discharge and Waste Systems – Fire resisting construction – Damp and Water proofing - Termite proofing.

UNIT V CONSTRUCTION EQUIPMENTS**6**

Selection of equipment – economic life of equipment – cost of equipment - maintenance of equipment – Earthwork equipment – Tractors and earth movers – Equipment for soil compaction – Material handling and hoisting – Dewatering and Pumping – Trenching, tunnelling and dredging – Screening Equipment like Batching Plant, RMS Carriers, Concrete pouring and pumping equipment

L : 30 T : 0 P : 0 Total: 30 PERIODS

TEXT BOOKS

- 1 Arora S.P. and Bindra S.P., “The Text Book of Building Construction”, Dhanpat Rai & Sons, 2010
- 2 Varghese, P.C. “Building construction”, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
- 3 Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 1998.

REFERENCES

- 1 Punmia P.C., “Building Construction”, Laxmi Publication (P) Ltd., 1993
- 2 Jha J and Sinha S.K., “Construction and Foundation Engineering”, Khanna Publishers, 2004
- 3 Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2002.
- 4 Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
- 5 Dr. Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983
- 6 Sharma & Kaul, Building Construction, S.Chand & Company Pvt, New Delhi, 1998
- 7 SP 7 : 2016 National Building Code of India 2016 (NBC 2016)

COURSE OUTCOMES

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

CO1 Learn about the different structural systems .

CO2 Understand various techniques and practices on masonry construction, flooring, and roofing

CO3 Plan the requirements for substructure construction.

CO4 Understand the importance of various service requirements for buildings

CO5 Select, maintain and operate hand and power tools and equipment used in the building construction sites

UNIT I STRESS AND STRAIN**9**

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law – Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Determination of principal stresses and principal planes – Mohr's circle of stresses – Volumetric strain– Compound Bars..

UNITII SHEAR AND BENDING IN BEAMS**9**

Beams and Bending - Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load.

Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions.

UNIT III DEFLECTION OF BEAMS**9**

Double integration method – Macaulay's method – Moment area method for computation of slopes and deflections of determinant beams.

UNIT IV SHAFTS AND SPRINGS**9**

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – Combined bending and torsion of shafts - strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel.

UNIT V THIN AND THICK CYLINDERS**9**

Stresses and deformation in thin cylinders and spherical shells subjected to internal pressure, Thick cylinders – Hoop and radial stress variation, Lamé's equation, Compound cylinders – Shrink fit.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

- 1 Bansal.R.K. "Strength of Materials", 6th Edition, Laxmi Publications(P) Ltd, 2017.
- 2 Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.

REFERENCES

- 1 Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi,2009.
- 2 Rajput.R.K. "Strength of Materials"4th Edition, S.Chand& co, New Delhi,2019
- 3 Timoshenko.S.P. and Gere.J.M, "Mechanics of Materials", 5th Edition, Tata McGraw Hill, 2008.
- 4 Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012
- 5 Ramamrutham.R. "Strength of Materials", 18th Edition, DhanpatRai Publishing company, 2014.

COURSE OUTCOMES

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

- CO1** Understand the fundamental concepts of stress and strain in mechanics of solids and Structures.
- CO2** Draw shear force and bending moment for different loading conditions and also analyze the Bending stress.
- CO3** Determine the deflection of any types of beam
- CO4** Design shafts to transmit required power and also springs for its Maximum energy storage capacities
- CO5** Analyze the stresses and deformation in cylinders and spherical shells subjected to internal Pressure.

23GET275

VQAR-I

L T P C

(Common to All B.E. / B. Tech. Courses)

2 0 0 2

UNIT I QUANTITATIVE ABILITY I 8

Number theory- Shortcuts, Divisibility rule- Unit place deduction-LCM &HCF, Square root and Cube Root, Decimal & Fraction Percentage, Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.

UNIT II QUANTITATIVE ABILITY II 6

Problems on Ages, Average, Clocks, Calendar, Data Interpretation- Bar chart- Pie chart- Line chart- Tables chart.

UNIT III VERBAL REASONING I 7

Analytical reasoning– Linear and circular arrangement, Blood relation, Direction Problems, Puzzles. Logical reasoning - Number and Alpha series, Odd man out, Element series and Logical series, Coding and decoding, Analogy, Classification, Logical sequence of words.

UNIT IV LINGUISTICS SKILLS I 6

Parts of Speech- Noun, Verb, Participle, Articles, Pronoun, Preposition, Adverb, Conjunction. Logical sequence of words, Tense & Voice, Comparison.

UNIT V LINGUISTICS SKILLS II 3

Comprehension - Comprehend and understand a paragraph, Paragraph writing.

L :30 T: 0 P: 0 J: 0 T: 30 PERIODS

TEXT BOOKS

- 1 Rajesh Varma, “Fast Track Objective Arithmetic”, Arihant Publications.
- 2 M.K.Panday, “Analytical Reasoning”, Magical Series.
- 3 BS Sijwali- Indu Sijwali, A New Approach to “Reasoning Verbal, Non-Verbal & Analytical”, Arihant Publications.
- 4 John Eastwood, “Oxford Practice Grammar”, Oxford.

REFERENCES

- 1 R.V.Praveen, “Quantitative Aptitude and Reasoning” PHI Publication.
- 2 R.S.Agarwal, “Quantitative Aptitude for Competitive Examinations”, S.Chand& Company Pvt Limited.
- 3 R.S.Agarwal, “A modern approach to Verbal & Non-verbal reasoning”, S.Chand & Company Pvt Limited.

COURSE OUTCOMES :

At the end of the course students should be able to

- CO 1** Apply the number system for solving application orientated concepts in quantitative aptitude.
- CO 2** Apply the financial ability for solving application orientated concepts in quantitative aptitude and in the data interpretation techniques.
- CO 3** Analyze the analytical reasoning and logical reasoning in verbal aptitude applications.
- CO 4** Apply appropriate grammar in both speaking and writing.
- CO 5** Analyze the given content and write a creative content.

CO/PO Mapping														
(S/M/W Indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2				2	2	1	1			2	3	
CO 2	2	1	1				1	1			2		2	
CO 3	2	2		1			2		2			1	3	2
CO 4	1							2		1			2	3
CO 5								2		1			3	3

23CEB201	CONSTRUCTION MATERIALS	L	T	P	C
		2	0	2	3

UNIT I STONES – BRICKS – BUILDING BLOCKS 6+4

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Efflorescence – Bricks for special use – Refractory bricks – Fly ash bricks - Concrete blocks – Light weight blocks.

Experiments:

1. Determination of Compressive strength and Water Absorption of different Bricks and Blocks

UNIT II LIME – CEMENT – AGGREGATES 6+16

Lime – lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – Ashes in cement – Aggregates – Coarse aggregates – Properties – Testing – Fine Aggregate – types – Grading - Bulking of sand - Properties - Testing

Experiments:

1. Determination of Specific gravity and Fineness of cement using Blaine's Apparatus
2. Determination of Standard Consistency, Initial & Final Setting time of Cement
3. Determination of Grading Zone and Bulking of Fine Aggregate
4. Determination of Specific Gravity and water absorption of Fine Aggregate

UNIT III CONCRETE 6

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Admixtures - High Strength Concrete - HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

UNIT IV TIMBER AND OTHER MATERIALS 6

Timber – Market forms – Industrial timber – Plywood – Veneer – Thermacole – Panels of laminates Steel – Structural steel properties and uses - Aluminum and other Metallic Materials – Composition – Aluminium composite panel – Uses – Market forms – Mechanical treatment – Paints Varnishes – Distempers – Bitumen

UNIT V MODERN MATERIALS

6+10

Glass – Ceramics – Sealants for joints – PVC – UPVC – WPC - Fibre reinforced glass plastic – Roofing materials – Ferro Cement – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geo-membranes and Geotextiles for earth reinforcement.

Experiments:

1. Determination of Tensile strength of given steel rod and double shear strength of given metal
2. Determination of Compressive strength of given Helical Spring & Hardness of the given specimen
3. Determination of Toughness of given metal by Izod and Charpy tests.
4. Determination of Modulus of Rigidity and Deflection of beam

LIST OF EQUIPMENTS

1. UTM
2. CTM
3. Torsion Impact Testing Machine
4. Impact Testing Machine
5. Pycnometer
6. Blaine's apparatus
7. Vicat apparatus
8. Spring Testing Machine
9. Hardness Testing Machine (Rock well & Brinell)
10. Beam Deflection Apparatus

L :30 T: 0 P: 30 Total: 60 PERIODS

TEXT BOOKS

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012
2. Shetty.M.S, "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008.

REFERENCES

- 1 Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
- 2 Gambhir.M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2013
- 3 IS:456 – 2000: Indian Standard specification for plain and reinforced concrete, 2011
- 4 IS:4926–2003 : Indian Standard specification for ready–mixed concrete, 2012
IS:383–1970: Indian Standard specification for coarse and fine aggregate from natural
Sources for concrete, 2011
- 5

COURSE OUTCOMES

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

- CO1** Compare the properties of most common and advanced building materials.
- CO2** Understand the typical and potential applications of building materials.
- CO3** Understand the relationship between material properties and structural form
- CO4** Understand the importance of experimental verification of material properties.
- CO5** Understand the importance of modern material for construction.

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3					3	3		3			3		1
CO - II	3		1	2		3	3	1		1	3	3	2	
CO - III	2	1				3						3		1
CO - IV	2			2		3	2			2	2	3	1	
CO - V	3				2	2		1	1	3		3		2
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23CEB202

SURVEYING

L T P C
2 0 2 3

UNIT I BASIC SURVEYING

6+9

Principles – Classification of Surveying – Scales – Conventional signs – Chain Surveying – Tape – Compass Surveying – types - Adjustment of error .

Experiments:

1. Aligning, Ranging, Chaining and Marking of Foundation using linear Instrument.
2. Calculate the area of the straight line irregular boundary using linear Instrument.
3. Compass Traversing – Measuring Bearings & arriving included angles.

UNITII LEVELLING

6+6

Definition – Terms – Levels and Staves – Temporary and permanent adjustments – Fly and check levelling – Booking – Reduction – Curvature and refraction – Reciprocal levelling – Longitudinal and cross sections – Plotting – Calculation of areas and volumes – Contouring - Capacity of reservoirs.

Experiments:

1. Fly levelling and Check levelling using Dumpy level.
2. Radial contouring / Grid Contouring.

UNIT III THEODOLITE SURVEYING

6+9

Theodolite – Types – Description – Horizontal and vertical angles – Temporary and permanent adjustments – Heights and distances – Tangential and Stadia Tacheometry – Stadia constants – Anallactic lens – Curves – Terminologies – Types – Setting out a simple curve – Rankine’s method of deflection angle.

Experiments:

1. Measurements of horizontal angles by reiteration and repetition and vertical angles.
2. Setting out Curve by Rankine’s method of deflection angle.
3. Determination of elevation of an object using single plane method when base is accessible / inaccessible.
4. Determination of Tachometric Constants.

UNIT IV TOTAL STATION SURVEYING

6+6

Basic Principle – Classifications – Electro-optical system: Measuring principle - Working principle - Sources of Error, Microwave system: Measuring principle - working principle - Sources of Error - Comparison between Electro-optical and Microwave system - Care and maintenance of Total Station instruments - Modern positioning systems

Experiments:

1. Measuring Horizontal and vertical angles, Traverse using Total station and Area of Traverse.
2. Building column marking using Total stations

UNIT VGPS AND DGPS SURVEYING

6

Basic Concepts – Different segments – space, control and user segments – Satellite configuration – signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability – Task of control segment – Hand Held and Geodetic receivers – data processing – Traversing and Triangulation – Application of GPS – Introduction and Application of DGPS – Fundamentals of Photogrammetry and Remote sensing

LIST OF EQUIPMENTS

1. Chain and its accessories
2. Dumpy level and its accessories
3. Prismatic Compass
4. Surveyor Compass
5. Theodolite
6. Total Station
7. Hand held GPS

L :30 T: 0 P: 30 Total: 60 PERIODS

TEXT BOOKS

- 1 Punmia B.C. Surveying, Vols. I, II and III, 16th Edition, Laxmi Publications, 2009
- 2 S. K. Duggal, Surveying, Vol I & II, 7th Edition, Tata McGraw-Hill Education, 2004

REFERENCES

- 1 James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001
- 2 Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.
- 3 Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
- 4 Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004
- 5 Arora K.R., "Surveying-Vol I & II", Standard Book house, 10th Edition 2008

COURSE OUTCOMES

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

- CO1** Use various surveying instruments and measuring the angles and distances
- CO2** Prepare contour maps, L.S, C.S
- CO3** Perform tachometric surveying for distance and height measurements
- CO4** Know about total station surveying
- CO5** Know about GPS surveying

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3				3	3		3				3		1
CO - II	2	1	2		3	3	1		1	3		2	2	
CO - III	2	1				2						2		1
CO - IV	2			2	2	2			2	2		3	1	
CO - V	3		2		2	2	1	1	3			3		2

23CEP201

CIVIL CAD DRAWING

L T P C
0 0 4 2

LIST OF EXPERIMENT

1. Basic Terminologies, Different Views in Building Construction, symbols
2. Draw the site plan, location plan and approval preparation for nodal agencies
3. Detailed working drawings of the component parts- Doors and windows
4. Detailed working drawings of the component parts- Steel Roof trusses, staircases
5. Detailed working drawings of the component parts- Section of Spread Footing Foundation
6. Draw Plan, section and elevation of Residential buildings (flat roof)
7. Draw Plan, section and elevation of Residential buildings (sloping roof)
8. Draw Plan, section and elevation of Single-storey factory buildings with trusses
9. Draw Plan, section and elevation of Single-storey R.C.C. Framed residential building.
10. Draw the beam-column layout plan of a R.C.C Framed residential building.

L: 0 T: 0 P: 30 TOTAL : 30 PERIODS

TEXT BOOKS

1. Shah, M.G, Kale, C.M, Patki, S.Y, "Building Drawing - With an Integrated Approach to Built Environment", Tata McGraw-Hill, 2007
2. Building drawing & detailing – Balagopal & T.S. Prabhu, Spades Publishers, Calicut.

REFERENCES

1. National Building Code of India 2016, Third edition, Bureau of Indian Standards, Govt. of India, 2016
2. Building planning & Drawing –Kumaraswamy N., Kameswara Rao A., Charotar Publishing
3. Donald Watson, "Time-Saver Standards for Building Materials & Systems: Design Criteria and Selection Data", Tata McGraw Hill Education, 2009

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Prepare the building plans satisfying the principles of planning and specification.

CO2: Understand the methods of the functional aspects in various building structures

CO3: To draw plan, elevation and section for various structures

CO4: Prepare detailed working drawings in various types of doors, windows

CO5: Develop drafting skills in drawing plan, section and elevation of public buildings using Auto CAD software.

23ITP204

PROGRAMMING IN PYTHON
(Common to All B.E/B.Tech Programme Except CSE, IT and
AIML)

L	T	P	C
0	0	4	2

LIST OF EXPERIMENTS

1. Program for various base conversion functions.
2. Programs to demonstrate the usage of operators and conditional statements
3. Programs to demonstrate usage of control structures
4. Program using array operation
5. Programs to demonstrate the usage of String functions
6. Program using classes and functions
7. Program to implement recursive function.
8. Program to implement lambda function.
9. Program on file manipulation
10. Programs to demonstrate the usage of lists, sets, dictionaries and tuples.
11. Program to implement function template.
12. Program to implement class template

L: 0 T:0 P:60 TOTAL:60 PERIODS

COURSE OUTCOMES

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

- CO1** Write simple programs using built-in data types of Python.
- CO2** Apply the conditional statements and loops for solving problems.
- CO3** Implement arrays, strings and functions in Python
- CO4** Identify the commonly used operations involving lists, sets, dictionaries, tuples and file handling in real time applications.
- CO5** Implement exemplary applications related to templates for solving real time problems.

23CEP202

MINI PROJECT - I

L	T	P	C
0	0	2	1

STRATEGY:

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
- Create a model/fabricate a model/conduct experiment/simulate mechanical system/implement the same. Analyze data, evaluate the results and conclude the

appropriate solution, suggestion for future work.

- The progress of the project is evaluated based on a minimum of two reviews.
- The review committee may be constituted by the Head of the Department
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details, result and conclusion.
- This final report shall be typewritten form as specified in the guidelines. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner

Some of the projects are listed below for the benefit of the students

- Study and preparation of detailed report on corrosion, nano-materials , industrialwater analysis.
- Preparation of technical report writing on environmental pollution and its remedies
- Software development using C Programming and Data structures
- Preparation of detailed report on materials.
- Create a model/fabricate a model/conduct experiment/simulate mechanicalsystem/implement the same.
- Prepare the building plans satisfying the principles of planning and specification.
The project area may be beyond the above listed.

COURSE OUTCOMES

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

- | | |
|------------|--|
| CO1 | Use design thinking approach to find out the industry or society problems |
| CO2 | Understand and define the industry or society problems |
| CO3 | Identify the customer needs and to identify new solutions to the problem statement |

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3	2	3		3	3	3		2		2	3	3	3
CO - II	3			3				3				3	3	3
CO - III	3		3		3	3	2			3	3		2	2
CO - IV														
CO - V														
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

SEMESTER IV

23MAT205	PROBABILITY, STATISTICS AND NUMERICAL METHODS	L	T	P	C
	(Common to CIVIL and MCT)	3	0	0	3

UNIT I PROBABILITY AND RANDOM VARIABLES 9

Axioms of probability - Conditional probability - Total probability - Baye's theorem- Discrete and continuous random variables – Moments – Moment generating functions and their properties.

UNIT II TESTING OF HYPOTHESIS 9

Sampling distributions – Tests for single mean, proportion and difference of means (large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT III SOLUTIONS OF EQUATIONS 9

Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting Gauss Jordan methods – Iterative methods of Gauss Jacobi and Gauss Seidal.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND
NUMERICAL INTEGRATION 9**

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

UNIT 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 equations – Multi step methods: Milne's predictor-corrector methods for solving first order equations.

L : 45 T:0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and statistics for Engineers", Pearson Education Asia, 9th Edition, 2018.
2. Grewal, B.S and Grewal, J.S, "Numerical methods in Engineering and Science", 10th Edition, Khanna Publishers, New Delhi, 2015

REFERENCES

1. Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists",9th Edition, Pearson Education, Asia, 2010.
2. Burden, R.L and Faires, J.D, "Numerical Analysis", 9 th Edition, Cengage Learning, 2016.
3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8 th Edition, 2014.
4. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
5. Spiegel,M.R., Schiller, J. and Srinivasan,R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill edition, 4th Edition, 2012.

COURSE OUTCOMES

At the end of the course students should be able to

- CO1** Utilize the skills in handling more than one random variable, standard distributions and functions of random variables.
- CO2** Apply the statistical concepts and tools for engineering applications and to use different types of research methodology techniques for decision making under uncertainty.
- CO3** Solve a set of algebraic equations representing steady state models formed in engineering problems.
- CO4** Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- CO5** Predict the system dynamic behaviour through solution of ODEs modelling the system.

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3	3	1		2				2			2		
CO - II	3	3	2	2	2				2		2	2		
CO - III	3	3			2				2			2		
CO - IV	3	3			2				2			2		
CO - V	3	3			2				2			2		
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23CET203

MECHANICS OF MATERIALS

L T P C
3 0 0 3

UNIT I ENERGY PRINCIPLES

9

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings), shear, flexure and torsion – Castigliano’s theorem- Maxwell’s reciprocal theorem - Principle of virtual work – Application of energy theorems for computing deflections in determinate beams, plane frames and plane trusses

UNIT II INDETERMINATE BEAMS

9

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

UNIT III COLUMNS AND STRUTS

9

Euler’s column theory – critical load for prismatic columns with different end conditions – effective length – limitations - Rankine-Gordon formula - Eccentrically loaded short columns – middle third rule - core of a section.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

9

Theories of failure–Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy Theory and distortion energy theory –Application of Failure Theories in analysis.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS

9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - Curved

beams – Winkler Bach formula.

L:45 T:0 P:0 J:0 Total: 45 PERIODS

TEXT BOOKS

1. S. Ramamrutham (Author), R. Narayanan (Author). “Strength of Materials”20th Edition, Dhanpat Rai publishing ,2020
2. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

REFERENCES

- 1 Punmia.B.C."Theory of Structures" (SMTS) Vol 1&II, sixteenth edition ,Laxmi Publishing Pvt Ltd, 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 Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2005
- 4 Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
- 5 Stephen Timoshenko “Strength of Materials”, Third Edition, Part 1.CBS Publishers Distributors Pvt. Ltd, 2021.

COURSE OUTCOMES

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

- CO1** Understand the behaviour of energy principles in structures.
- CO2** Analyse propped cantilever, fixed and continuous beams for various loading
- CO3** Assess the behaviour of columns
- CO4** Determine principal stresses and planes for and study theories of failure and energy theories.
- CO5** Understand the bending of beams in symmetrical and unsymmetrical sections.

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3	3	3										3	
CO - II	3	3	3									3	3	
CO - III	3	3	3			3		3		2		3	3	
CO - IV	3	3	3										3	
CO - V	3	3	3			3		3		2		3	3	
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23CET204	HIGHWAY AND RAILWAY ENGINEERING	L	T	P	C
		3	0	0	3

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Development of Roads in India – Institutions for highway planning and implementation at different levels - Jayakar committee recommendations and Realisations - Conventional methods and modern methods (Remote Sensing, GIS and GPS techniques) - Requirements of Ideal Alignment, Factors Controlling Highway Alignment - Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards] .

UNIT II HIGHWAY GEOMETRIC DESIGN 9

Speed Studies – PIEV theory – Design of super elevation– Theory & Problems -Extra widening on horizontal curves– Theory & Problems.-Transition curves -Theory & Problems. Design of Vertical Alignment: Terrain classification - Categories of Gradient – Grade compensation – Geometric design of hill roads [IRC Standards Only]-Fundamentals of Traffic Engineering.

UNIT III PAVEMENT DESIGN 9

Rigid and Flexible Pavements- Components and their Functions -Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements - ESWL, ESAL ,Climate, Sub-grade Soil and Traffic - Design Practice for Flexible Pavements [IRC Method and Recommendations- Problems] -Design Practice for Rigid Pavements – IRC Recommendations - concepts only, Introduction to IIT PAVE

UNIT IV RAILWAY ENGINEERING - BASICS AND COMPONENTS 9

Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS – Permanent Way - Components and functions of each component – Coning of wheels-Gauges: Classification, Selection &Uniformity -Rails: Functions, Types of rail sections, Length of rails, Rail Joints, Creep of rails.-Sleepers: Functions, Requirements, Classification & Sleeper density.-Ballast: Functions, Requirements, Types of ballast

UNIT V SIGNALS, POINTS AND CROSSING 9

Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage - Track Modernisation – -Necessity of Points and Crossings – Turnouts. -Railway Stations: Requirements, Classifications.-Station Yards: Types - Signaling: Objects, Engineering principles and Types.- Control Systems: Control of train movement – Track Circuiting - Interlocking of signals and points: Necessity and Methods. Lay outs of Railway stations and yards and Rolling Stock, Tractive Power, Track Resistance

L:45 T:0 P:0 Total: 45 PERIODS

TEXT BOOKS

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemch and Publishers, 2018.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2013.

REFERENCES

- 1 Kadiyali.L.R."Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2023
- 2 Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012 .
- 3 Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons,Delhi, 2003
- 4 Garber and Hoel, "Principles of Traffic & Highway Engineering", CENGAGE Learning, Delhi, 2010

UNIT V RESERVOIR PLANNING AND ECONOMIC ANALYSIS**6**

Reservoir – Site Selection - classification of reservoirs- Determination of Storage capacity-Reservoir sedimentation - methods of controlling the sedimentation–levee sand flood walls-Channel improvement. Economic Analysis - Estimation of cost and Evaluation of Benefits -Discount rate Discounting factors – Discounting techniques–Computer Applications.

L: 30 T: 0 P: 0 Total : 30 Periods**TEXT BOOKS**

- 1 Santhosh Kumar Garg, “Irrigation Engineering and Hydraulic Structures” Khanna Publishres-New Delhi. 2023
- 2 Punmia, B.C and Pande B.B Lal, “Irrigation and Water Power Engineering”, LakshmiPublications (P) Ltd, New Delhi. 2021

REFERENCES

- 1 Dilip Kumar Mujumdar, “Irrigation Water Management-Principles & Practice”, Prantice Hall of India (P) Ltd, New Delhi. 2014
- 2 P.N.Modi, “Irrigation Water Resources and Water Power Engineering” Standard Book House, Delhi, 2020
- 3 National water Policy 2012, MOWR,GOI
- 4 Sharma R.K and Sharma T.K’ “Irrigation Engineering (Including Hydrology)”, S.Chand& Co Ltd, New Delhi. 2009
- 5 Sumbaramanya K, “Engineering Hydrology”, The McGraw Hill companies, 5th Edition, 2020

COURSE OUTCOMES

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

CO1	Learn about various irrigation methods, irrigation scheduling and efficiency
CO2	Know about canal irrigation, river training works and water logging
CO3	Know about diversion structures and dams
CO4	Know about water resource engineering and network design
CO5	Know about reservoir planning and economic analysis

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I			2			3	1				2			1
CO - II		1					2	2						1
CO - III				1		2	2		1			1		1
CO - IV			3		1		3			2	2			3
CO - V						3	3							2
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

UNIT I FLUID PROPERTIES & STATICS

9

Introduction - Units and dimensions - Properties of fluids- Mass Density - Specific Weight - Specific Volume - Specific Gravity – Viscosity – Compressibility - Vapor Pressure - Surface Tension - Capillarity.

Statics: Pressure – Absolute, Gauge and Vacuum pressure - Pressure at a point – Variation of pressure with depth – Mechanical Pressure measuring devices - Simple and Differential manometers - Hydrostatic forces on a plane surface – Buoyancy – Metacenter.

UNIT II FLUID KINEMATICS & DYNAMICS

9

Kinematics: Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets.

Dynamics: Continuity equation (for one dimensional and three-dimensional flows) – Euler’s equation – Bernoulli’s equation for ideal and real fluids - Pitot tube - Venturimeter - Orifice meter.

Experiments:

1. Determination of Co-efficient of discharge of Venturimeter / Orificemeter
2. Determination of Co-efficient of discharge of notches (Rectangular / Triangular)
3. Determination of Co-efficient of discharge of Orifice – Constant / Variable head methods

UNIT III FLOW THROUGH PIPES

9

Viscous flow - Laminar flow through circular tubes (Hagen Poiseuille's) – Turbulent flow - Hydraulic and Energy gradient line - Darcy -Weisbach equation - Major and Minor losses - Pipes in Series and in Parallel.

Experiments:

1. Determination of Friction Coefficient in pipes
2. Determination of Minor Losses in pipes

UNIT IV FLOW IN OPEN CHANNELS

9

Uniform flow – Types and regimes of flow – Properties of open channel -Fundamental equations – Chezy’s and Manning’s equation- Most Economical section (rectangular and trapezoidal channels) – Non-Uniform flow - Specific energy – Specific Energy Curve - Hydraulic jump - Gradually varied flow.

UNIT V HYDRAULIC MACHINES

9

Impact of jet on flat and curved plates - Hydraulic machines - Classification of turbines– Pelton turbine – Francis turbine - Kaplan turbine - Introduction to Gas and Steam turbines - Pumps –Centrifugal Pump - Reciprocating Pump.

Experiments:

1. Study on Performance Characteristics of Centrifugal pump
2. Study on Performance Characteristics of Reciprocating pump
3. Study on Performance Characteristics of Pelton turbine
4. Study on Performance Characteristics of Francis/Kaplan Turbine.

L: 45 T: 0 P:30 J:0 Total: 75 PERIODS

LIST OF EXPERIMENTS**TEXT BOOKS**

1. Bansal R K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2019.
2. Kumar D.S., “Fluid Mechanics and Fluid Power Engineering”, Katson Publications, S. K. Kataria& Sons, New Delhi,2017.

REFERENCES

1. Modi P.N & Seth S.M., “Hydraulics & Fluid Mechanics”, Standard book house, New Delhi, 2019.
2. Rajput, R K, “A text book of Fluid Mechanics & Hydraulic Machines”, S Chand & Co., New Delhi, 2016.
3. C.S.P.Ojha, P.N.Chandramouli, and R.Berndtsson, “Fluid Mechanics and Machinery”,2010, OXFORD University Press.
4. Mohhanty A K, ‘Fluid Mechanics’ Second Edition, Prentice Hall of India Private Limited, New Delhi, 2007.
5. Jagdish Lal, “Hydraulic Machines”, 6th reprint., Metropolitan book Co. private Ltd. New Delhi,2019

COURSE OUTCOMES

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

- CO1** Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.
- CO2** Apply the laws applicable to fluids and its application through fluid kinematics and dynamics.
- CO3** Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
- CO4** Describe the basics of open channel flow, its classification and specific energy concept and its application
- CO5** Know the working principles of pumps with characteristic curves and turbines

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	3	3	-	-	-	-	-	-	-	2	-	-	3	-
CO - II	3	3	2	3	-	-	1	-	-	-	-	-	3	-
CO - III	3	3	3	3	1	-	-	-	-	2	-	-	3	2
CO - IV	3	3	-	-	-	1	-	-	-	-	-	-	3	1
CO - V	3	3	3	2	2	-	1	-	2	-	-	-	3	2
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23CEB204

ENVIRONMENTAL ENGINEERING

L T P C
3 0 2 4

UNIT I PLANNING FOR WATER SUPPLY SYSTEM

9+ 18

Public water supply system – Planning - Objectives - Sources of water and their characteristics - Design period - Population forecasting - Water demand – Standards – Water quality index - Smart Water Management Technologies

Experiments:

- Sampling and preservation methods for analysis of water
- Physical Examination of water: taste, odor, and color
- Determination of pH, acidity, and alkalinity
- Determination of hardness
- Determination of chloride content of water sample

UNITII CONVEYANCE AND DISTRIBUTION SYSTEM

9

Intake structures - Pipe materials - Laying, jointing, testing of pipes - Pumping stations - Selection of pumps - Methods of distributing water - Storage and distribution reservoirs - Analysis of distribution system – EPA NET modeling – Pipe Appurtenances - Integration with IoT for Real-time Monitoring

UNIT III TREATMENT OF WATER

9+9

Treatment of water - Working principles - Purpose and design unit process - Screening – Sedimentation – Coagulation – Filtration – Aeration - Disinfection – Water softening – Fluoridation and Defluoridation - Advanced Oxidation Processes and Membrane Filtration Techniques

Experiments:

- Determination of suspended, volatile, fixed, and settleable solids in wastewater
- Coagulation and Precipitation process for treating wastewater
- Determination of Ammonia Nitrogen in wastewater

UNIT IV SANITATION SYSTEM

9

Sewage Characteristics - Methods of collection - Classification - Effluent discharge standards - Materials for pipe sewers - Laying, jointing, dewatering, and testing - Sewer appurtenances - Traps - Plumbing system of drainage – One pipe system and two pipe system of plumbing - Sanitary fittings - Sustainable Sanitation Solutions and Green Infrastructure.

UNIT V TREATMENT OF WASTE WATER

9+3

Design Principles - Functions, design, and drawing of screen grit chambers and primary sedimentation tanks – Construction, operation, and maintenance aspects - Activated Sludge Process and Trickling filter – Oxidation ditches - UASB – Waste Stabilization Ponds – Facultative ponds - Lagoons - Bioreactors and Phytoremediation

Experiments:

- Determination of B.O.D and C.O.D

L : 45 T: 0 P: 30 Total: 75 PERIODS

TEXT BOOKS

- 1 Garg,S.K., "Environmental Engineering"Vol.I&&II, Khanna Publishers,New Delhi, (Reprint 2024)
- 2 Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P)Ltd.,New Delhi, 2016.

REFERENCES

- 1 Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2018.
- 2 Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2009.
- 3 Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2020.
- 4 Water supply & Sanitary Engg. Vazirani & Chandola, Khanna Publishers,2005.
- 5 Water and Waste water Engineering, Gorden, Fair& Gayer Okun, Allied Book Stall, aroda,2010.

COURSE OUTCOMES

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

- CO1** Identify and analyze different water sources and characteristics, and understand planning objectives for public water supply systems.
- CO2** Explain and evaluate methods of water conveyance and distribution, including smart technologies for real-time monitoring.
- CO3** Describe and assess various water treatment processes, including advanced oxidation and membrane filtration techniques.
- CO4** Evaluate different sanitation systems, understanding sewage characteristics and sustainable sanitation solutions.

CO5 Design and implement wastewater treatment processes, evaluating their maintenance and operational aspects.

COs	Programme outcomes / Programme Specific outcomes													
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
CO - I	2	3	3	3	3	2	2	1		1	3	3		
CO - II	2		3	2	3	2	3			3	2	2		
CO - III			2	3	3	2	2			2		2		
CO - IV			3		3	2					2	3		
CO - V			3								2			
3 – Strong Contribution, 2 – Medium Contribution, 1 – Weak Contribution, - No Contribution														

23GEP275

PERSONAL BRANDING

L T P C
0 0 4 2

UNIT-I SELF-AWARENESS & PERSONAL DEVELOPMENT

Self-Awareness: Key Areas -Personality, Values, Habits, Needs & Emotions, Impact of Self-Awareness on Personal Development

Personality –Definition, Elements, Determinants, Needs and Benefits, Personality traits. Personality development skills, Positive traits for effective people, **SWOT** :Analyzing Strength and weakness (SWOT), Building Esteem & Self-Confidence, Working on attitudes (aggressive, assertive, submissive), Self-Motivation

UNIT-II BODY LANGUAGE

Body Language and Gestures, Personal Grooming, Personal Hygiene, Social Effectiveness, Business Etiquette

UNIT-III INTERVIEW AND LEADERSHIP SKILLS

Resume Building, Video Resume, Leadership Styles, Leadership Traits, Group Dynamics- Conflict management

UNIT-IV SOCIAL IMAGE TRAITS

Social etiquettes -Positive Social Image, Social Graces, Online Etiquettes, Dining Etiquettes, Voice Modulation, – Networking: Case Study and Company website references.

UNIT-V PERSONALITY TEST

Big Five Personality Test, Open DISC Assessment Test.

TEXT BOOKS

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.

REFERENCES

1. Smith, B. Body Language. Delhi: Rohan Book Company. 2004
2. Personality Development and Career management: By R.M.Onkar (S Chand Publications)

Practical-60 Hours, Total 60 Hours

List of Exercises

- 1 Swot Analysis
- 2 Grooming, Dressing and Photo-shoot
- 3 Body Language, Handshaking
- 4 Art of Storytelling, Marketing & selling yourself
- 5 Self-Discipline: Goal setting (Qualitative and Quantitative)
- 6 Teamwork & Leadership Activity
- 7 Dealing with Pressure, Failure & Decision Making
- 8 Psychological/Personality test
- 9 Video Resume
- 10 Business Card creation
- 11 Social Profiling in FB/Insta/Linked In/Personal Website
- 12 Online Interview
- 13 Speed Interview
- 14 Networking Event-Online/Offline

Course Objective

- To understand about the personality self-development for career
- To understand the concepts of body language for professional grooming
- To understand the interview and leadership skills for professionalism
- To understand social imaging qualities for an interview
- To practice the personal branding attributes for self-assessment

Course Outcome

- To evaluate the quality of personality for self-development in a career perspective.
- To apply the body language in his professional interview modes.
- Apply the communication and leadership styles in public speaking.
- Apply the social imaging qualities in their presentation skill.
- Demonstrate personal branding skills in mock interviews.

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

Two Weeks

COURSE OUTCOMES

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

- CO1** Demonstrate proficiency in the use of construction tools, equipment, and techniques
- CO2** Understand the various phases of construction projects, including planning, execution, and project management, and how these phases interrelate.
- CO3** Develop strong communication and documentation skills.

23CET301	STRUCTURAL ANALYSIS - I			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • To introduce basic theory and concepts of classical methods of structural Analysis • To apply structural analysis principles to real-world problems. 							
UNIT I	FUNDAMENTAL CONCEPTS AND ENERGY METHODS						9
Definition Static and Kinematic Indeterminacy – Beams, Trusses and Frames – Degree of Freedom– Equilibrium and Kinematic Stability – Principle of Superposition – Basic Methods of Structural Analysis. Energy methods – Castigliano’s theorem- Application to Statically determinate and indeterminate Structures							
UNIT II	SLOPE DEFLECTION METHOD						9
Principle – Slope deflection equation- Concept of symmetry and anti symmetry - Calculating fixed end moments for different types of loads and beam - Application to continuous beams - portal frames with and without sway (single bay - Single storey).							
UNIT III	MOMENT DISTRIBUTION METHOD						9
Principle - Stiffness- Distribution Factor and carryover moments – Application to continuous beams - portal frames with and without sway (single bay - Single storey).							
UNIT IV	MOVING LOAD AND INFLUENCE LINE DIAGRAMS						9
Influence lines for reaction, bending moment and shear force diagrams for simply supported beams – Point load – UDL shorter and longer than the span - Moving loads -Maximum moment -Shear - Absolute maximum forces - series of concentrated loads and UDL in beams. Muller Breslau’s principle – Influence lines for continuous beams – concept of rolling loads for bridges							
UNIT V	ANALYSIS OF TRUSSES						9
Analysis of plane truss with one or two redundant - trusses with lack of fit - Thermal stresses - Settlement of supports - Trussed beams. (Cantilever Method)							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Punmia B C, Jain A K and Jain A K , "Strength of Materials and Theory of Structures - Vol. 2", Laxmi Publications, NewDelhi, 2005						

T2	Hibbeler R C , "Structural Analysis", Pearson Prentice Hall, New Jersey, 2012.
REFERENCES	
R1	Devdas Menon , "Structural Analysis", Narosa Publications, NewDelhi, 2018
R2	Alan Williams , "Structural Analysis in theory and Practice", Butterworth-Heinemann Publications, 2009.
R3	Rajasekaran S and Sankarasubramanian G , "Computational Structural Mechanics", Prentice Hall of India Private Ltd., New Delhi, 2001
R4	Bhavikatti, S.S, "Matrix Method of Structural Analysis", I. K. International Publishing House Pvt.Ltd.,New Delhi-4, 2014
R5	Negi L.S. and Jangid R.S., "Structural Analysis", Tata McGraw Hill Publishing. Co. Ltd. 2004
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Develop the ability to analyse and design the Structural Elements
CO 2	Analyse the determinate and indeterminate structures using slope deflection method.
CO 3	Analyse the determinate and indeterminate structures using Moment Distribution Method
CO 4	Understand the concept of Moving Loads
CO 5	Analyse the trusses

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2							1	2	
CO2	3	3	3	2							1	2	
CO3	3	3	3	2							1	2	
CO4	3	3	2	2							1	2	
CO5	3	3	2	2							1	2	

23CET302	DESIGN OF RC STRUCTURAL ELEMENTS	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To introduce different design philosophy for reinforced concrete elements. To develop the ability to design RC Structural Elements by using relevant Codes and Standards 					
UNIT I	INTRODUCTION	9			
Stress strain curve for concrete and reinforcing concrete – Standard concrete mixes for RCC works Type of Loads on Structures and Load combinations- Concept of Elastic method, ultimate load method and limit state method – Working stress method as detailed in IS code - Design of Singly Reinforced beam by working stress method. Advantages of Limit State Method over other methods. Analysis and design of singly and doubly reinforced rectangular beams by limit State Method.					
UNIT II	LIMIT STATE METHOD - FLANGED BEAM, SHEAR & TORSION	9			
Analysis and design of flanged beams – Use of design aids for Flexure - Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and					

torsion - Design of RC members for combined bending, shear and torsion - serviceability.				
UNIT III	LIMIT STATE DESIGN OF SLABS AND STAIRCASE			9
Behaviour of one way and two way slabs – Design of simply supported, cantilever and continuous slabs subjected to uniformly distributed load for various boundary conditions. Types of Staircases– Design of dog-legged Staircase – Design of Flat Slab.				
UNIT IV	LIMIT STATE DESIGN OF COLUMNS			9
Types of columns – Design of rectangular and circular columns for axial load – Design of short columns subjected to axial load and uniaxial / biaxial bending - Interaction charts. Design of slender columns subjected to biaxial bending.				
UNIT V	LIMIT STATE DESIGN OF FOOTINGS			9
Design of axially and eccentrically loaded square and rectangular footings – Types of combined footing - Design of combined rectangular footings for two columns only- Design concepts of strap footing, raft/mat foundation.				
		L:45	T:0	P: 0
Total: 45 Periods				
TEXT BOOKS				
T1	Varghese P C , "Limit State Design of Reinforced Concrete", II, Prentice Hall of India Ltd, New Delhi, 2010.			
T2	Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2011.			
REFERENCES				
R1	Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., 2021			
R2	Sinha,S.N.,“Reinforced Concrete Design”, Tata Mc Graw- Hill Publishing Company Ltd., NewDelhi,2017.			
R3	Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”,Laxmi Publication Pvt. Ltd., New Delhi, 2016			
R4	N. Subramanian, “Design of Concrete Structures” Oxford University Press,2019.			
R5	S.K. Duggal, “Reinforced Concrete Design: Principles and Practice”, McGraw-Hill Education,2017.			
CODE BOOKS				
1	IS456:2000,Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards,NewDelhi,2000.			
2	SP 16: Design Aids for Reinforced Concrete to IS 456:1978,Bureau of Indian Standards (BIS),NewDelhi,1999.			
COURSE OUTCOMES				
At the end of the course students should be able to				
CO 1	Know the various design concepts and design of RC beams by working stress and limit state methods			
CO 2	Understand the design of flanged beams, design for shear and torsion, and anchorage and development length.			
CO 3	Design and detailing of rectangular slabs and staircases by limit state method			
CO 4	Design the columns subjected to both axial and eccentric loads and understand the use of interaction diagrams.			
CO 5	Design the isolated footings and combined footing.			

COs	Mapping of Programme Outcomes / Programme Specific Outcomes			
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)			

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

23CET303	CONCRETE TECHNOLOGY				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To understand the fundamental principles of concrete and concrete mix design To evaluate workability, strength and durability of concrete 								
UNIT 1	CEMENT AND ADMIXTURES							9
Cement - Types of cements - composition, properties and uses – BIS specifications, Admixtures - Plasticizers – Super Plasticizers – Retarders – Accelerators – Air entraining admixtures – supplementary cementitious materials: silica fume, fly ash, Metakaolin, Ground Granulated blast furnace slag – Water proofing admixtures: Properties, advantages, dosage and application.								
UNIT II	CONCRETE MIX DESIGN							9
Mix design : Introduction, concept of mix design – batching of ingredients: volume batching, weigh batching – Mix Proportioning of concrete uses admixtures - Statistical Quality control of concrete - Mix Design for Concrete and Special Concrete - BIS Method as per IS 10262-2019 and ACI method of mix proportioning								
UNIT III	FRESH AND HARDENED PROPERTIES OF CONCRETE							9
Workability – Definition - factor affecting workability - measurement of workability - Segregation – Bleeding – steps of manufacture of concrete - Batching, mixing, transporting, placing, compacting – Early Volume change - Setting time - Curing of concrete - Factors affecting strength of concrete - Water / cement ratio, Maturity of concrete, micro – Cracking and Autogenous healing – Evolution of heat and Expansion – Shrinkage of concrete and factors affecting it.								
UNIT IV	DURABILITY OF CONCRETE AND TESTING OF HARDENED CONCRETE							9
Durability : Definition, significance – Permeability - Frost action - Effect of fire – Chemical attack, Sulphate attack – methods of controlling – Thermal properties of concrete – Chloride attack – Concrete in sea water – Resistance to abrasion and Cavitation – Corrosion of steel. Testing on hardened concrete: Compression test, flexural strength of concrete, direct tension test methods – factors influencing strength results – Accelerated strength tests – determination of modulus of elasticity – In situ strength determination – variation in test results – Non-destructive strength tests, ultra-sonic pulse velocity tests, and rebound hammer test.								

UNIT V	SPECIAL CONCRETE				9		
Self-Compacting concrete, High fly ash concrete, Light weight concretes - Fiber reinforced concrete - Ferrocement - SIFCON - Shotcrete - Polymer concrete - High performance concrete - Geopolymer Concrete - Concrete containing polymers - Bacterial concrete - Heavyweight concrete for radiation shielding - Mass concrete - Roller compacted concrete							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Shetty M.S. and Jain A.K. "Concrete Technology" (Theory and Practice), S.Chand and Company Ltd., New Delhi, 2019.						
T2	Santhakumar A.R., "Concrete Technology", Oxford University Press, New Delhi, 2018.						
REFERENCES							
R1	Neville A.M., Properties of Concrete, Pearson, 2012.						
R2	Gambir M.L. "Concrete Technology", Tata McGraw Hill, Publishing Co, Ltd, New Delhi, 2013.						
R3	Bhavikatti S.S. "Concrete Technology" I K International Publishing House, 2015						
R4	K. R. Arora, "Concrete Mix Design: Procedures and Practices", Standard Publishers Distributors, New Delhi, 2019.						
R5	V.S. Ramachandran, "Concrete Admixtures Handbook: Properties, Science, and Technology", 1995.						
CODE BOOKS							
1.	IS 456:2000 (Reaffirmed 2021) 'Plain and Reinforced Concrete – Code of Practice', BIS, New Delhi						
2.	IS 10262:2019 "Concrete Mix Proportioning - Guidelines", BIS, New Delhi						
3.	ACI Manual of Concrete Practice 2000, Part 1: Materials and General Properties of Concrete (ACI 211.1-91)						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Understand the properties of cement and Admixtures						
CO 2	Design concrete mixes for various application						
CO 3	Understand the properties of fresh and hardened concrete						
CO 4	Know the tests to be conducted to ensure strength and durability of concrete						
CO 5	Know the properties and applications of special concrete						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	1	3	2			2					3		
C02	1						2		2		2	1	2
C03	1										2		
C04	1										2		
C05	1	3	2			3				2	2		

23CEB301	SOIL MECHANICS	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. 					
UNIT I	INTRODUCTION TO SOIL MECHANICS	8+12			
Nature of Soil - Problems with soil - phase relation - sieve analysis - sedimentation analysis - Atterberg limits - classification for engineering purposes - BIS Classification system - GI Index- Soil compaction - factors affecting compaction - field compaction methods and monitoring.					
Experiments:					
<ol style="list-style-type: none"> Grain size distribution-Sieve Analysis Grain size distribution-Hydrometer Analysis Specific gravity of soil grains Atterberg limits test Field density test (Core cutter and sand replacement methods) 					
UNIT II	SOIL WATER AND WATER FLOW	8+3			
Soil water - Various forms - Capillary rise - Suction - Total, neutral and effective stress distribution in soil-Permeability - Darcy's Law- Permeability measurement in the laboratory - quick sand condition - Seepage - Laplace Equation - Introduction to flow nets -properties and uses-Application to simple problems					
Experiments:					
<ol style="list-style-type: none"> Permeability determination (constant head and falling head methods) 					
UNIT III	COMPACTION AND CONSOLIDATION	9+5			
Soil compaction - factors affecting compaction - field compaction methods and monitoring.- Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory - laboratory consolidation test - Field consolidation curve - NC and OC clays - problems on final and time rate of consolidation					
Experiments:					
<ol style="list-style-type: none"> Determination of moisture-Density relationship using standard Proctor test. One dimensional consolidation test (Demonstration only) 					
UNIT IV	STRESS DISTRIBUTION AND SHEAR STRENGTH	11+10			
Stress distribution in soil media - Boussinesque's formula - stress due to line load and Circular and rectangular loaded area - Use of influence charts-Westerguard's equation for point load- Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests - Types of shear tests based on drainage and their applicability - Drained and undrained behavior of clay and sand - Stress path for conventional triaxial test.					
Experiments:					
<ol style="list-style-type: none"> Direct shear test on cohesionless soil Unconfined compression test on cohesive soil Triaxial compression test (Demonstration only) Standard Penetration Test (Demonstration only) 					
UNIT V	SLOPE STABILITY	9			
Slope failure mechanisms - Modes - Infinite slopes - Finite slopes - Total and effective stress					

analysis- Stability analysis for purely cohesive and C- soils - Method of slices – Modified Bishop’s method - Friction circle method - Stability number – Problems - Slope protection measures			
L:45		T:0	P:30
Total: 75 Periods			
TEXT BOOKS			
T1	Punmia B.C, “Soil Mechanics and Foundations”, Laxmi Publications Pvt.Ltd, New Delhi, 2023.		
T2	V.N.S. Murthy, “Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering”, CRC Press, 2021.		
REFERENCES			
R1	Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited, New Delhi, 2013.		
R2	Venkatramaiah.C., “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi, 2018.		
R3	Murthy, V.N.S., “Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering”, CBS Publishers 2018.		
R4	Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 10th Edition, 2022.		
R5	IS 1498 : 1970 - Classification and Identification of Soils for General Engineering Purposes		
COURSE OUTCOMES			
At the end of the course students should be able to			
CO 1	Classify the soil and assess the engineering properties, based on index properties.		
CO 2	Understand the concepts of water flow through soil		
CO 3	Understand compaction and identify the settlement in soils.		
CO 4	Determine the determine stresses acting on soil and its shear strength		
CO 5	Analyze both finite and infinite slopes.		

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2				2			3		3	3	2
CO2	2										2		
CO3	2	3	3	3		2	2		2		2	3	2
CO4	3						3		2		3	3	2
CO5	3	2	3	3		2					2		

23CEP301	CONCRETE AND HIGHWAY LABORATORY	L	T	P	C
		0	0	2	1
COURSE OBJECTIVES:					

- To perform workability tests on fresh concrete
- To perform tests on hardened concrete to assess its strength
- To perform tests on bitumen to assess its quality

LIST OF EXPERIMENTS

MIX DESIGN OF CONCRETE

1. Mix Design of High Performance concrete
2. Mix design of concrete by ACI Method

TEST ON FRESH CONCRETE

3. Slump cone test
4. Flow table
5. Compaction factor
6. Vee bee test

TEST ON HARDENED CONCRETE

7. Compressive strength - Cube & Cylinder
8. Flexure test
9. Modulus of Elasticity

TEST ON BITUMEN

10. Penetration & Softening Point
11. Ductility
12. Viscosity
13. Marshall Stability and Flow values

NON- DESTRUCTIVE TEST ON HARDENED CONCRETE

14. Ultra-Sonic Pulse Velocity Test
15. Rebound hammer Test

DURABILITY TEST ON HARDENED CONCRETE (DEMONSTRATION ONLY)

16. Sulphate Attack
17. Chloride Attack
18. Acid Attack

L:0	T:0	P: 30	Total: 30 Periods
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TEXT BOOKS

- | | |
|-----------|--|
| T1 | Dr. M.L. Gambhir, "Concrete Manual", Dhanpat Rai & Sons Delhi, 2020. |
| T2 | M. S. Shetty, "Concrete Mix Design", S. Chand & Company Ltd.,2020. |

CODE BOOKS

- | | |
|------------|--|
| R1 | IS:10262:2019, Concrete Mix Proportioning - Guidelines (Second Revision) |
| R2 | IS:1199:1959, Methods of sampling and analysis of concrete,(Test on fresh concrete) |
| R3 | ACI 211 , ACI Method of Mix design of Concrete |
| R4 | IS:516;1959, Method of Tests for Strength of Concrete ,(Test on hardened concrete) |
| R5 | IS:13311:1992-Part 1, Method of Non-destructive testing of concrete, Ultrasonic pulse velocity |
| R6 | IS:13311:1992-Part 2, Method of Non-destructive testing of concrete, Rebound hammer test |
| R7 | IS: 1203-1978, Determination of penetration of bitumen |
| R8 | IS : 1205-1978, Determination of softening point of bitumen |
| R9 | IS : 1206-1978-Part 2, Method for Testing Tar and Bitumen Materials: Determination of Absolute Viscosity |
| R10 | IS: 1208-1978, Determination of ductility of bitumen |
| R11 | ASTM D6927 – 06, Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures |

COURSE OUTCOMES

At the end of the course students should be able to	
CO 1	Determine the properties of fresh concrete
CO 2	Determine the properties of hardened concrete
CO 3	Determine the properties of bitumen.
CO 4	Gain knowledge on Non- Destructive Test
CO 5	Gain knowledge on basic durability tests on concrete

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		3		2	3	3	3	2	3	3	2
CO2				3		2	2	3	2			3	2
CO3		2		3		2		3	2		2		
CO4		3		3		2	2	3	2			2	
CO5	2		2	3		2	3	3	2		2	2	2

Professional Elective – I

23CEE301	AIRPORT, HARBOUR AND DOCKS ENGINEERING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To learn about the planning and design of components of airport. To study about the types and components of docks and harbour. 					
UNIT I	AIRPORT PLANNING				6
Role of Air Transport, Components of Airport-airport classification-airport planning: objectives, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Airport Layouts – Apron, Terminal Building, Motor Vehicle Parking Area and Circulation Pattern- Case studies of Airport Layouts					
UNITII	AIRPORT DESIGN				6
Design of Components - Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage Taxiway Design –Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways.					
UNIT III	AIRPORT VISUAL AIDS AND AIR TRAFFIC CONTROL				6
Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts -Runway and Taxiway Lightings-Air Traffic Control – Basic Actions, Air Traffic Control Network Helipads, Hangars, Service Equipment.					
UNIT IV	HARBOUR ENGINEERING				6
Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports. Requirements and Classification of Harbours -Site Selection & Selection					

Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals. Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines					
UNIT V	DOCKS ENGINEERING				6
Dry and Wet Docks, Tidal basin, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks - graving docks, floating docks, marine railway. Planning and Layouts Entrance, Position of Light Houses, Navigating. Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids. Coastal structures : Piers, Breakwaters, Wharves, jetties, Quays, Spring fenders, Dolphins and Floating Landing Stage- Environmental concern of Port operations – Coastal Regulation Zone, 2011.					
		L:30	T:0	P: 30	Total: 30 Periods
TEXT BOOKS					
T1	Khanna S.K, Arora M.G and Jain S.S, “Airport Planning and Design”, Nemchand and Brothers, Roorkee, 2012				
T2	Dr.K.P.Subramanian,”A text book on Railways, Airports, Docks and Harbours”, Scitech, Chennai, 2012				
REFERENCES					
R1	S. C. Saxena, "Airport Planning and Design", CBS Publishers & Distributors,2020.				
R2	M. A. S. Rao and V. L. Sharma, "Airport Planning and Design: A Comprehensive Approach", Wiley India Pvt. Ltd.,2019.				
R3	B. Donsbach, "Introduction to Airport Design",Pearson Education,2014.				
R4	S. K. Jain, R. K. Sharma, "Port and Harbour Engineering", Nem Chand & Bros, 2018.				
R5	M. N. Rao, "Coastal and Harbour Engineering: Theory and Practice", CBS Publishers & Distributors Pvt. Ltd.,2021.				
CODE BOOKS					
1	IS 11116:1984- Code of Practice for Lighting for Airport Aprons – code of practice. BIS, New Delhi.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Gain insight on the planning and site selection of airport as per regulatory standards				
CO 2	Design runways, taxiways and apron				
CO 3	Gain knowledge on airport visual aids and air traffic control				
CO 4	Understand the functioning of components of harbour				
CO 5	Understand the functioning of components of harbour docks.				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1									3	3	3
CO2	2									2		2	2
CO3	1	1	2				2						
CO4	1					3		1			2	2	2
CO5	1	1	2			3			1	2			2

23CEE302	REMOTE SENSING AND GIS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To learn the fundamental concepts of Remote Sensing technology and Geographic Information System and data types To discuss the various applications of remote sensing and GIS for Civil Engineering applications. 							
UNIT I	INTRODUCTION TO REMOTE SENSING						9
Introduction to Remote sensing - Electro Magnetic energy - EMR spectrum - EMR interaction with atmosphere - Scattering - Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials - Spectral Signature - EMR interaction with water, soil and Earth Surface – Satellites, orbits and missions – Image characteristics and Resolution concepts.							
UNIT II	IMAGE PROCESSING AND SATELLITE APPLICATIONS						9
Introduction to image processing - Pre-processing and corrections – image enhancement – image compression techniques – spatial filtering technique - image classification techniques - Visual and digital Interpretation of Satellite Images - Environmental Satellites - GOES, NOAA, AVHRR, CZCR, OCM and MODIS .							
UNIT III	FUNDAMENTALS OF GEOGRAPHIC INFORMATION SYSTEM						9
Geo-data - type - Input Sources - Raster and Vector data structures - Comparison of Raster and Vector data - errors in data - Projection and transformation - Reclassification - proximity analysis – Digitization techniques – cartography principles - various geo-spatial analysis – Concepts of RDBMS – Network analysis – web based GIS.							
UNIT IV	GIS ANALYSIS AND TERRAIN MODELING						9
Analysis using Raster and Vector data – Operations – Overlaying - Buffering –Modelling in GIS - Digital Terrain Modelling, Analysis and application – Products of DEMs and their uses – Sources of errors in GIS and their elimination.							
UNIT V	GIS AND REMOTE SENSING APPLICATIONS						9
Spectral responses of clear and contaminated water – water quality mapping and monitoring - Water supply and sewerage network modelling - Groundwater vulnerability for pollution - DRASTIC and SINTACS model - Eutrophication and sedimentation in lakes and reservoir – Impact urbanization on catchment - nutrients transport modeling.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Anji Reddy, M., "Remote Sensing and Geographical Information Systems (5th Edition). BS Publications., 2020.						
T2	Lillesand, T. M., Kiefer, R. W., and Chipman, J. " Remote Sensing and Image Interpretation John Wiley & Sons., 2014.						
REFERENCES							
R1	Jensen, J. R., "Remote Sensing of the Environment: An Earth Resource Perspective" (2nd Edition). Pearson Education, 2007.						
R2	Sabins, F. F. Jr., and Ellis, J. M., "Remote Sensing: Principles, Interpretation, and Applications Waveland Press., 2020.						
R3	M. Anji Reddy, "Remote Sensing and GIS", BS Publications, 2019.						
R4	S. C. Misra, "Geographic Information Systems and Science", Oxford University Press, 2020.						
R5	K. S. K. Reddy, "Remote Sensing and GIS for Natural Resources Management", Tata McGraw-						

	Hill Education,2020.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand components of Remote Sensing
CO 2	Apply image processing techniques to enhance, classify, and interpret satellite images for a variety of applications
CO 3	Understand components of GIS types of data structures
CO 4	Create digital terrain modelling using Geo spatial analysis.
CO 5	Know the applications GIS and Remote Sensing

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3					1						3	
CO2					3	2						3	
CO3						2						2	
CO4		3	3	2	2		1	2	1		2		3
CO5		2	3	2				2	1	2	3	1	

23CEE303	TRAFFIC ENGINEERING AND MANAGEMENT	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To gain insights on the traffic components and assess the traffic characteristics and related problems. To develop a strong knowledge base of traffic planning and its management. 						
UNIT I	TRAFFIC CHARACTERISTICS					9
Significance and scope - characteristics of vehicles and road users - Components of traffic engineering -road, traffic and land use characteristics - Volume & Capacity - Level-of-Service (LOS) of a traffic facility - Headway concepts and applications - Vulnerable Road User (VRU) - Traffic problems in India - Integrated development of cities and towns.						
UNIT II	TRAFFIC SURVEYS AND DATA ANALYSIS					9
Traffic survey methods – Volume and Speed studies - Origin and destination survey - Travel time and delay studies - Parking & Pedestrian Studies - Accident Studies and Safety Level of Services-Basics of Traffic flow theory- Vehicle detection methods -Fundamental derived parameter, introduction. Types of Data and Methods of Data Analysis						

UNIT III	TRAFFIC CONTROL MEASURES	9
Traffic signs and Types– Road Markings - Design of traffic signals and signal co-ordination - traffic control aids and road furniture - street lighting- computer applications in signal design- Road Arboriculture.		
UNIT IV	DESIGN OF INTERSECTIONS	9
Conflicts at intersections – channelized intersections - Classification of ‘at grade’ intersections – Uncontrolled, Channelization, Rotary and roundabouts - Principles of intersection design - elements of intersection design - rotary design - grade separation and interchanges - design principles - pedestrian considerations.		
UNIT V	TRAFFIC MANAGEMENT	9
Traffic Regulations - Transportation System Management (TSM) and Travel Demand Management (TDM) - traffic forecasting techniques - restrictions on turning movements - one way streets-traffic segregation - traffic calming - tidal flow operations - exclusive bus lanes – Intelligent Transportation system (ITS) & Applications. Road Safety audit (RSA) – Stages of RSA.		
L:45		T:0
P: 0		Total: 45 Periods
TEXT BOOKS		
T1	Kadiyali, L.R, " Traffic Engineering and Management", Khanna Technical Publications, Delhi, 2019.	
T2	S. K. Sharma, "Traffic Engineering and Management", Dhanpat Rai & Co., 2020.	
REFERENCES		
R1	C.E.G. Justo, "Highway Engineering", Nem Chand & Bros, 2020.	
R2	B. L. Gupta and Amit Gupta, "Highway Engineering", S. Chand & Co., 2018	
R3	V. K. Jain, "Transportation Engineering: An Introduction", CBS Publishers & Distributors Pvt. Ltd.,2021.	
R4	M. S. Tyagi, "Advanced Traffic Management Systems", Ane Books Pvt Ltd., 2019.	
R5	V. R. P. Kiran and M. K. Garg, "Transport Planning and Traffic Engineering" Wiley India Pvt. Ltd.,2019	
CODE BOOKS		
1	IRC: 106-1990 - Guidelines for Capacity of Urban Roads in Plain Areas	
2	IRC: 35-1997 - Manual of Road Traffic Studies	
3	IRC: 106-1990 - Guidelines for Capacity of Urban Roads in Plain Areas,	
COURSE OUTCOMES		
At the end of the course students should be able to		
CO 1	Understand significance and scope of traffic Engineering	
CO 2	Understand traffic flow principles and applications.	
CO 3	Understand traffic signs and design traffic signals.	
CO 4	Identify and analyze different types of traffic conflicts at intersections	
CO 5	Understand Traffic Regulations and their role in traffic management	

COs	Mapping of Programme Outcomes / Programme Specific Outcomes
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	3					1					2		
CO2		3				3				2	1	3	
CO3			3			2					2	2	
CO4			3	3							1	3	3
CO5				1		3		3		3	1		2

23CEE304	SOLID AND HAZARD WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the various types, sources, and environmental impacts of solid and hazardous wastes and develop effective management strategies for each waste stream.
- To equip students with the technical skills for waste characterization, reduction, recycling, and sustainable disposal

UNIT I	INTRODUCTION	9
Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Municipal Waste, Plastic Waste, Biomedical Waste, E waste, Dairy Wastes, Agricultural Wastes, Slaughter House Wastes, Industrial Waste and Hazardous Waste		
UNIT II	CHARACTERIZATION OF SOLID WASTE AND HAZARDOUS WASTE	9
Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW.		
UNIT III	TRANSPORT OF WASTES	9
Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation- compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.		
UNIT IV	WASTE PROCESSING TECHNOLOGIES	9
Objectives of waste processing – material separation and processing technologies – biological & chemical conversion technologies – methods and controls of Composting - thermal conversion technologies, energy recovery – incineration – solidification & stabilization of hazardous wastes- treatment of biomedical wastes		
UNIT V	SOLID WASTE DISPOSAL	9
Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation		
		L:45 T:0 P: 0 Total: 45 Periods
TEXT BOOKS		

T1	George Techobanoglous Hilary Theisen, and Samuel A., "Integrated Solid Waste Management", McGraw - Hill, 2014.
T2	"Manual on Solid Waste Management" (Ministry of Urban Development, Government of India), Ministry of Urban Development (MoUD), Government of India, 2016.
REFERENCES	
R1	V. R. Laxmi, "Solid Waste Management: A Complete Guide", APH Publishing Corporation, 2020.
R2	K. K. Garg, "Handbook of Solid Waste Management", I.K. International Publishing House Pvt. Ltd.,2020.
R3	S. K. Gupta, "Solid Waste Management: Principles and Practice", Khanna Publishers, 2021.
R4	M. N. Rao, "Waste Management: Principles and Practices", Wiley India Pvt. Ltd., 2021.
R5	"Manual on Municipal Solid Waste Management" (Central Pollution Control Board, CPCB), Central Pollution Control Board (CPCB), Government of India, 2020.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Identify and classify various types of solid and hazardous wastes.
CO 2	Analyze waste properties and recommend reduction, recycling, and reuse methods.
CO 3	Evaluate systems for waste handling, collection, and transport.
CO 4	Apply technologies for biological, chemical, and thermal waste processing.
CO 5	Analyze and apply various waste disposal methods

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3						2				2	
CO2	2	3	2			2	2			2		2	
CO3	1	2				2		2	1		2		2
CO4	2	2	3				2						
CO5	2	3	3			3		2		2	2	1	1

OPEN ELECTIVE COURSES (OEC)

23CE0301	ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES					
<ul style="list-style-type: none"> To impart the knowledge and skills to identify, assess and mitigate the environment and social impacts of development projects To give exposure to the students about the prediction and assessment of environmental impacts on environment 					
UNIT I	INTRODUCTION				9
Introduction to Environmental Impact Assessment - Need for Environmental Impact Assessment - Environmental Impact Statement - Stages and Types of Environmental Impact Assessment - Capability and limitations of Environmental Impact Assessment - Legal provisions on Environmental Impact Assessment - International treaties and agreements on the environment and natural resources					
UNIT II	ENVIRONMENTAL CLEARANCE PROCESS IN INDIA				9
Procedure for environmental clearance - Flow chart - Environmental guidance for Thermal powerplants Mining projects - River valley development projects - Legislation and Institutional support - International Co operation - Guidance for industrial licensing					
UNIT III	METHODOLOGIES				9
Methods for Environmental assessment-Matrices & Networks-Check lists- Cost benefit analysis-Analysis of Alternative-Software Packages and Expert Systems in Environmental Impact Assessment.					
UNIT IV	PREDICTION AND ASSESSMENT				9
Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna- Wildlife crossing EIA in hilly areas - Mathematical models- Public participation in EIA.					
UNIT V	SOCIO-ECONOMIC IMPACT ASSESSMENT				9
Definition of Social Impact Assessment-Social Impact Assessment model and the planning process- Relationship between social impacts and change in community and institutional arrangements- Individual and family level impacts -Communities in transition environmental risk assessment framework.					
		L : 45	T : 0	P : 0	Total: 45 PERIODS
TEXT BOOKS					
T1	Charles H. Eccleston, "Environmental Impact Assessment: A Guide to Best Professional Practices				

	CRC Press, 2020.
T2	R. K. Agarwal, "Environmental Impact Assessment: An Integrated Approach", S. Chand Publishing, 2021.
REFERENCES	
R1	S. N. Pandey, "Environmental Impact Assessment: Theory and Practice", Pearson India, 2020
R2	R. K. Mishra, "Environmental Impact Assessment and Sustainable Development", APH Publishing Corporation, 2020.
R3	"National EIA Notification Handbook", Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, 2020.
R4	D. L. Khan, "Introduction to Environmental Impact Assessment", Discovery Publishing House, 2019
R5	P. C. Mishra, "Environmental Impact Assessment and Environmental Management", I.K. International Publishing House Pvt. Ltd., 2020
COURSE OUTCOMES	
At the end of the course student should be able to:	
C01	Understand the concept of EIA and its significance
C02	Understand the roles and responsibilities of various stakeholders in obtaining environmental clearance
C03	Apply various methodologies for assessing the environmental impacts of any developmental activities
C04	Analyze the environmental impact of industrial and development projects on land, water, and air quality
C05	Understand the concept of Social Impact Assessment (SIA) and its role in evaluating the socio-economic consequences of development projects.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01		1	3										
C02		1	3										
C03		1	3				1						
C04		1	3	1		1	1	1			1		
C05		1	3	1		1	1	1			1		

23CE0302	BYE LAWS IN BUILDING AND CONSTRUCTION				L	T	P	C	
					3	0	0	3	
COURSE OBJECTIVES:									
<ul style="list-style-type: none"> To understand the Principles of Reinforced Concrete Design. To develop the ability to Design RC Structural Elements by using relevant Codes and Standards 									
UNIT I	FUNDAMENTALS OF BUILDINGS							9	
Introduction – Classification of Buildings – Based on nature of occupancy – Based on fire resistance – Based on built in environment and Naturality – Classification of residential buildings.									
UNIT II	PLANNING REGULATIONS							9	

Interior planning: Aspect – Prospect – Privacy – Internal privacy – External privacy – Furniture requirements – Roominess – Grouping – Circulation – Elegance – Flexibility – Economy – Practical consideration- Parking – Angle parking – Drive way.																
UNIT III		BUILDING BYE LAWS										9				
Introduction – Building byelaws – Objectives – Principles – Minimum plot sizes & building frontages – Open spaces – Minimum standard dimensions of building elements – Provisions for lighting and ventilation – Provisions for safety from fire and explosions- Requirements for green built and landscaping – special requirements for low income housing – sizes of structural elements																
UNIT IV		PLANNING FOR RESIDENTIAL BUILDINGS										9				
Introduction – Planning of Residential buildings - Planning of Public buildings – School – Library – Hospital – Cinema buildings – Hostel – Office buildings - Post office – Bus station – Church – Mosque.																
UNIT V		FACTS OF VAASTU SASTRA										9				
Introduction - Basic rules of vaastu construction – Relevance of vaastu today – Shape of the site –Directions – Orientation – Level differences – Main entrance – Doors and Windows – Columns and beams – Steps – Well – Colours – Position of stairs – Roof																
				L:45			T:0			P: 0			Total: 45 Periods			
TEXT BOOKS																
T1		B. S. Pabla, “Building Byelaws and Regulations” Khanna Publishers, 2019														
T2		Building Byelaws and Development Regulations" by R. K. Jain														
REFERENCES																
R1		M.G. Shah & C.M. Kale, "Building Planning, Design, and Scheduling", McGraw-Hill Education,2018														
R2		B.S. Pabla, "Building Byelaws and Regulations", Khanna Publishers, 2019														
R3		V.K.Puri, “New Manual On Unified Building Bye - Laws For Delhi”, 2018														
R4		National Building Code of India (NBC), Bureau of Indian Standards (BIS),2016														
R5		Dr. N. S. Raghavan, "Vaastu Shastra for Residential and Commercial Buildings", New Age International,2020.														
COURSE OUTCOMES																
At the end of the course students should be able to																
CO 1		Recognize the various subcategories of residential buildings														
CO 2		Learn strategies for achieving the right balance between openness and privacy in interior spaces														
CO 3		Learn the criteria for determining minimum plot sizes and building frontages based on zoning and land use regulations														
CO 4		Understand the Principles of Residential Building Planning														
CO 5		Apply the concepts of Vaastu Shastra in building design and planning..														

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping												CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	

C01			2				1					
C02			2				1					
C03			2			2	3		1			
C04			2			2	3		1			
C05			2			2	3		1			

23CE0303	INDUSTRIAL WASTE MANAGEMENT				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To develop an understanding of industrial pollution and waste management systems To familiarize students with techniques and legislations for pollution prevention and control To enable students to design and evaluate waste treatment systems for industrial application 								
UNIT I	INTRODUCTION							9
Industrial scenario in India – Types of industries and industrial pollution – Characteristics of industrial wastes – Industrial wastewater and environmental impacts – Industrial waste survey – Industrial wastewater generation rates – Population equivalent – Toxicity of Industrial effluents and bioassay tests.								
UNIT II	INDUSTRIAL POLLUTION PREVENTION							9
Importance of prevention techniques – Significance of control measures – Benefits and barriers – Source reduction techniques – Waste audit – Recycle, reuse and byproduct recovery – Applications – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes								
UNIT III	POLLUTION FROM MAJOR INDUSTRIES							9
Sources, characteristics, waste treatment flow sheets for selected industries – Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, Fertilizer, Thermal power plants – Wastewater reclamation concepts.								
UNIT IV	TREATMENT TECHNOLOGIES							9
Equalization – Neutralization – Oil separation – Flotation – Precipitation – Heavy metal removal – Adsorption – Sequential batch reactor (SBR) – Handling and treatment of solid waste management								
UNIT V	WASTEWATER REUSE AND RESIDUAL MANAGEMENT							9
Zero effluent discharge systems – Residue management – Quality requirements for wastewater reuse and industrial reuse – Disposal on water and land – Quantification and characteristics of sludge – Location, needs and flow sheet of operational sequences in CETPs.								
					L:45	T:0	P:0	Total: 45 Periods
TEXT BOOKS								
T1	Patwardhan.A.D., “Industrial Wastewater Treatment”, Prentice Hall of India, NewDelhi, 2022							
T2	Rao M.N. & Dutta A.K., Waste water Treatment, Oxford & IBH Publishing Co. Pvt. Ltd., 2020							
REFERENCES								
R1	M. L. Mehta, "Industrial Pollution Control and Waste Management"Springer, McGraw-Hill Education (India), 2015							
R2	Stephenson R.L. and Blackburn J.B., Jr., “Industrial Wastewater Systems Hand book”,							

	Lewis Publisher, New York, (Reprint 2012)
R3	C. S. Rao , "Environmental Pollution Control Engineering", New Age International, 2019
R4	Mackenzie L. Davis"Water and Wastewater Engineering: Design Principles and Practice",McGraw-Hill Education, 2019
R5	Dr. V.K. Sharma, "Handbook of Industrial Pollutants and Their Control", Dhanpat Rai & Co, 2019
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Know the sources and effects of industrial contaminants
CO 2	Recommend rigid preventive measures to overcome environmental pollution
CO 3	Understand the causes and effects of pollution from various industries
CO 4	Categorize various industrial waste treatment techniques
CO 5	Know the significance of reuse system and appropriate waste management techniques

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2	2			3	2						
CO2						2							
CO3						2							
CO4		2	2			3	2						
CO5		2	2			3	2						

23CE0304	BUILDING MAINTENANCE	L	T	P
		3	0	0
UNIT I	INTRODUCTION			
Maintenance – Objectives of Maintenance - Types of maintenance – Factors influencing maintenance- Maintenance processes - Maintenance procedure - Inspection – Types of inspection – Errors – Construction errors – Design errors - Man- made error.				
UNIT II	MATERIALS FOR REPAIR			
Epoxy –polymer & latex –acrylic polymers –polyester resins - application of repair chemicals - concrete repair chemicals - examples of concrete chemicals for repair				
UNIT III	CONCRETE STRUCTURE			
Causes and signs of deterioration – diagnosis of deterioration - Corrosion of steel in reinforced concrete - Treatment against carbonation induced and chloride induced corrosion-cracks in RCC structural elements and their prevention				

23CE0305	DISASTER MANAGEMENT	L	T	P
		3	0	0

Course Objectives:

- The students are exposed to various types of disasters, which may strike periodically or once in a decade or century.
- Students will be able to select the best risk mitigation strategies.

UNIT I	NATURAL DISASTERS
Cyclones - Floods - Drought and Desertification - Earthquake - Tsunami - Volcanoes - Landslides and Avalanche – studies.	

UNIT II	MAN MADE DISASTERS
Chemical industrial hazards - Major power breakdowns - Traffic accidents - Fire, Forest Fire, Oil fire - War - Atomic bombs - Nuclear disaster - Accident in Mines – Case studies	

UNIT III	GEO.SPATIAL TECHNOLOGY
Remote sensing - GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation - Disaster mapping – Case studies	

UNIT IV	RISK ASSESSMENT AND MITIGATION
Hazards, Risks and Vulnerabilities - Disasters in India - Assessment of Disaster Vulnerability of a location and vulnerable groups - Preparedness and Mitigation measures for various Disasters - Mitigation through capacity building - Preparation of Disaster Management Plans.	

UNIT V	POST DISASTER EFFECTS AND REMEDIAL MEASURES
Legislative responsibilities of disaster management - Disaster management act 2005 – Post disaster recovery, rehabilitation, Relief & Logistics Management - Disaster related infrastructure development - Post Disaster, Emergency Support Functions and their coordination mechanism.	

		L : 45	T: 0	P: 0	Total: 45 PERIODS
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TEXT BOOKS	
T1	R. K. Bansal, “Natural Hazards and Disaster Management” Laxmi Publications, 2015
T2	R. K. Gupta, " Disaster Management: Natural Hazards and Their Mitigation " Deep & Deep Publications, 2015

REFERENCES	
R1	Murthy D B N , "Disaster Management: Text and Case Studies", Deep and Deep Publications (P) Ltd., 2008.
R2	Edward A. Keller, Duane E. DeVecchio, " Natural Hazards and Disasters", Pearson Education, 2021.
R3	A. P. S. K. Rao, " Disaster Management and Mitigation: Assessment and Planning ", I.K. International Publishing House, 2018
R4	V. K. Gaur, " Handbook of Disaster Management" , Deep & Deep Publications, New Delhi, India, 2021

COURSE OUTCOMES	
At the end of the course student should be able to:	
C01	Know types of natural disasters, causes and their impact on environment and society
C02	Know the types of natural disasters, causes and their impact on environment and society
C03	Analyze the applications of GIS and GPS in disaster management
C04	Assess the risk and mitigation strategies of various disaster
C05	Understand the different disaster management techniques

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3- Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01													
C02													
C03	2	2	2			3					2		
C04	2	2	2		2	3					2		
C05	2	2	2		2	2					2		

23CE0306	WATER SUPPLY AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand water sources, quality standards, and demand estimation for public water supply.
- Learn principles and design of water treatment and distribution systems.
- Explore advanced treatment technologies and plumbing systems for efficient water management.

UNIT I	WATER SOURCES AND PUBLIC SUPPLY SYSTEMS	9
Public water supply system — Planning, Objectives, Design period, Population forecasting; Water demand — Sources of water and their characteristics, Surface and Groundwater — Impounding Reservoir — Development and selection of source — Source Water quality — Characterization — Significance — Drinking Water quality standards.		
UNIT II	WATER CONVEYANCE SYSTEMS AND PUMPING TECHNOLOGIES	9
Water supply — intake structures — Functions; Pipes and conduits for water — Pipe materials — Hydraulics of flow in pipes — Transmission main design — Laying, jointing and testing of pipes — appurtenances — Types and capacity of pumps — Selection of pumps and pipe materials.		
UNIT III	WATER TREATMENT PROCESSES	9
Objectives — Unit operations and processes — Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation -Clarifloccuator-Plate and tube settlers — Pulsator clarifier — sand filters — Disinfection — Residue Management -Construction, Operation and Maintenance aspects.		
UNIT IV	ADVANCED WATER TREATMENT TECHNOLOGIES	9
Water softening — Desalination- R.O. Plant — demineralization — Adsorption — Ion exchange- Membrane Systems — RO Reject Management — Iron and Manganese removal -Defluoridation — Construction and Operation & Maintenance aspects — Recent advances — MBR process.		
UNIT V	WATER DISTRIBUTION AND PLUMBING SYSTEMS	9
Requirements of water distribution — Components — Selection of pipe material — Service reservoirs — Functions — Network design — Economics — Analysis of distribution networks - Computer applications — Appurtenances — Leak detection. Principles of design of water supply in buildings — House service connection — Fixtures and fittings, systems of plumbing and types		

of plumbing.				
L:45		T:0	P: 0	Total: 45 Periods
TEXT BOOKS				
T1	S.K. Garg, Public Water Supply System and Sources of Water, Khanna Publishers, New Delhi, 2021.			
T2	P. C. Punmia, Ashok K. Jain, Arun K. Jain "Water and Wastewater Engineering: Design Principles and Practice", Laxmi Publications, 2022			
REFERENCES				
R1	A. K. S. J. Kumar, "Water Supply Intake Structures and Pipe Materials", Laxmi Publications, 2022			
R2	Syed R. Qasim, Edward M. Motley, Guang Zhu, Water Works Engineering: Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.			
R3	Christopher G. W. "Handbook of Water and Wastewater Treatment Technologies, Butterworth-Heinemann, 2020			
R4	Larry W. Mays, "Water Distribution System Handbook" McGraw-Hill Education, 2020			
R5	C. S. P. Ojha, S. K. Gupta, "Environmental Engineering: Water, Wastewater, and Waste Management", CBS Publishers & Distributors Pvt. Ltd., 2021			
COURSE OUTCOMES				
At the end of the course students should be able to				
CO 1	Know the different water sources			
CO 2	Learn the purpose and design considerations of intake structures in a water supply system			
CO 3	Gain knowledge on unit operations and processes involved in water treatment.			
CO 4	Gain knowledge on processes involved in advanced water treatment.			
CO 5	Learn the components involved in water distribution system			

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3- Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	2												
CO3	2	1				1	1				1		
CO4	2	1				1	1				1		
CO5	2					1					1		