B.E. Degree

in

CIVIL ENGINEERING

CURRICULUM & SYLLABUS (CBCS)

(For students admitted from the Academic Year 2022-2023)

DEPARTMENT OF CIVIL ENGINEERING

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING

CHUNKANKADAI, NAGERCOIL – 629 003.

KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING

Chunkankadai, Nagercoil – 629 003.

AUTONOMOUS COLLEGE AFFILIATED TO ANNA UNIVERSITY

ACADEMIC REGULATIONS 2022

B. E. CIVIL ENGINEERING CURRICULAM

CHOICE BASED CREDIT SYSTEM

INTRODUCTION

Inconsonance to the vision of our College,

An engineering graduate we form would be a person with optimal human development, i.e. physical, mental, emotional, social and spiritual spheres of personality.

He/she would be also a person mature in relationships, especially knowing how to treat everyone with respect, including persons of complementary gender with equality and gender sensitivity guided by clear and pro-social values.

He would be patriotic and would hold the Indian Constitution and all the precepts it outlays close to his heart and would have a secular spirit committed to safeguard and cherish the multi-cultural, multi-religious and multi-linguistic ethos of Indian Society.

Academically, he/she would be a graduate with a strong engineering foundation with proficient technical knowledge and skills. He would have enough exposure and experience into the ethos of relevant industry and be industry ready to construct a successful career for himself and for the benefit of the society.

He would have been well trained in research methodology and would have established himself as a researcher having taken up many research projects, with sound ethical standards and social relevance. He would be a person with a passion for technical innovations committed to lifelong learning and research.

He would be well prepared and confident to develop ingenuous solutions to the problems people face as an individual and as a team and work for the emancipation of our society with leadership and courage.

Civil Engineering being one of the oldest and broadest engineering disciplines, involves protecting the public and environmental health as well as improving existing infrastructure. The curriculum equips the students to understand real-life situations, problems, and to plan, develop and maintain infrastructures and facilities essential to modern life. Students get an opportunity to participate in field trips to get into real world as a part of Civil Engineering syllabus and curriculum.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I.	To prepare students for successful careers in Civil Engineering field that meets the needs of national and multinational companies.
II.	To develop the confidence and ability among students to synthesize data and technical concepts and there by applying it in real world problems.
III.	To develop students to use modern techniques, skill and mathematical engineering tools for solving problems in Civil Engineering.
IV.	To inspire the professionals with creative thinking and innovative research.
V.	To follow the engineering qualities with the social and ethical values.

II. PROGRAMME OUTCOMES (POs)

PO#	Graduate Attribute
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

III. PROGRAMME SPECIFIC OUTCOMES (PSOs)

1	Demonstrate knowledge in core areas of civil engineering such as planning, designing, estimating and carrying out construction.
2	Apply the concept of sustainable development in the context of environment, economic and social requirements.
3	Develop research activities, consultancy services with critical thinking, professional development and lifelong learning.

PEO's – PO's & PSO's MAPPING:

PEO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
I.	2	1	3	3	3	2	2	1	3	3	3	2	3	2	2
II.	3	3	-	1	1	2	-	-	1	3	3	3	2	1	3
III.	1	-	-	-	-	-	2	3	1	3	3	3	2	1	3
IV.	-	3	1	2	3	1	1	-	1	1	-	3	1	1	3
V.	2	2	2	2	1	1	2	2	3	3	3	3	1	3	1

PROGRAMME ARTICULATION MATRIX

Year	**Semester**	**Course name**	**PO**												**PSO**		
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
I	I	MA22101	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
		PH22101	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
		CH22101	3	2	2	1	-	-	2	-	-	-	-	1	-	1	-
		CS22101	3	3	3	3	-	-	-	-	-	-	-	1	1	-	2
		EN22101	-	-	-	-	-	-	-	-	2	2	-	2	-	1	-
		BS22101	3	1	-	-	-	2	2	-	2	1	-	1	-	1	-
		CS22102	3	3	3	3	2	-	-	-	-	-	-	1	1	-	2
		HS22101	3	2	2	1	-	-	2	-	2	-	1	1	-	-	3

		HS22102	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
	II	MA22201	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
		ES22202	3	2	2	2	-	-	-	-	-	-	-	1	1	-	-
		CE22201	2	2	2	-	2	2	2	2	2	2	2	2	2	1	3
		ME22201	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-
		EN22201	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
		PH22201	2	1	-	-	-	-	-	-	2	1	-	1	-	1	-
		CH22201	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
		CE22202	2	2	2	2	2	2	2	2	2	2	2	2	3	-	2
		ES22203	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
		GE 3152	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
II	III	MA22304	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1
		CE22301	3	2	3	3	2	2	2	2	2	2	2	3	3	-	3
		CE22302	3	3	2	2	2	1	1	1	1	2	3	3	3	1	2
		CE22303	3	2	2	2	2	2	-	-	2	2	2	2	2	-	1
		CE22304	3	3	3	3	2	2	2	2	2	2	2	3	3	-	3
		CE22305	3	2	3	1	3	2	1	-	-	2	2	3	2	3	3
		SD22301	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
		AC22301	-	1	1	1	1	1	1	1	1	1	1	1	-	-	-
		HS22301	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
		GE3252	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
	IV	CE22401	3	2	2	2	1	2	-	-	1	1	-	3	2	2	1
		CE 22402	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1
		CE 22403	3	2	2	2	1	1	1	-	1	-	-	2	3	2	2
		CE 22404	3	2	3	2	-	2	2	1	-	-	-	1	3	2	2
		CE 22405	3	3	2	2	2	2	2	1	2	1	2	2	2	-	1
		CE 22406	2	2	3	2	2	2	-	-	1	-	1	2	3	1	1
		CE 22407	3	2	1	2	2	1	-	1	2	-	2	3	3	-	1
		CE 22408	3	2	2	2	2	2	-	-	2	2	2	2	2	-	1
		SD22401	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
		AC22401	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22101	Matrices and Calculus	BSC	3	1	0	4	4
2	PH22101	Engineering Physics	BSC	3	0	0	3	3
3	CH22101	Engineering Chemistry	BSC	3	0	0	3	3
4	CS22101	Problem solving and Python Programming	ESC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	EN22101	Communicative English	HSMC	2	0	2	4	3
PRACTICAL COURSES								
6	BS22101	Physics & Chemistry Laboratory	BSC	0	0	4	4	2
7	CS22102	Python programming Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
8	IP22101	Induction Programme	-	-	-	-	-	0
9	HS22101	Higher order thinking	MC	1	0	0	1	1
10	HS22102	Universal Human Values : Understanding Harmony and Ethical Human Conduct	HSMC	2	0	0	2	2
TOTAL				17	1	10	28	23

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22201	Statistics and Numerical Methods	BSC	3	1	0	4	4
2	ES22202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
3	CE22201	Building Materials and Techniques	ESC	3	0	0	3	3
4	ME22201	Engineering Graphics	ESC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	EN22201	Technical English	HSMC	2	0	2	4	3
6	PH22201	Physics for Civil Engineers	BSC	2	0	2	4	3
7	CH22201	Environment and Sustainability	BSC	2	0	2	4	3
PRACTICAL COURSES								
8	CE22202	Building Materials Laboratory	ESC	0	0	4	4	2
9	ES22203	Engineering Practices Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
10	GE3152	Heritage Of Tamil, தமிழர் மரபு	MC	1	0	0	1	1
TOTAL				19	1	14	34	27

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22304	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	CE22301	Strength of	PCC	3	1	0	4	4

		Materials						
3	CE22302	Soil Mechanics	PCC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
4	CE22303	Surveying	PCC	3	0	2	5	4
5	CE22304	Concrete Technology	PCC	2	0	2	4	3
PRACTICAL COURSES								
6	CE22305	Computer Aided Building Drawing	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
7	SD22301	Coding Skills and Soft Skills Training – Phase I	EEC	0	0	4	4	2
MANDATORY COURSES								
8	AC22301	Constitution of India - Audit Course	AC	2	0	0	2	0
9	HS22301	Value Education I	MC	1	0	0	1	0
10	GE3252	Tamils And Technology, தமிழரும் தொழில் நுட்பமும	MC	1	0	0	1	1
TOTAL				18	2	12	32	23

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	CE22401	Structural Analysis	PCC	3	1	0	4	4
2	CE22402	Foundation Engineering	PCC	3	0	0	3	3
3	CE22403	Highway and Railway Engineering	PCC	3	0	0	3	3
4	CE22404	Fluid Mechanics &Hydraulic Machines	PCC	3	0	0	3	3
5	CE22405	Environmental	PCC	3	0	0	3	3

		Engineering						
PRACTICAL COURSES								
6	CE22406	Strength of Materials Laboratory	PCC	0	0	4	4	2
7	CE22407	Hydraulic Engineering Laboratory	PCC	0	0	4	4	2
8	CE22408	Survey Camp (2 weeks – During Winter Vacation)	PCC	-	-	-	-	1
EMPLOYABILITY ENHANCEMENT COURSES								
9	SD22401	Coding Skills and Soft Skills Training – Phase II	EEC	0	0	4	4	2
MANDATORY COURSES								
10	AC22401	Industrial Safety Engineering	AC	2	0	0	2	0
TOTAL				17	1	10	30	23

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	CE22501	Irrigation Engineering	PCC	3	0	0	3	3
2		Professional Elective I	PEC	3	0	0	3	3
3		Professional Elective II	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
4	CE22502	Design of Reinforced Concrete Elements	PCC	3	0	2	5	4
PRACTICAL COURSES								
5	CE22503	Soil Mechanics Laboratory	PCC	0	0	4	4	2
6	CE22504	Environmental Engineering	PCC	0	0	4	4	2

		Laboratory						
7	CE22505	Inplant / Industrial Training (2 weeks - During 4th semester Summer Vacation)	EEC	-	-	-	-	1
EMPLOYABILITY ENHANCEMENT COURSES								
8	SD22501	Coding Skills and Soft Skills Training – Phase III	EEC	0	0	4	4	2
MANDATORY COURSES								
9	AC22501	Entrepreneurship Development	AC	2	0	0	2	0
10	HS22501	Value Education II	MC	1	0	0	1	0
TOTAL				15	0	14	29	20

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	HS22601	Professional Ethics	HSMC	3	0	0	3	3
2		Open Elective – I	OEC	3	0	0	3	3
3		Professional Elective III	PEC	3	0	0	3	3
4		Professional Elective IV	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	CE22601	Design of Steel Structures	PCC	3	0	2	5	4
6	CE22602	Estimation and Costing	PCC	2	0	2	4	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	CE22604	Technical Seminar	EEC	0	0	2	2	1
8	SD22601	Coding Skills, Logical Reasoning and Quantitative	EEC	0	0	4	4	2

		Aptitude Training – Phase I						
TOTAL				17	0	10	27	22

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1		Professional Elective V	PEC	3	0	0	3	3
2		Professional Elective VI	PEC	3	0	0	3	3
3		Open Elective – II	OEC	3	0	0	3	3
4		Open Elective – III	OEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	CE22701	Construction Planning and Project management	PCC	2	0	2	3	3
EMPLOYABILITY ENHANCEMENT COURSES								
6	CE22703	Design and Product Development	EEC	0	0	6	6	3
7	SD22701	Coding Skills, Logical Reasoning and Quantitative Aptitude Training – Phase II	EEC	0	0	4	4	2
TOTAL				14	0	12	25	20

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
EMPLOYABILITY ENHANCEMENT COURSES								
1	CE22801	Project Work/ Internship	EEC	0	0	16	16	8
TOTAL						16	16	8

(Total Credits = 166)

SUMMARY

B.E.Civil Engineering										
S.No	**Subject Area**	**Credits per Semester**								**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
1	**HSMC**	5	3	-	-	-	3	-	-	11
2	**BSC**	12	10	4	-	-	-	-	-	26
3	**ESC**	5	13	-	-	-	-	-	-	18
4	**PCC**	-	-	16	21	11	7	3	-	58
5	**PEC**	-	-	-	-	6	6	6	-	18
6	**OEC**	-	-	-	-	-	3	6	-	9
7	**EEC**	-	-	2	2	3	3	5	8	23
9	**Non-Credit/ (Mandatory)**	1	1	1	-	-	-	-	-	3
Total		23	27	23	23	20	22	20	8	166

PROFESSIONAL ELECTIVE COURSES

LIST OF IDENTIFIED VERTICALS	
1.	Construction Engineering and Management
2.	Environment Engineering
3.	Hydraulics and Hydrology
4.	Structural Engineering
5.	Diversified Courses

Sl.No.	Vertical 1: Construction Engineering and Management	Vertical 2: Environment Engineering	Vertical 3: Hydraulics and Hydrology	Vertical 4: Structural Engineering	Vertical 5: Diversified Courses
1	Construction Management and Safety	Air and Noise Pollution Control	Surface water Hydrology	Fundamentals of Prestressed Concrete Design	Remote Sensing and GIS
2	Repair and Rehabilitation of Structures	Solid and hazardous waste management	Groundwater Engineering	Structural Dynamics and Earthquake Engineering	Advanced Surveying
3	Prefabricated Structures	Industrial Waste Water Management	Participatory Water Resources Management	Basics of Finite Element Analysis	Pavement Engineering
4	Smart Materials and Measuring Technology	Environmental Impact Assessment	Open Channel Flow	Modern Method of Analysis	Airport Docks and Harbour Engineering
5	Housing Planning and Management	Environmental Health and Safety	Advanced Fluid Mechanics	Bridge Engineering	Ground Improvement Techniques
6	Structural Geology	Geo Environmental Engineering	Coastal Zone Management	Computer Aided Design	Applications of AI in Civil Engineering

VERTICAL 1: Construction Engineering and Management (6 courses)

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	CE22511	Construction Management and Safety	PEC	2	0	2	4	3
2.	CE22512	Repair and Rehabilitation of Structures	PEC	3	0	0	3	3
3.	CE22613	Prefabricated Structures	PEC	3	0	0	3	3
4.	CE22614	Smart Materials and Measuring Technology	PEC	3	0	0	3	3
5.	CE22715	Housing planning and Management	PEC	3	0	0	3	3
6.	CE22716	Structural Geology	PEC	3	0	0	3	3

VERTICAL 2: Environment Engineering (6 courses)

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	CE22521	Air and Noise Pollution Control	PEC	3	0	0	3	3
2.	CE22522	Solid and Hazardous Waste Management	PEC	3	0	0	3	3
3.	CE22623	Industrial Waste Water Management	PEC	3	0	0	3	3
4.	CE22624	Environmental Impact Assessment	PEC	3	0	0	3	3
5.	CE22725	Environmental Health and Safety	PEC	3	0	0	3	3
6.	CE22726	Geo Environmental Engineering	PEC	3	0	0	3	3

VERTICAL 3: Hydraulics and Hydrology (6 courses)

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	CE22531	Surface water Hydrology	PEC	3	0	0	3	3
2.	CE22532	Ground water Engineering	PEC	3	0	0	3	3
3.	CE22633	Participatory Water Resources Management	PEC	3	0	0	3	3
4.	CE22634	Open Channel Flow	PEC	3	0	0	3	3
5.	CE22735	Advanced Fluid Mechanics	PEC	3	0	0	3	3
6.	CE22736	Coastal Zone Management	PEC	3	0	0	3	3

VERTICAL 4: Structural Engineering (6 courses)

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	CE22541	Fundamentals of Prestressed Concrete	PEC	3	0	0	3	3

		Design						
2.	CE22542	Structural Dynamics and Earthquake Engineering	PEC	3	0	0	3	3
3.	CE22643	Basics of Finite Element Analysis	PEC	3	0	0	3	3
4.	CE22644	Modern Method of Analysis	PEC	3	0	0	3	3
5.	CE22745	Bridge Engineering	PEC	3	0	0	3	3
6.	CE22746	Computer Aided Design	PEC	3	0	0	3	3

VERTICAL 5: Diversified Courses (6 courses)

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	CE22551	Remote Sensing and GIS	PEC	3	0	0	3	3
2.	CE22552	Advanced Surveying	PEC	3	0	0	3	3
3.	CE22653	Pavement Engineering	PEC	3	0	0	3	3
4.	CE22654	Airport Docks and Harbour Engineering	PEC	3	0	0	3	3
5.	CE22755	Ground Improvement Techniques	PEC	3	0	0	3	3
6.	CE22756	Applications of AI in Civil Engineering	PEC	3	0	0	3	3

OPEN ELECTIVE – I

(TO BE OFFERED TO OTHER DEPARTMENT)

Sl. No.	Course Code	Course Title	Cate Gory	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	CE22681	Climate Change and Its Impact	OEC	3	0	0	3	3
2	CE22682	Selection of Materials	OEC	3	0	0	3	3

OPEN ELECTIVE – II

(TO BE OFFERED TO OTHER DEPARTMENT)

Sl. No.	Course Code	Course Title	Cate Gory	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	CE22781	Environment and Agriculture	OEC	3	0	0	3	3
2.	CE22782	Drinking Water supply and treatment	OEC	3	0	0	3	3

OPEN ELECTIVE – III

(TO BE OFFERED TO OTHER DEPARTMENT)

Sl. No.	Course Code	Course Title	Cate Gory	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	CE22783	Green Building	OEC	3	0	0	3	3
2.	CE22784	Air Pollution and Control Engineering	OEC	3	0	0	3	3

SEMESTER I

MA22101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical Applications
- To familiarize the students with differential calculus
- To familiarize the student with functions of several variables. This is needed in many branches of engineering
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications
- To make the students understand various techniques ODE

UNIT I	MATRICES	12

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Problem solving using Cayley-Hamilton method – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature, rank, index.

UNIT II	DIFFERENTIAL CALCULUS	12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules: sum, product, quotient, chain rules - Implicit differentiation – Logarithmic differentiation – Applications: Maxima and Minima of functions of one variable.

UNIT III	FUNCTIONS OF SEVERAL VARIABLES	12

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

UNIT IV	MULTIPLE INTEGRALS	12

Double integrals – Double integrals in Cartesian and polar coordinates –Area enclosed by plane curves - Change of order of integration – Triple integrals – Volume of solids: cube, rectangular parallelopiped.

UNIT V	ORDINARY DIFFERENTIAL EQUATIONS	12

Linear differential equations of second and higher order with constant coefficients when the R.H.S is e^{ax}, x^n , sin ax, cos ax, $e^{ax}x^n$, e^{ax} sinbx, e^{ax} cosbx – Linear differential equations of second and third order with variable coefficients: Cauchy's and Legendre's linear equations – Method of variation of parameter .

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1:	Define the basic concepts of matrices, limit and continuity of a function, differentiation, ODE and integration
CO2:	Explain the properties of matrices and nature of the quadratic form

CO3:	Interpret the techniques of differentiation, partial differentiation, ODE and integration
CO4:	Apply diagonalization of matrices in quadratic form and apply Cayley Hamilton theorem to find the inverse of matrices
CO5:	Solve problems on differentiation, partial differentiation, integration and ODE using different methods

TEXT BOOKS:	
1.	Narayanan, S. and ManicavachagomPillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, Reprint 2017.
2.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
REFERENCES:	
1.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2.	Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
3.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4.	Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
5.	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO3	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO4	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO5	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1

Table of Specifications for End Semester Question Paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand** (Un)	**Apply** (Ap)	**Analyse**(An) **Evaluate** (Ev)
Unit-I: Matrices	2	1 either or	1(2)-CO1	1(2)-CO2	1either or (16)-CO4	-
Unit-II: Differential Calculus	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Unit-III: Functions of several variables	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-

Unit-IV: Multiple integrals	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-
Unit-V: Ordinary differential equations	2	1 either or	-	2(2)-CO3	1either or (16)-CO5	-
Total Qns. Matrices And Calculus	10	5 either or	1(2)	9(2)	5 either or (16)	-
Total Marks	20	80	2	18	80	-
Weightage	20%	80%	2%	18%	80%	-

Weightage for Cos					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	2	2	16	16	64
Weightage	2%	2%	16%	16%	64%

PH22101	**ENGINEERING PHYSICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology
- To help the students to interrelate the topics such as properties of matter, thermal physics, ultrasonics, quantum theory and crystals, learned in the course
- To motivate students to compare and contrast the available equipment in the respective fields
- To induce the students to design new devices that serve humanity by applying the knowledge gained during the course

UNIT I	**PROPERTIES OF MATTER**	**9**

Elasticity – Types of Elastic moduli – Factors affecting elasticity - Stress-strain diagram and its uses - beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: determination of young's modulus – I shaped Girders - twisting couple - torsion pendulum: determination of rigidity modulus and moment of inertia – torsion springs - other states of matter

UNIT II	**THERMAL PHYSICS**	**9**

Modes of Heat transfer – Thermal conductivity – Newton's law of cooling – Linear heat flow – Thermal conductivity in compound media - Lee's Disc method – Radial heat flow – Rubber tube method – Solar water heater - Thermodynamics – Isothermal and adiabatic process – Otto cycle – Diesel cycle

UNIT III	**ULTRASONICS**	**9**

Sound waves – ultrasonics – properties - production: magnetostriction method - piezoelectric method – cavitation - acoustic grating: wavelength and velocity of ultrasonic waves in liquids – applications: welding, machining, cleaning, soldering and mixing (qualitative) - SONAR – ultrasonic flaw detector - ultrasonography.

UNIT IV	**QUANTUM PHYSICS**	**9**

Black body radiation – Planck's radiation law – Deduction of Wien's displacement law and Rayleigh Jean's law - Compton effect, Photoelectric effect (qualitative) – matter waves – concept

of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – scanning tunneling microscope.		
UNIT V	**CRYSTAL PHYSICS**	**9**
Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, Crystal planes, directions and Miller indices – Characteristics of crystal structures: SC, BCC, FCC and HCP structures - crystal imperfections: point, line and surface defects – crystal growth : epitaxial and lithography techniques		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Recall the basics of properties of matter, thermal physics and ultrasonics, to improve their engineering knowledge.
CO2:	Define the advanced physics concepts of quantum theory and the characteristics of crystalline materials.
CO3:	Illustrate Bending of beams, thermal behavior and ultrasonic devices to assess societal and safety issues.
CO4:	Summarize the dual aspects of matter, crystal structures and imperfections of crystals.
CO5:	Apply the moduli of elasticity of different materials, thermal energy, ultrasonics, scanning tunneling microscope and crystal growth techniques in engineering fields.

TEXT BOOKS:

1.	Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.
2.	Shatendra Sharma & Jyotsna Sharma, Engineering Physics, Pearson India Pvt Ltd., 2018

REFERENCES:

1.	Halliday.D, Resnick, R. & Walker. J, "Principles of Physics", Wiley, 2015.
2.	Bhattacharya, D.K. & Poonam.T., Engineering Physics, Oxford University Press, 2015.
3.	Pandey.B.K, & Chaturvedi.S, Engineering Physics, Cengage Learning India. 2012.
4.	Malik H K & Singh A K, "Engineering Physics", McGraw Hill Education (India Pvt. Ltd.) 2nd edition 2018.
5.	Serway.R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning India. 2010.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	1	-

CO	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit I - Properties Of Matter	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)- CO5	-
Unit II - Thermal Physics	2	1 either or	1(2)-CO1	1(2)- CO3	1 either or (16)- CO5	-
Unit III - Ultrasonics	2	1 either or	2(2)- CO1	-	1 either or (16)- CO5	-
Unit IV - Quantum Physics	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
Unit V - Crystal Physics	2	1 either or	2(2)-CO2	1 either or (16)- CO4	-	-
Total Qns. Engineering Physics	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for Cos					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	8	6	4	34	48
Weightage	8%	6%	4%	34%	48%

CH22101	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To make the students conversant with water treatment methods and electrochemistry Concept
- To gain basic knowledge of corrosion and protection methods
- To understand the basic concepts and synthesis of various engineering materials, nano materials and fuels
- To familiarise the students with the principles, working process and application of energy storage devices

UNIT I	**WATER TREATMENT**	**9**

Water: Sources, impurities - Hardness of water: Types - Estimation of hardness (EDTA method) - Disadvantages of hard water in boilers (Scale, Sludge) – Softening methods: Internal treatment (Calgon, Sodium Aluminate) and External treatment (Demineralisation process). Domestic water treatment – Desalination of brackish water: RO and Solar desalination method.

UNIT II	**ELECTROCHEMISTRY AND CORROSION**	**12**

Electrochemical cell – Free energy and emf – Nernst equation and applications – Oxidation and reduction potential – Standard electrodes: Standard Hydrogen electrode, Saturated calomel electrode, Glass electrode – pH measurement – Conductometric titration (acid-base, precipitation) and Potentiometric titrations: Redox titration (Fe^{2+} x $Cr_2O_7^{2-}$).

Corrosion – Types: Chemical corrosion and Electrochemical corrosion – Corrosion control methods: Sacrificial anodic and Impressed current Cathodic protection method

UNIT III	**FUELS AND COMBUSTION**	**8**

Fuels - classification of fuels – Comparison of solid, liquid and gaseous fuel - Solid fuel - coal - analysis of coal (proximate only) – Liquid fuel - Petroleum – Refining of petroleum - manufacture of synthetic petrol (Bergius process) – Biodiesel – preparation, properties and uses. Gaseous fuel – CNG, LPG.

Combustion – Calorific value – Types (Gross and Net calorific value) – Dulong's formula – GCV and LCV calculation using Dulong's formula. Flue gas – Analysis of flue gas by Orsat method.

UNIT IV	**ENERGY STORAGE DEVICES**	**8**

Batteries – Types (Primary and Secondary) - Lead acid battery, Lithium ion battery - Super capacitors – Storage principle, types and examples – Electric vehicle – working principle - Fuel cells – microbial fuel cell and polymer membrane fuel cell.

Nanomaterials in energy storage – CNT –Types, properties and applications.

UNIT V	**ENGINEERING MATERIALS**	**8**

Abrasives – Types: Natural and Artificial – SiC – preparation, properties and uses. Refractories – Types Acidic, Basic, Neutral – Refractoriness, RUL. Cement – Manufacture – Special cement – white cement and water proof cement. Glass – Manufacture, properties and uses

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Recall the basic concepts of water softening, nano materials and batteries
CO2:	Summarize the types of corrosion, fuels and energy storage devices
CO3:	Explain the basic principles of electrochemistry and engineering materials
CO4:	Identify suitable methods for water treatment, fuel and corrosion control
CO5:	Apply the knowledge of engineering materials, fuels and energy storage devices for material selection and also in energy sectors

TEXT BOOKS:

1.	P. C. Jain and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.
2.	S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.

REFERENCES:

1.	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2.	Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge

	University Press, Delhi 2015.
3.	Sivasankar B. ‘’Engineering chemistry’’, Tata McGraw Hill Publishing company Ltd, New Delhi, 2008.
4.	B.S.Murty, P.Shankar, Baldev Raj, B B Rath and James Murday, ‘’ Text book of nano science and technology’’ Universities press.
5.	O.G. Palanna, “Engineering Chemistry” McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	1	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	1	-
CO3	3	2	2	1	-	-	1	-	-	-	-	1	-	1	-
CO4	3	2	2	1	-	-	2	-	-	-	-	1	-	1	-
CO5	3	2	2	1	-	-	2	-	-	-	-	1	-	1	-
CO	3	2	2	1	-	-	2	-	-	-	-	1	-	1	-

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit I – Water Treatment	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)- CO4	-
Unit II - Electrochemistry And Corrosion	2	1 either or		1(2)-CO2 1(2)-CO3 1 either or (16) – CO3	-	-
Unit III – Fuels And Combustion	2	1 either or		2(2)- CO2	1 either or (16)- CO5	-
Unit IV – Energy Storage Devices	2	1 either or	1(2)-CO1	1 (2)- CO2	1 either or (16)- CO5	-
Unit V – Engineering Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
Total Qns. Engineering Chemistry	10	5 either or	3 (2)	4 (2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	6	46	48	-
Weightage	20%	80%	6%	46%	48%	-

Weightage for Cos					
	CO1	CO2	CO3	CO4	CO5
Total Marks	6	10	36	16	32
Weightage	6%	10%	36%	16%	32%

CS22101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving
- To learn to solve problems using Python conditionals and loops
- To define Python functions and use function calls to solve problems
- To use Python data structures - lists, tuples, and dictionaries to represent complex data

UNIT I	INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING STRATEGIES	9

Introduction- Components and functions of a computer system- Hardware and Software. Problem solving strategies- Program design tools: Algorithms, Flow charts, Pseudo code

UNIT II	DATA TYPES, EXPRESSIONS, STATEMENTS AND CONTROL FLOW	9

Features of Python -Variables and Identifiers – Data types: Numbers, Strings, Boolean, Tuples, List, Dictionary, Sets - Input operation - Comments, Reserved words, Indentation - Operators and Expressions – Type Conversion - Selection / Conditional Branching Statements - Basic Loop Structures / Iterative Statements - Nested Loops – break statement – continue statement – pass statement

UNIT III	FUNCTIONS AND STRINGS	9

Functions: Function Definition, function call- variable scope and lifetime – return statements. Strings: Definition, operations (concatenation, appending, multiply, slicing) - immutability, comparison, iterations, string methods

UNIT IV	LIST, TUPLES AND DICTIONARIES	9

Lists: Access, updating values- nested, cloning- list operations- list methods- looping in list. Tuples: Tuple operations- nested tuple; Dictionaries- Creating, Accessing, adding, modifying, deleting items

UNIT V	FILES, EXCEPTIONS AND PACKAGES	9

Files: Types of files, Opening and closing Files, Reading and writing files, File positions, Renaming and deleting files. Exceptions: Errors and exceptions, Handling exceptions, Packages

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Describe the algorithmic solutions to simple and complex computational problems
CO2:	Apply functions, modules and packages in Python program and use conditionals and loops for solving problems
CO3:	Analyze conditional branching statements
CO4:	Evaluate python programs
CO5:	Develop programs using compound data types and files

TEXT BOOKS:	
1.	Reema Thareja, "Python Programming Using Problem Solving Approach", 13th Edition, Oxford University Press, 2022.
2.	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
REFERENCES:	
1.	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
2.	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.
4.	Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	-	-	3
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	-	-	1	-	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	1	-	-	3
CO5	3	3	3	3	-	-	-	-	-	-	-	1	-	-	3
CO	3	3	3	3	-	-	-	-	-	-	-	1	-	-	3

Table of Specification for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level					
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An)	Evaluate (Ev)	Create (Cr)
			No. of Qns. (marks) and CO					
Unit-I: Introduction to Computers and Problem Solving Strategies	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)- CO1	-	-	-	-
Unit-II: Data Types, Expressions, Statements and Control Flow	2	1 either or	1(2)-CO2	1(2)-CO2	-	1 either or (16)- CO3	-	-
Unit-Ill: Functions and Strings	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO2	-	-	-

Unit-IV: List, Tuples and Dictionaries	2	1 either or	1(2)-CO4	1(2)-CO4	-	-	1 either or (16)- CO4	-
Unit-V: Files, Exceptions and Packages	2	1 either or	1(2)-CO5	1(2)-CO5	-	-	-	1 either or (16)- CO5
Total Qns. Problem Solving and Python Programming	10	5 either or	5(2)	5(2) 1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)
Total Marks	20	80	10	26	16	16	16	16
Weightage	20%	80%	10%	26%	16%	16%	16%	16%

Weightage for COs					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EN22101	**COMMUNICATIVE ENGLISH**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

COURSE OBJECTIVES:

- To guide the learners on the basics of language including vocabulary and grammar
- To develop the receptive skills of the learners: Reading and Listening
- To develop the productive skills of the learners: Writing and Speaking
- To make the learners realize the importance of accuracy and fluency
- To help the learners use the language in real situations

UNIT I	**VOCABULARY AND LANGUAGE STUDY**	**6**

Vocabulary – Synonyms and Antonyms, Word building – Prefixes and Suffixes – Word formation- Definitions - One word substitutes - Reading for vocabulary and language development- Note making and Summarising - Developing Hints.

UNIT II	**READING AND LANGUAGE DEVELOPMENT**	**6**

Parts of speech, Types of sentences – Statement, Interrogative, Imperative, Exclamatory, Wh-questions, **Yes** or **No** questions and tag questions, Formal Letters – Academic, Official, and Business Letters

UNIT III	**GRAMMAR AND LANGUAGE DEVELOPMENT**	**6**

Tense and Voice, Auxiliary verbs (be, do, have), Modal verbs - *Types of Reading* : Intensive Reading and Extensive Reading- *Strategies*: Predicting- Skimming and Scanning -Reading for facts - Understanding the parts of paragraph- Learning the transitional signals used in the passage to classify the text

UNIT IV	**FUNDAMENTALS OF WRITING**	**6**

Punctuation and Capitalization- **Sentence formation**: Word order-Completion of sentences-Conjunctions-Transitional signals- sentence and sentence structures- Informal Letters.

UNIT V	**EXTENDED WRITING**	**6**

Degrees of Comparison – Reported speech -**Paragraph writing**-Topic sentence, supporting sentences and concluding sentence-Informal and Formal expressions

TOTAL : 30 PERIODS

PRACTICAL EXERCISES

Listening (Receptive skill**)** *Intensive Listening: Effective and Attentive Listening*	
Exercises	
1) Listening for gist from recorded speeches	
2) Listening for specific information from recorded conversations	
3) Listening for strengthening vocabulary skills.	
4) Listening to variety of situations and voices- Listening for language development	
5) Listening for pronunciation: syllables, stress and intonation.	
Speaking (Productive Skill)	
Exercises	
1) Introducing oneself and others	
2) Asking for / giving personal information	
3) Practicing dialogues in pairs	
4) Giving directions-Informal and formal dialogues	
5) Speaking in connected speech	
6) Responding to questions	
7) Short presentations	
8) Speaking in small and big groups	
9) Learning and practicing the essential qualities of a good speaker	
TOTAL: 30 PERIODS	
TOTAL(T+P): 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Apply and practice the correct usages of language
CO2:	Receive the language effectively and meaningfully through receptive skills
CO3:	Produce the language appropriate to the needs and situations exercising productive skills
CO4:	Transfer or interpret any piece of information with accuracy and fluency
CO5:	Apply the language intellectually and confidently
TEXT BOOKS:	
1.	Shobha. K.N, Rayen, Joavani, Lourdes, "Communicative English", Cambridge University Press, 2018.
2.	Sudharshana.N.P and Saveetha. C, "English for Technical Communication", Cambridge University Press: New Delhi, 2016.
REFERENCES:	
1.	Kumar, Suresh. E., "Engineering English", Orient Blackswan, Hyderabad, 2015.
2.	Means, L. Thomas and Elaine Langlois, "English & Communication for Colleges", Cengage Learning, USA: 2007.
3.	Greendaum, Sydney and Quirk, Randolph, "A Student's Grammar of the English Language", Pearson Education.
4.	Wood F.T, "Remedial English Grammar", Macmillan, 2007.
5.	Kumar, Sanjay and Pushp Lata, "Communication Skills: A Workbook", New Delhi: OUP, 2018.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	1	1	-	2	-	1	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO3	-	-	-	-	-	-	-	-	1	1	-	2	-	1	-
CO4	-	-	-	-	-	-	-	-	2	2	-	2	-	1	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO	-	-	-	-	-	-	-	-	2	2	-	2	-	1	-

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Kn)	Understand (Un)	Apply (Ap)
			No. of Qns.(marks) and CO		
Unit-I: Vocabulary and Language Study	2	1 compulsory	2(2)-CO1	1 Compulsory (16)- CO1	-
Unit-II: Reading and Language Development	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-Ill: Grammar and Language Development	2	1 either or	1(2)- CO3	1(2)-CO3	1 either or(16)-CO3
Unit-IV: Fundamentals of Writing	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4
Unit-V: Extended writing	2	1either or	1(2)-CO5	1(2)-CO5	1 either or (16)- CO5
Total Qns. Communicative English	10	1 Compulsory & 4 either or	7(2)	3(2) 1 Compulsory &1 either or (16)	3 either or (16)
Total Marks	20	80	14	38	48
Weightage	20%	80%	14%	38%	48%

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

BS22101	PHYSICS & CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of

experimental data.	
• To determine error in experimental measurements and techniques used to minimize such error.	
• To make the student an active participant in each part of all lab exercises.	
LIST OF EXPERIMENTS	
1.	Non-uniform bending – Determination of Young's modulus.
2.	SHM of Cantilever – Determination of Young's modulus.
3.	Poiseuille's flow – Coefficient of viscosity of liquid
4.	Torsional pendulum - Determination of Rigidity modulus.
5.	Newton's ring – Radius of curvature of convex lens.
6.	Lee's Disc – Determination of coefficient of thermal conductivity of bad conductor.
TOTAL: 30 PERIODS	
CHEMISTRY LABORATORY	
OBJECTIVES	
• To inculcate experimental skills to test basic understanding of water quality parameters such as, acidity, alkalinity and hardness.	
• To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.	
LIST OF EXPERIMENTS	
1.	Determination of total hardness of water by EDTA method.
2.	Conductometric titration of strong acid and strong base.
3.	Determination of strength of given hydrochloric acid using pH meter.
4.	Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4.
5.	Determination of alkalinity in water sample.
6.	Estimation of iron content of the given solution using potentiometer.
TOTAL: 30 PERIODS	
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Determine different moduli of elasticity used in day to day engineering applications
CO2:	Calculate the viscosity of liquids and radius of curvature of convex lens
CO3:	Estimate the coefficient of thermal conductivity of bad conductors
CO4:	Determine the water quality parameters of the given water sample.
CO5:	Analyze quantitatively the metals (Fe, Ni,) in the any sample volumetrically as well as by using spectro-analytical methods.

Course outcomes	**PO**												**PSO**		
	1	**2**	**P**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	-	-	-	-	-	2	1	-	1	-	1	-

CO2	3	1	-	-	-	-	-	-	2	1	-	1	-	1	-
CO3	3	1	-	-	-	-	-	-	2	1	-	1	-	1	-
CO4	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO5	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO	3	1	-	-	-	2	2	-	2	1	-	1	-	1	-

CS22102	**PYTHON PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES

- To understand the problem solving approaches
- To learn the basic programming constructs in Python
- To practice various computing strategies for Python-based solutions to real world problems
- To use Python data structures - lists, tuples, dictionaries
- To do input/output with files in Python

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing algorithms and flow charts for the same
2. Python programming using simple statements and expressions
3. Scientific problems using Conditionals and Iterative loops
4. Implementing real-time/technical applications using Lists, Tuples
5. Implementing real-time/technical applications using Sets, Dictionaries
6. Implementing programmes using Functions
7. Implementing programmes using Strings
8. Implementing real-time/technical applications using File handling
9. Implementing real-time/technical applications using Exception handling
10. Exploring Pygame tool
11. Developing a game activity using Pygame like bouncing ball

TOTAL PERIODS: 60

COURSE OUTCOMES

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

CO1: Develop algorithmic solutions to simple computational problems

CO2: Develop and execute simple Python programmes

CO3: Implement programmes in Python using conditionals, loops and functions for solving problems

CO4: Process compound data using Python data structures

CO5**:** Utilize Python packages in developing software applications

Course outcomes	PO												PSO		
	1	2	P	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	1	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	1	1	-	2
CO5	3	3	3	3	2	-	-	-	-	-	-	1	1	-	2
CO	3	3	3	3	2	-	-	-	-	-	-	1	1	-	2

HS22101	HIGHER ORDER THINKING	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- Teaching the students the sources and dynamics of thinking.
- Teaching the students the basics of systematic and scientific thinking.
- Initiating the students into critical thinking and to use critical thinking in practical life
- Initiating students into creative thinking

UNIT I	INTRODUCTION TO COGNITION, KNOWLEDGE AND THINKING	3

Cognition - Different Cognitive functions - Cognition and intelligence - Cognitive development: till adolescence and post adolescence - possibility of true knowledge - The sources of Knowledge. Sensation, perception. Reality of perception - Concept formation, abstraction. Memory and retrieving - Introduction to thinking and types of thinking. Systematic thinking

UNIT II	LOGIC AND REASONING	3

Commonsense and scientific knowledge. Pursuit of truth.- Syllogistic Logic. Greek and Indian. – Exercises

UNIT III	CRITICAL THINKING SKILLS AND DISPOSITIONS	3

Critical Thinking Skills & Dispositions. Critical Thinking Exercises

UNIT IV	ANALYSIS OF ARGUMENTS	3

Propositions and fallacies. - Analyzing arguments. - Exercises.

UNIT V	CREATIVE THINKING AND INNOVATIVE THINKING	3

Evolution of Scientific Thinking and Paradigm Shift. - Dynamics of Thoughts: Hegel. - Convergent thinking and divergent thinking (out of the box thinking). - Problem solving and Planning.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

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

CO1:	Demonstrate the sources of knowledge and the process of thinking
CO2:	Demonstrate critical thinking skills and dispositions of critical thinking

CO3:	Confidently engage in creative thinking and problem solving

REFERENCES:

1	Introduction to Logic, Irving M. Copi, Carl Cohen and Kenneth McMahon, Fourteenth Edition, Pearson Education Limited, 2014.
2	Teaching Thinking Skills: Theory and Practice, Joan Boykoff Baron and Robert J. Sternberg, W.H. freeman and Company, New York.
3	Cognitive Psychology, Robert J. Sternberg, Third Edition, Thomson Wadsworth, UK

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	3
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	3
CO3	3	2	2	1	-	-	1	-	1	-	1	1	-	-	3
CO	3	2	2	1	-	-	2	-	2	-	1	1	-	-	3

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Introduction To Cognition, Knowledge And Thinking	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Logic And Reasoning	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-III: Critical Thinking Skills And Dispositions	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-IV: Analysis Of Arguments	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-V: Creative Thinking And Innovative Thinking	2	1either or	2(2)-CO3	-	1either or (16)-CO3	-
Total Qns. Higher Order Thinking	10	5 either or	10 (2)	4 either or (16)	1 either or (16)	
Total Marks	20	80	20	64	16	
Weightage	20%	80%	20%	64%	16%	

Weightage for COs

	CO1	CO2	CO3
Total Marks	40	40	20
Weightage	40%	40%	20%

HS22102	UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.

UNIT I	**INTRODUCTION TO VALUE EDUCATION**	**6**

Value Education - Definition, Concept and Need for Value Education, Basic Guidelines - The Content and Process of Value Education - Basic Guidelines for Value Education - Self exploration as a means of Value Education - Happiness and Prosperity as parts of Value Education.

UNIT II	**HARMONY IN THE HUMAN BEING**	**6**

Human Being is more than just the Body- Harmony of the Self ('I') with the Body - Understanding Myself as Co-existence of the Self and the Body - Understanding Needs of the Self and the needs of the Body - Understanding the activities in the Self and the activities in the Body.

UNIT III	**HARMONY IN THE FAMILY, SOCIETY AND HARMONY IN THE NATURE**	**6**

Family as a basic unit of Human Interaction and Values in Relationships - The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love - Comprehensive Human Goal: The Five Dimensions of Human Endeavour - Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

UNIT IV	**SOCIAL ETHICS**	**6**

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

UNIT V	**PROFESSIONAL ETHICS**	**6**

Universal Human Values - Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies - Production System and Management Models.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1:	Illustrate the significance of value inputs in a classroom and start applying them in their life and profession.
CO2:	Explain the role of a human being in ensuring harmony in society and nature.
CO3:	Demonstrate the value of harmonious relationship based on trust and respect in their life and profession.
CO4:	Compare values, skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO5:	Classify ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

TEXT BOOKS:

1	R R Gaur, R Sangal, G P Bagaria, "Human Values and Professional Ethics", Excel

	Books, New Delhi, 2010.
2	A.N. Tripathy, “Human Values”, New Age International Publishers, New Delhi, 2004.
REFERENCES:	
1.	Gaur. R.R., Sangal. R, Bagaria. G.P, “A Foundation Course in Value Education”, Excel Books, 2009.
2.	Gaur. R.R., Sangal. R, Bagaria. G.P, “Teachers Manual” Excel Books, 2009.
3.	Gaur R R, R Sangal, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2009.
4.	William Lilly, “Introduction to Ethic” Allied Publisher.
5.	Nagarajan, R.S., Professional Ethics and Human values, New Age International Publishers, 2006.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
CO2	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
CO3	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
CO4	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
CO5	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3
CO	1	-	-	-	-	2	2	3	1	1	-	1	-	-	3

Table of specification for end semester question paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand (Un)**	**Apply (Ap)**	**Analyse(An) Evaluate(Ev)**
Unit I: Introduction to Value Education	2	1 either or	2(2)-CO1	1 either or (16)-CO1	-	-
Unit II:Harmony in the Human Being	2	1 either or	2(2)-CO2	1 either or (16)-CO2	-	-
Unit III: Harmony in the Family, Society And Harmony in the Nature	2	1 either or	1(2)-CO3	1(2)-CO3 1either or (16)-CO3	-	-
Unit IV: Social Ethics	2	1either or	1(2)-CO4	1(2)-CO4	1either or (16)-CO4	-
Unit V: Professional Ethics	2	1either or	1(2)-CO5	1(2)-CO5	1either or (16)-CO5	-
Total Qns. Universal Human Values: Understanding Harmony and Ethical Human Conduct	10	5either or	7(2)	3(2) 3 either or (16)	2 either or (16)	-
Total Marks	20	80	14	54	32	
Weightage	20%	80%	14%	54%	32%	
Weightage for COs						
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	

Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

SEMESTER II

MA22201	**STATISTICS AND NUMERICAL METHODS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES:

- To provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various numerical methods of solving ordinary differential equations.

UNIT I	**TESTING OF HYPOTHESIS**	**12**

Statistical hypothesis -Type I and Type II errors - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t distribution for single mean and equality of means - Test based on F distribution for equality of variances - Chi square test for single variance and goodness of fit - Independence of attributes - Contingency table : Analysis of r × c tables.

UNIT II	**DESIGN OF EXPERIMENTS**	**12**

General principles – Analysis of variance (ANOVA) - One way classification - Completely randomized design (CRD) – Two way classification - Randomized block design (RBD) – Three way classification -Latin square design(LSD) – Two factor experiments: 2^2 factorial design

UNIT III	**NUMERICAL SOLUTION OF EQUATIONS**	**12**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel .

UNIT IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION**	**12**

Newton's forward and backward interpolation – Interpolation with unequal intervals - Lagrange's interpolation- Divided differences - Newton's divided difference - Approximation of derivates using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3, 3/8 rules- Numerical double integration: Trapezoidal and Simpson's rules.

UNIT V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**12**

Single step methods : Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.	
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Define the basic concepts of statistical tests, ANOVA, iterative methods, interpolations and ODE.
CO2:	Discuss the techniques of statistical tests and design of experiments.
CO3:	Explain the solution of equations, ODE, single and multistep methods, interpolations, differentiation and integration.
CO4:	Apply the concept of testing of hypothesis and design of experiment in real life.
CO5:	Apply numerical techniques in system of equations, differential equations, interpolation, differentiation and integration.
TEXT BOOKS:	
1.	Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
2.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
REFERENCES:	
1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics, 4th Edition, Tata McGraw Hill Edition, 2012.
5.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2012.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO3	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO4	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO5	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1
CO	3	2	-	-	-	-	-	-	-	-	-	1	1	-	1

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate (Ev)
Unit-I: Testing of hypothesis	2	1 either or	1(2)-CO1	1(2)-CO2	1either or (16)-CO4	-
Unit-II: Design of experiments	2	1 either or	2(2)-CO1	-	1either or (16)-CO4	-
Unit-III: Numerical solution of equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Unit-IV: Interpolation, Numerical differentiation and integration	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Unit-V: Numerical solution of ordinary differential equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Total Qns. Statistics and Numerical Methods	10	5 either or	6(2)	4(2)	5 either or (16)	-
Total Marks	20	80	12	8	80	-
Weightage	20%	80%	12%	8%	80%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	12	2	6	32	48
Weightage	12%	2%	6%	32%	48%

ES22202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To introduce the basic circuit components.
- To educate on the working principles and applications of electrical machines.
- To explain the construction and working of semiconductor devices
- To educate on logic gates, flip flops and registers
- To introduce the functional elements and working of measuring instruments.

UNITI	INTRODUCTION TO ELECTRICAL ENGINEERNG	9

Introduction-Conductors, semiconductors and Insulators-Electrostatics – Electric Current-Electromotive Force-Electric Power- Ohm's Law-Basic circuit components-Electromagnetism related laws-Kirchhoff's Laws.

UNIT II	ELECTRICAL MACHINES	9

Construction, working principle and types of DC Generator – Motor- single phase Transformer - single phase and three phase Induction motor –Applications

UNIT III	ANALOG ELECTRONICS	9

Classification of Semiconductors– Construction , Characteristics and working -PN Junction Diode- Zener Diode - Bipolar Junction Transistor-IGBT- SCR- MOSFET.

UNIT IV	DIGITAL ELECTRONICS	9
Review of number systems, binary codes- Boolean Algebra-Logic gates-Implementation of Boolean expression using K-map –Types of flip flops, Registers.		
UNIT V	**MEASUREMENTS AND INSTRUMENTATION**	**9**
Functional elements of an instrument –Static and dynamic characteristics of instruments, Errors, Principles of electrical indicating instruments- Types of indicating instruments -Moving Coil and Moving Iron instruments- DSO -Transducers-Resistive Transducers		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Apply the basic laws to determine circuit parameters
CO2:	Explain the construction, working and application of electrical machines.
CO3:	Explain the construction and working of semiconductor devices.
CO4:	Interpret the function of combinational and sequential circuits.
CO5:	Interpret the operating principles of measuring instruments.

TEXT BOOKS:

1.	M .S.Sukhja ,T.K.Nagsarkar "Basic Electrical and Electronics Engineering" Oxford Higher Education First Edition ,2018.
2.	S. Salivahanan, R.Rengaraj "Basic Electrical and Instrumentation Engineering" McGraw Hill Education, First Edition,2019.

REFERENCES:

1.	Kothari DP and I.J Nagrath, "Basic Electrical and Elecronics Engineering", Fourth Edition, McGraw Hill Education, 2019.
2.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.
3.	V. K. Mehta, Rohit Mehta "Basic Electrical Engineering", S.Chand& Company Pvt. Ltd, New Delhi, 2012.
4.	S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015
5.	B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co, 2008.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-

CO4	3	3	2	2	-	-	-	-	-	-	-	1	1	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	1	-	-
CO	3	2	2	2	-	-	-	-	-	-	-	1	1	-	-

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate(Ev)
Unit-I : Introduction To Electrical Engineering	2	1 either or	2 compulsory	-	1either or (16)-CO1	-
Unit-II: Electrical Machines	2	1 either or	2 compulsory	1 either or (16)-CO2	-	-
Unit-III: Analog Electronics	2	1 either or	2 compulsory	1 either or (16)-CO3	-	-
Unit-IV: Digital Electronics	2	1 either or	2 compulsory	1 either or (16)-CO4		-
Unit-V: Measurements And Instrumentation	2	1 either or	2 compulsory	1 either or (16)-CO5	-	-
Total Qns. Basic Electrical and Electronics Engineering	10	5 either or	2 compulsory	4 either or (16)	1 either or (16)	-
Total Marks	20	80	20	64	16	-
Weightage	20%	80%	20%	64%	16%	-

Weightage for COs						
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

CE22201	**BUILDING MATERIALS & TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSEOBJECTIVES:

- To learn the various construction materials and the technique that is commonly used in Civil Engineering construction

UNITI	**BASIC CONSTRUCTION MATERIALS**	**9**

Stones: Classification - composition and mineral constituents - properties and tests - artificial stones. Bricks: Brick earth - composition and harmful constituents - manufacturing process, classification - sampling and testing - properties - brick substitutes- Concrete blocks.

UNIT II	**MISCELLANEOUS MATERIALS**	**9**

Weather proofing: Paints and varnishes, polymers and plastics. Timber: Market forms - physical properties, seasoning and preservative treatment. Ferrous metals: Iron and steel - market forms - structural steel - composition - materials properties and behaviour. Non-ferrous metals:

Aluminium, copper, brass and glass products -properties - applications.		
UNIT III	**CONSTRUCTION PRACTICES**	**9**
Specifications - Construction co-ordination - Site clearance and marking - Earthwork - Earth moving operations -Foundations and basements - Mortar - Types - Masonry - Brick masonry - Bonds - Stone masonry - Concrete hollow block masonry.		
UNIT IV	**CONSTRUCTION TECHNIQUES**	**9**
Flooring - Damp proof courses - Construction joints - Movement and expansion joints - Contraction joints - Roofing -Form works - Centering and shuttering - Scaffoldings, shoring and underpinning - Shoring for deep cutting- Cable anchoring and grouting.		
UNIT V	**CONSTRUCTION EQUIPMENT**	**9**
Selection of equipment - Earthwork equipment - Tractors and earth movers - Equipment for soil compaction -material handling and hoisting - dewatering and pumping - trenching, tunnelling and dredging.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	List the various Building Materials, Techniques And Equipment	
CO2:	Demonstrate the construction practices and techniques in the field of civil Engineering	
CO3:	Apply the suitable construction materials, techniques and equipment	
CO4:	Analyze the Suitability of Modern Building Materials and Equipment	
CO5:	Evaluate the quality of materials and Construction Practices	
TEXT BOOKS:		
1.	Edward Allen and Joseph Iano, “Fundamentals of Building Construction: Materials and Methods”, John Wiley &Sons; 7th edition, 2019.	
2.	Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method ofConstruction", Dhanpat Rai and Sons, 2010.	
REFERENCES:		
1.	Varghese, P.C., “Building construction”, Prentice Hall of India Pvt. Ltd, New Delhi, 2016.	
2.	Peurifoy, Schexnayder, Shapira, “Construction Planning, Equipment and Methods”, Tata McGraw Hill Education Private Ltd, 9th edition, 2018.	
3.	National Building Code of India, Part V, "Building Materials”, 2016.	
4.	Duggal.S.K., "Building Materials", 4th Edition, New Age International Publishers, 2012.	
5.	Arora S.P. and Bindra S.P., “The Text Book of Building Construction”, Dhanpat Rai and Sons, 2019.	

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	-	-	-	2	-	1	-	-	-	-	2	2	1	3
CO2	3	2	1	-	2	2	2	-	-	-	1	2	2	1	3
CO3	3	2	2	-	2	2	2	-	-	1	2	2	2	1	3
CO4	2	3	2	2	2	2	2	2	2	2	2	2	2	1	3
CO5	2	-	-	-	2	-	1	-	-	-	-	2	2	1	3
CO	2	2	2	-	2	2	2	2	2	2	2	2	2	1	3

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qus.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate(Ev)
Unit-I Basic Construction Materials	2	1 either or	2 compulsory	-	1 either or (16)-CO1	-
Unit-II Miscellaneous Materials	2	1 either or	2 compulsory	1 either or (16)-CO2	-	-
Unit-III Construction Practices	2	1 either or	2 compulsory	1 either or (16)-CO3	-	-
Unit-IV Construction Techniques	2	1 either or	2 compulsory	1 either or (16)-CO4		-
Unit-V Construction Equipment	2	1 either or	2 compulsory	1 either or (16)-CO5	-	-
Total Qns. Building Materials & Techniques	10	5 either or	2 compulsory	4 either or (16)	1 either or (16)	-
Total Marks	20	80	20	64	16	-
Weightage	20%	80%	20%	64%	16%	-

Weightage for COs						
	CO	CO2	CO3	CO4	CO5	
Total Marks	2	20	20	2	20	
Weightage	2	20%	20	2	20%	

ME22201	ENGINEERING GRAPHICS	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To draw the engineering curves
- To draw orthographic projection of points and lines
- To draw orthographic projection of solids and section of solids
- To draw the development of surfaces

CONCEPTS AND CONVENTIONS

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

dimensioning.		
UNIT I	**PLANE CURVES**	**12**
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method —construction of involutes of square and circle — Drawing of tangents and normal to the above curves.		
UNIT II	**PROJECTION OF POINTS, LINES AND PLANES**	**12**
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to any one principal plane.		
UNIT III	**PROJECTION OF SOLIDS**	**12**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one of the principal planes by rotating object method.		
UNIT IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**	**12**
Sectioning of solids (Prisms, pyramids cylinder sand cones) in simple vertical position when the cutting plane is inclined to the one of theprincipalplanesandperpendiculartotheother—obtainingtrueshapeofsection.Developmentof lateral surfaces of simple and sectioned solids—Prisms, pyramids cylinders and cones.		
UNIT V	**ISOMETRIC PROJECTIONS AND FREEHAND SKETCHING**	**12**
Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids & cylinders, in simple vertical positions. Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of projection of simple objects by CAD Software (Demonstration purpose only).		
		TOTAL: 60 PERIODS
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Recall the existing national standards and interpret a given three dimensional drawing.	
CO2:	Interpret graphics as the basic communication and methodology of the design process.	
CO3:	Acquire visualization skills through the concept of projection.	
CO4:	Develop the sectioned solids and discover its true shape .	
CO5:	Develop imagination of physical objects to be represented on paper for engineering communication.	
TEXT BOOKS:		
1.	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.	
2.	Jeyapoovan T., "Engineering Graphics using AutoCAD", Vikas Publishing House, 7th Edition, 2015.	
REFERENCES:		
1.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International	

	(P) Limited 2008.
2.	Julyes Jai Singh S., "Engineering Graphics", SRM tri sea publishers, Nagercoil,7th Edition,2015.
3.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
4.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
5.	Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-
CO2	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-
CO5	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-
CO	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-

Table of specification for end semester question paper

Unit No. and Title	Total 20 Marks Qus.	Cognitive Level			
		Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I Plane curves	1 either or	-	1 either or (20)-CO1	-	-
Unit-II Projection Of Points, Lines And Planes	1 either or	-	1 either or (20)-CO2	-	-
Unit-III Projection Of Points, Lines and Planes	1 either or	-	-	1 either or (20)-CO3	-
Unit-IV Section Of Solids and Development of Surfaces	1 either or	-	-	1 either or (20)-CO4	-
Unit-V Isometric Projections And Freehand Sketching	1 either or	-	-	1 either or (20)-CO5	-
Total Qns. Engineering Graphics	5 either or	-	2 either or (20)	3 either or (20)	-
Total Marks	100	-	40	60	-
Weightage	100%	-	40%	60%	-

Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

EN22201	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To widen strategies and skills to augment ability to read and comprehend engineering

and technology texts.

- To develop writing skill to make technical presentations.
- To draft convincing job applications and effective reports..
- To strengthen listening skills to comprehend technical lectures and talks in their areas of Specialization.
- To cultivate speaking skills both technical and general.

UNIT I	**LANGUAGE STUDY**	**12**

Technical Vocabulary- synonyms, antonyms, prefix and suffix, word formation, Homonyms and Homophones - puzzles,- Reading: skimming a reading passage – scanning for specific information- Instruction- Interpreting – Writing: Recommendation- Checklist.

UNIT II	**READING AND STUDY SKILLS**	**6**

Active and Passive voice- Extended Definitions- Imperatives- Numerical Adjectives- Purpose Statement – Reading: Critical reading- Newspaper articles- journal reports- editorials and opinion blogs - Report Writing: Fire Accident, Industrial visit, Project report, feasibility report, survey report, business report.

UNIT III	**WRITING SKILLS- INTRODUCTION TO PROFESSIONAL WRITING**	**6**

Error Spotting/Common Errors- Concord-Compound words- Abbreviations and Acronyms- Discourse Markers - Finding key information – shifting facts from opinion- interpreting visual material- making inference from the reading passage - Interpretation of charts- - Minutes of the meeting- Paraphrasing- Proposal writing.

UNIT IV	**TECHNICAL WRITING AND GRAMMAR**	**6**

If Conditional Clauses- Prepositional Phrases- Fixed and semi fixed expressions- -e-mail communication- reading the attachment files having a poem /joke / proverb/sending their responses through e-mail.- Job application letter and Resume/CV/ Bio-data.

UNIT V	**EXTENDED WRITING AND LANGUAGE STUDY**	**6**

Articles- Cause and Effect expressions- Collocations- Sequencing words- Reading longer technical texts and taking down notes- Structure of Essay- Types of Essay: Narrative essay- Descriptive Essay- Analytical Essay- Cause and Effect Essay – Compare and contrast essays.

TOTAL – 30 PERIODS

PRACTICAL EXERCISES

Listening Skills – Listening for professional Development

Listening to UPSC Toppers Mock Interviews- Listening to debates/discussions/different viewpoints /scientific lectures/event narrations/documentaries/telephonic conversations

Speaking Skills –emphasizing communicative establishment

Seeking Information -asking and giving directions- narrating personal experiences/ events- answering interview questions- picture description- presenting a product and giving instruction to use a product – mini presentations-role plays- speaking in formal and informal situations-speaking about one's locations - speaking about great personalities –describing a simple process- telephone skills and etiquette

	TOTAL: 30 PERIODS
	TOTAL (T+P) = 60 PERIODS
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Infer advanced technical texts from varied technical genres to expand engineering knowledge and explore more ideas.
CO2:	Analyze technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.
CO3:	Present reports and job letters utilizing the required format prescribed on par with international standards using the exact vocabulary to make their works worthy to be read.
CO4:	Employ the language tones and styles appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world
CO5:	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.
TEXT BOOKS:	
1.	Mike Markrl, " Technical Communication", Palgrave Macmillan, London, 2012.
2.	Sumant, S and Joyce Pereira, "Technical English II", Chennai: Vijay Nicole Imprints Private Limited, 2014.
REFERENCES:	
1.	Raman, Meenakshi & Sangeetha Sharma, "Communication Skills", New Delhi: OUP, 2018.
2.	Rizvi M, Ashraf, "Effective Technical Communication", New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007.
3.	Kumar, Sanjay and Pushp Lata, "Communication Skills: A Workbook", New Delhi: OUP, 2018.
4.	Means, L. Thomas and Elaine Langlois, "English & Communication for Colleges", Cengage Learning, USA: 2007.
5.	Greendaum, Sydney and Quirk, Randolph, "A Student's Grammar of the English Language", Pearson Education.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	-	-	-	-	3	-	2	-	1	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO3	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO4	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
CO	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-

Table of specification for end semester question paper

Unit No. And Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Kn)	Understand (Un)	Apply (Ap)
			No. of Qns.(marks) and CO		
Unit-I: Language Study	2	1 compulsory	1(2)-CO1	1(2)-CO11Compulsory (16)- CO1	-
Unit-II: Reading And Study Skills	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-III: Writing Skills	2	1 either or	1(2)- CO3	1(2)-CO3	1 either or(16)-CO3
Unit-IV: Technical Writing and Grammar	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4
Unit-V: Extended Writing And Language Study	2	1either or	1(2)-CO5	1(2)-CO5	1either or (16)- CO5
Total Qns. Technical English	10	1 Compulsory & 4 either or	6(2)	4(2) 1 Compulsory &1 either or (16)	3either or (16)
Total Marks	20	80	12	40	48
Weightage	20%	80%	12%	40%	48%

Weightage For COs					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

PH22201	**PHYSICS FOR CIVIL ENGINEERS**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

COURSE OBJECTIVES:

- To understand the concepts of light, electron transport properties and the essential principles of semiconductors.
- To become proficient in factors affecting buildings
- To know the basics of the functioning of advanced engineering materials
- To induce the students to design new devices that serve humanity by applying the knowledge gained during the course.

UNIT I	**PHOTONICS**	**6**

Interference – Air wedge – LASER – population inversion - Einstein coefficient's –NdYAG Laser - CO_2 laser – semiconductor laser – Optical fibre – Total internal reflection – propagation of light – Numerical Aperture and Acceptance angle – Fiber optic communication system – Endoscopy.

UNIT II	**ELECTRICAL PROPERTIES OF MATERIALS**	**6**

Classical free electron theory - Expression for electrical conductivity and Thermal conductivity, Wiedemann-Franz law – Success and failures - Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Band theory of solids - Electron effective mass – concept of hole.

UNIT III	SEMICONDUCTING MATERIALS	6
Semiconductors –direct and indirect band gap semiconductors – Intrinsic semiconductors Carrier concentration, band gap in intrinsic semiconductors – extrinsic semiconductors - N-type & P-type semiconductors – Variation of carrier concentration and Fermi level with temperature - Hall effect - measurement of Hall coefficient – applications		
UNIT IV	**THERMAL, ACOUSTIC AND OPITICAL EFFECT IN BUILDINGS**	**6**
Thermal comfort - factors affecting the thermal performance of buildings - thermal insulation and its benefits – Reverberation time – Sabine's formula (Qualitative) - Sound absorbing materials - factors affecting acoustics of buildings and their remedies – Day- light design of windows, measurement of day-light - artificial lighting - Green building – features – benefits.		
UNIT V	**ADVANCED ENGINEERING MATERIALS**	**6**
Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Properties - Nanomaterials– structural and design applications.		
		TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1:	Recall the basic concepts of light, electron transport properties of conductors and basic principles of semiconductors
CO2:	List the factors affecting the buildings and the principles of advanced engineering materials
CO3:	Illustrate laser and fibre optics, classical and quantum concepts of conducting materials, physics of semiconducting materials
CO4:	Explain the impact of heat, sound and light in buildings and functioning of smart materials
CO5:	Develop the applications of optics, fibre optics, moduli of elasticity and thermal energy, behavior of conductors, semiconductors and advanced engineering materials and also the influence of various factors in building constructions.

TEXT BOOKS:

1.	Gaur R.K. and Gupta S.L., "Engineering Physics". Dhanpat Rai publishers, 2016.
2.	Kasap,S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2017.

REFERENCES:

1.	Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
2.	Budinski, K.G. & Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.
3.	Jadhav, Nilesh Y. 'Green and Smart buildings' Springer, 2016
4.	Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.
5.	Kittel, C. Introduction to Solid State Physics. Wiley, 2017.

LIST OF EXPERIMENTS	
1	Uniform bending – Determination of Young's modulus
2	Air-wedge – Thickness of thin wire
3	Spectrometer – Grating
4	LASER – Wavelength and particle size determination
5	Optical fibre – Acceptance angle and Numerical aperture
6	Band gap determination
	TOTAL:30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO5	3	3	-	-	-	-	-	-	2	1	-	1	-	1	-
CO	2	1	-	-	-	-	-	-	2	1	-	1	-	1	-

Table of specification for end semester question paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand** (Un)	**Apply** (Ap)	**Analyse(An) Evaluate(Ev)**
			No. of Qns. (marks) and CO			
Unit I - Photonics	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)- CO5	-
Unit II - Electrical Properties of Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
Unit III - Semiconducting Materials	2	1 either or	2(2)- CO1	-	1 either or (16)- CO5	-
Unit Iv - Thermal, Acoustic and Opitical Effect in Buildings	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
Unit V - Advanced Engineering Materials	2	1 either or	2(2)-CO2	-	1 either or (16)- CO5	-
Total Qns. Physics for Civil Engineers	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for COs					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	8	6	20	18	48
Weightage	8%	6%	20%	18%	48%

CH22201	ENVIRONMENT AND SUSTAINABILITY	L	T	P	C
		2	0	2	3

COURSEOBJECTIVES:

- To understand the concept of ecosystem and biodiversity
- To conversant with various types of pollution and its effects
- To obtain knowledge on natural resources and its exploitation
- To understand the social issues related to environment and methods to protect
- To gain knowledge on sustainability and environment

UNITI	ECOSYSTEM AND BIODIVERSITY	6

Environment – Ecosytem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web – Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.

UNIT II	NATURAL RESOURCES	6

Introduction – Forest resources – Uses and Overexploitation - Deforestation – causes and consequences – Water resources – effect of over utilisation of water – Food resources – Impacts of modern agriculture (pesticides, fertilizers, water logging, salinity) – Sustainable Energy resources – Wind, Solar, hydroelectric power, geothermal – Land resources – Desertification, soil erosion – Role of an individual in the conservation of natural resources.

Case study – Deforestation, water conflicts, fertilizer and pesticide problem.

UNIT III	ENVIRONMENTAL POLLUTION AND MANAGEMENT	7

Definition, causes, effects and control measures of air pollution, water pollution, noise pollution, thermal pollution and marine pollution – Waste water treatment - Waste management – solid waste, biowaste, e-waste - Disaster management – Flood, cyclone, earthquake

UNIT IV	SOCIAL ISSUES AND HUMAN HEALTH	6

Population explosion and its effects on environment — variation of population among nations - Environmental issues and Human health – Food adulteration – Risk of food adulteration – Detection and prevention of food adulteration - COVID-19 – Human rights – Value education

UNIT V	SUSTAINABLE DEVELOPMENT AND ENVIRONMENT	5

Sustainable development – needs and challenges — Goals – Aspects of sustainable development – Assessment of sustainability - Environmental ethics – Green chemistry – Eco mark, Eco products – EIA – Regional and local environmental issues and possible solutions - Role of engineering in environment and human health

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1:	Recall the basic concepts of environment and sustainable development
CO2:	Summarize the types of pollution, various natural resources and food adulterants
CO3:	Explain the methods for waste management and detection of adulterants

CO4:	Apply the gained knowledge to overcome various issues related to health and environment
CO5:	Identify suitable methods for local environmental issues and sustainability
TEXT BOOKS:	
1.	Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, New Delhi, 2017.
2.	Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2ndEdition, Pearson Education, 2015.
REFERENCES:	
1.	Erach Bharucha, "Text book of Environmental studies" Universities Press (I) PVT LTD, Hyderabad, 2015.
2.	Rajagopalan. R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 2015.
3.	G. Tyler Miller and Scott E. Spoolman, —"Environmental Science", Cengage Learning India PVT LTD, 2014.
4.	Ruth F. Weiner and Robin A. Matthews. Butterworth, "Environmental Engineering", Heineman Publications, 4th Edition.
5.	Dash M.C, "Concepts of Environmental Management for Sustainable Development", Wiley Publications, 2019.
LIST OF EXPERIMENTS	
1.	Determination of DO content of waste water sample (Winkler's method).
2.	Determination of chloride content of water sample by Argentometric method
3.	Estimation of copper content in water by Iodometry.
4.	Determination of Ca / Mg in waste water sample
5.	Detection of adulterant in ghee/edible oil/coconut oil.
6.	Detection of adulterant in sugar/honey/chilli powder.
	TOTAL:30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
CO2	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
CO3	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
CO4	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
CO5	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1
CO	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit I – Ecosystem and Biodiversity	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)- CO4	-
Unit II – Natural Resources	2	1 either or	1(2)-CO1	1(2)- CO2	1 either or (16)- CO4	-
Unit III – Environmental Pollution and Management	2	1 either or	-	1(2)- CO2 1(2)- CO3 1 either or (16)- CO3	-	-
Unit IV – Social Issues and Human Health	2	1 either or	-	1(2)- CO2 1(2)- CO3	1 either or (16)- CO4	-
Unit V – Sustainable Development And Environment	2	1 either or	2(2)-CO1	-	1 either or (16)- CO5	-
Total Qns. Environment and Sustainability	10	5 either or	4 (2)	6 (2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	8	28	64	-
Weightage	20%	80%	8%	28%	64%	-

Weightage for COs					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	8	8	20	48	16
Weightage	8%	8%	20%	48%	16%

CE22202	**BUILDING MATERIALS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES

- To assess the strength of various materials experimentally
- To apply the concepts of mechanics of materials to determine the behaviour of materials under load

LIST OF EXPERIMENTS

1. Determination of Grading of fine aggregates using sieve analysis.
2. Determination of specific gravity of fine and coarse aggregates.
3. Determination of compacted and loose bulk density of fine aggregate.
4. Determination of impact value of coarse aggregate.
5. Determination of elongation and flakiness index of coarse aggregate.
6. Determination of normal consistency of cement.
7. Determination of initial and final setting time of cement.
8. Determination of soundness of cement.
9. Determination of compressive strength of bricks and blocks.
10. Determination of water absorption of bricks and blocks.
11. Determination of ductility grade and tensile strength of bitumen using ductility test.
12. Determination of viscosity of bitumen.

TOTAL PERIODS: 60

COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Choose a testing method for a particular material
CO2:	Demonstrate experiments as per standard codes
CO3:	Study the behaviour of material properties experimentally
CO4:	Interpret the properties of construction materials
CO5:	Evaluate the strength of building materials
REFERENCE BOOKS	
1	IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by dry sieving.
2	IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete.
3	IS 383– 1970 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.
4	Construction Materials Laboratory Manual, Anna University, Chennai-600 025.
5	National Building Code of India, Part V, "Building Materials", 2016.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	2	2	3	2	2	2	2	2	2	-	3	-	2
CO2	2	2	1	2	1	2	2	2	1	2	1	1	3	-	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2	3	-	2
CO4	3	2	1	2	3	2	-	-	-	-	2	3	3	-	2
CO5	3	2	1	2	3	2	-	-	-	-	3	3	3	-	2
CO	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	3	-	2

ES22203	**ENGINEERING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
COURSE OBJECTIVES					
The main learning objective of this course is to prepare the students for					
• Drawing pipeline plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.					
• Wiring various electrical joints in common household electrical wirework.					

• Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.		
• Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.		
GROUP - A (CIVIL & MECHANICAL)		
PART I	**CIVIL ENGINEERING PRACTICES**	**15**
PLUMBING WORK	❖ Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.	
	❖ Preparing plumbing line sketches.	
	❖ Laying pipe connection to the suction side of a pump	
	❖ Laying pipe connection to the delivery side of a pump.	
	❖ Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.	
WOOD WORK	❖ Sawing	
	❖ Planning	
	❖ Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.	
PART II	**MECHANICAL ENGINEERING PRACTICES**	**15**
WELDING WORK	❖ Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.	
	❖ Practicing gas welding.	
BASIC MACHINING WORK	❖ Perform turning operation in the given work piece.	
	❖ Perform drilling operation in the given work piece.	
	❖ Performing tapping operation in the given work piece.	
ASSEMBLY WORK	❖ Assembling a centrifugal pump.	
	❖ Assembling a household mixer.	
SHEET METAL WORK	❖ Making of a square tray	
GROUP - B (ELECTRICAL AND ELECTRONICS)		
PART-I	**ELECTRICAL ENGINEERING PRACTICES**	**15**
❖ One lamp controlled by one switch.		
❖ Series and parallel wiring.		
❖ Staircase wiring.		
❖ Fluorescent Lamp wiring.		
❖ Residential wiring		
❖ Iron Box wiring and assembly.		

PART-II	ELECTRONIC ENGINEERING PRACTICES	15
❖ Introduction to electronic components and equipment's		
❖ Calculation of resistance using colour coding		
❖ Verify the logic gates AND, OR, EX-OR and NOT.		
❖ Measurement of AC signal parameters using CRO		
❖ Soldering simple electronic circuits on a small PCB and checking continuity.		
TOTAL PERIOD: 60		

COURSE OUTCOMES	
At the end of the course the students will be able to	
CO1:	Prepare various pipe and furniture fittings used in common household
CO2:	Perform the given metal joining and metal removal operation in the given work piece as per the dimensions
CO3:	Apply the fundamental concepts involved in Electrical Engineering
CO4:	Explain the basic electrical wiring procedures
CO5:	Assemble basic electronic components

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO2	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO3	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO4	2	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO5	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-

GE3152	**HERITAGE OF TAMIL**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

COURSE OBJECTIVES:		
• To help students understand the values of Tamil Language, basic language families in India and types of Tamil literature.		
• To facilitate the students to understand Tamil heritage of rock arts, paintings and musical instruments in their economic life.		
• To facilitate the students in understanding the harmony existing in Tamils martial arts.		
• To create an awareness on concept of Thinai Tamils and its values.		
• To understand the contribution and Influence of Tamils in Indian culture.		
UNIT I	**LANGUAGE AND LITERATURE**	**3**

Environment – Ecosytem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web –. Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.		
UNIT II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**3**
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**	**3**
Therukoothu, Karagattam - Villu Pattu - Kaniyan Koothu – Oyillattam - Leather puppetry- Silambattam – Valari - Tiger dance - Sports and Games of Tamils.		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**3**
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**	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
		TOTAL: 15 PERIODS

COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Describe the importance of Tamil Language and types of Tamil literature.
CO2:	Illustrate their knowledge in rock art paintings to modern art.
CO3:	Demonstrate a strong foundational knowledge in martial arts.
CO4:	Explain the concept of Thinai Tamils and its values
CO5:	Describe the contribution of Tamils in Indian culture.

TEXT & REFERENCE BOOKS:

1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியல் பணிகள் கழகம்.
2.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
3.	Dr.S.Singaravelu, "Social Life of the Tamils - The Classical Period", International Institute of Tamil Studies.
4.	Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, "Historical Heritage of the Tamils", International Institute of Tamil Studies.
5.	Dr.M.Valarmathi, " The Contributions of the Tamils to Indian Culture", International Institute of Tamil Studies.
6.	Dr.K.K.Pillay, "Studies in the History of India with Special Reference to Tamil Nadu".

GE3152	தமிழர் மரபு	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- தமிழ் மொழியின் மதிப்புகள், இந்தியாவில் உள்ள அடிப்படை மொழிக்குடும்பங்கள் மற்றும் தமிழ் இலக்கிய வகைகளை மாணவர்கள் புரிந்துகொள்ள உதவுதல்.
- மாணவர்கள் பாறை ஓவியங்கள், சிற்பக்கலைகள் மற்றும் இசைக்கருவிகளின் வழி தமிழ் பாரம்பரியத்தைப் புரிந்துகொள்ள வசதி செய்தல்
- தமிழர்களின் கலை மற்றும் வீர விளையாட்டுகளைப் புரிந்து கொள்வதற்கு மாணவர்களுக்கு உதவுதல்.
- தமிழர்களின் திணைக் கருத்துக்கள் மற்றும் அவர்களின் வாழ்க்கை நெறிகளைப் பற்றி மாணவர்களுக்கு விழிப்புணர்வை ஏற்படுத்துதல்
- இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பையும் அதன் தாக்கத்தையும் மாணவர்கள் புரிந்துகொள்ள செய்தல்.

UNIT I	மொழி மற்றும் இலக்கியம்	3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

UNIT II	மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை.	3

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

UNIT III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுக்கள்.

UNIT IV	தமிழர்களின் திணைக் கோட்பாடுகள்.	3

துமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு	3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

இப்பாடத் திட்டத்தின் மூலம் மாணவர்கள் பெறும் பயன்கள்:

CO1:	தமிழ் மொழியின் முக்கியத்துவம் மற்றும் இலக்கிய வகைகளை விவரிக்க முடியும்.
CO2:	பாறை ஓவியங்கள் முதல் நவீன கலைகள் வரை அவர்களின் அறிவை விவரிக்க

	முடியும்.
CO3:	தற்காப்புக் கலைகளின் வலுவான அடித்தள அறிவை விவரிக்க முடியும்.
CO4:	தமிழர்களின் திணைக் கருத்துக்கள் மற்றும் அதன் மதிப்புகளை விளக்க முடியும்.
CO5:	இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பை விவரிக்க இயலும்.

TEXT & REFERENCE BOOKS:

1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியல் பணிகள் கழகம்.
2.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
3.	Dr.S.Singaravelu, "Social Life of the Tamils - The Classical Period", International Institute of Tamil Studies.
4.	Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, "Historical Heritage of the Tamils", International Institute of Tamil Studies.
5.	Dr.M.Valarmathi, " The Contributions of the Tamils to Indian Culture", International Institute of Tamil Studies.
6.	Dr.K.K.Pillay, "Studies in the History of India with Special Reference to Tamil Nadu".

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand** (Un)	**Apply** (Ap)	**Analyse(An) Evaluate(Ev)**
			No. of Qns. (marks) and CO			
Unit-I: Language and Literature	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Heritage - Rock Art Paintings to Modern Art – Sculpture	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-
Unit-III: Folk and Martial Arts	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Thinai Concept of Tamils	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Contribution of Tamils to Indian National Movement and Indian	2	1 either or	1(2)-CO5	1(2)-CO5 1either or (16)- CO5	-	-

Culture						
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-
Weightage	20%	80%	14%	86%	-	-

Weightage for COs					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

SEMESTER III

MA22304	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis this is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To familiarize the basic concepts of Laplace transform and inverse Laplace transform techniques used in wide variety of situations

UNIT I	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**

Degree and order of partial differential equations -First order linear partial differential equations -Lagrange's linear equation: Method of grouping and method of multipliers - Homogeneous linear partial differential equations of second and higher order with constant coefficients with functions$e^{ax+by}, \sin(ax+by), \cos(ax+by)$.

UNIT II	**FOURIER SERIES**	**12**

Conditions for a Fourier expansion: Dirichlet's conditions –Fourier series - Euler's Formulae– General Fourier series for functions of polynomials in the interval $(0,2\pi)$ and $(0,2l)$ - Functions having points of continuity and discontinuity - Half range series: Half range sine and cosine series (polynomials only) – Root mean square value.

UNIT III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**

Classification of PDE of second order – One-dimensional wave equation: Fourier series solutions of one-dimensional wave equation with zero initial velocity– Fourier series solutions of one-dimensional wave equation with zero initial displacement - One dimensional equation of heat conduction – Steady state conditions with zero boundary conditions.

UNIT IV	**LAPLACE TRANSFORM**	**12**

Definition of the Laplace Transform -Existence conditions – Transforms of elementary functions$t^n, e^{at}, e^{-at}, sinat, cosat, sinhat, coshat$ – Transform of unit step function and unit

impulse function – Basic properties : Linear, Change of scale, First Shifting theorem (Statement only) –Problems based on properties- Differentiation of Transform:$L[t\,f(t)]$- Integration of Transform: $L\left[\frac{f(t)}{t}\right]$– Initial and final value theorems(Statement only)– Problems based on Initial and final value theorems - Laplace Transform of periodic functions.		
UNIT V	**INVERSE LAPLACE TRANSFORM**	**12**
Inverse Laplace Transform– Inverse Laplace Transform of elementary functions – Basic properties: Linear, First Shifting theorem, Change of scale (Statement only) - Problems based on properties - Convolution theorem(Statement only) – Inverse Laplace Transform using Convolution theorem.		
	TOTAL: 60 PERIODS	
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Solve the standard partial differential equations.	
CO2:	Find the Fourier series for periodic functions.	
CO3:	Apply Fourier series in one dimensional heat and wave equations.	
CO4:	Determine the Laplace transforms for functions.	
CO5:	Apply inverse Laplace transforms in engineering fields.	
TEXT BOOKS:		
1.	Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi,2018.	
2.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,New Delhi, 2018.	
REFERENCES:		
1.	James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.	
2.	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.	
3.	Srimanta Pal, Suboth C. Bhunia, " Engineering Mathematics", Oxford University Press, New Delhi, 2015,	
4.	R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics" 5th Edition, Narosa Publishing House Pvt.Ltd. New Delhi, 2016.	
5.	Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.	

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-

CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Partial Differential Equations	2	1 either or	2(2) –CO1	1 either or (16) – CO1	-	-
Unit-II: Fourier Series	2	1 either or	2(2) - CO2	1 either or (16) — CO2	-	-
Unit-III: Applications Of Partial Differential Equations	2	1 either or	1(2) — CO3	1(2) — CO3	1 either or (16) — CO3	-
Unit-IV: Fourier Transforms	2	1 either or	1(2) - CO4	1(2) — CO4	1 either or (16) — CO4	-
Unit-V: Z-Transforms And Difference Equations	2	1 either or	1(2) – CO5	1(2) — CO5	1 either or (16) — CO5	-
Total Qns. Transforms Techniques And Partial Differential Equations	10	1 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

CE22301	STRENGTH OF MATERIALS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- This course imparts knowledge about stresses, strains, shear force, bending moment, slope and deflection in beams, concept of torsion in circular shaft and theory of columns.

UNIT I	STRESSES AND STRAIN	12

Types of loads –Types of Stresses and strains – Stress, strain diagram for mild steel – Elastic limit – Hooke‘s law – Poisson‘s ratio – Factors of safety – Elastic constants – Young‘s modulus –Shear modulus–Bulk modulus–Thermal stresses– Deformation of simple and compound bars.

UNIT II	SHEAR FORCE AND BENDING MOMENTS IN BEAMS	12

Types of beams, supports and loads– Bending moment and Shear force– Point of contra flexure– Clockwise and anti-clockwise moments– Shearforce and bending moment diagrams for beams subjected to different loads and Couples. Calculation of shear stress and bending stress of beams of various sections.

UNIT III	DEFLECTION OF BEAMS	12

Beam Deflection – Slope –Macaulay‘s Method –Mohr‘s Theorems – Moment area method – Conjugate beam theorems – Conjugate beam method.

UNIT IV	THEORY OF COLUMN AND TORSION	12
Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations – Rankine – Gordon formula – Simple torsion –Torsion equation for circular shafts and hollow circular shafts – Assumptions – Torsional rigidity – Power transmission – Modulus of rupture.		
UNIT V	**ANALYSIS OF TRUSSES**	**12**
Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient method.		
		TOTAL: 60 PERIODS

COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	State the theory of stress, strain, forces, moment, torsion and deflection.
CO2:	Explain the concept of simple bending and theory of column and torsion.
CO3:	Draw shear force and bending moment diagram for beams.
CO4:	Compute Shear stress, bending stress, elastic constants, deflection of beams and stresses in thin cylinder.
CO5:	Determine torsional behavior of shaft and forces in determinate trusses.
TEXT BOOKS:	
1.	Rajput R.K., "Strength of Materials", 7th Edition, S. Chand & Company Ltd, New Delhi, 2018.
2.	Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
REFERENCES:	
1.	Subramanian R., "Strength of Materials", 2nd Edition, Oxford University Press, 2014.
2.	R K Bansal, "A text book of Strength of Materials", Lakshmi Publications (P) Limited, New Delhi, Sixth Edition, 2018.
3.	Singh D.K "Mechanics of Solids" Pearson Education 2012.
4.	Ferdinand Pierre Beer, Elwood Russell Johnston, John T. De Wolf and David Francis Mazurek, "Mechanics of Materials", 7th Edition, McGrawHill Education, 2015.
5.	Srinath, L.S, "Advanced mechanics and solids", Tata-McGraw Hill publishing company ltd, 2005.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	1	-	-	-	-	2	1	-	3	2	-	1
CO2	3	2	2	2	-	-	-	-	2	1	2	3	3	-	1
CO3	3	3	3	3	-	-	-	2	2	2	2	3	3	-	2

CO4	3	3	3	3	-	-	-	-	2	3	2	3	3	-	2
CO5	3	3	3	2	-	-	-	-	2	2	1	3	3	-	2
CO	3	3	3	2	-	-	-	2	2	2	2	3	3	-	1

Table of specification for end semester question paper

Unit No. And Title	Total 2 Marks qns.	Total 16 Marks qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. Of Qns. (Marks) And CO			
Unit-I: Stresses and Strain	2	1 Either Or	2(2) –CO1	-	1 Either Or (16) – CO3	-
Unit-II: Shear Force and Bending Moments in Beams	2	I Either Or	2(2) –CO1	-	1 Either Or (16) — CO5	-
Unit-III: Deflection of Beams and Thin Cylinder	2	1 Either Or	1(2) — CO1	1(2) — CO3	1Either Or (16) — CO3	-
Unit-IV: Theory of Column and Torsion	2	I Either Or	I(2) –CO1	1(2) — CO4 1 Either Or (16) — CO2	-	-
Unit-V: Analysis of Trusses	2	1 Either Or	2(2) – CO5	-	1 Either Or (16) — CO4	-
Total Qns. Strength of Materials	10	5 Either Or	8(2)	2(2) 1 Either Or (16)	4 Either Or (16)	-
Total Marks	20	80	16	20	64	-
Weightage	20%	80%	16%	20%	64%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	12	16	34	18	20
Weightage	12%	16%	34%	18%	20%

CE22302	**SOIL MECHANICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To impart knowledge on engineering behaviour and performance of soil. At the end of this course student attains adequate knowledge in assessing the physical, engineering, and compaction and strength properties of soils.

UNIT I	**BASIC PROPERTIES OF SOILS**	**9**

Soil formation – Soil problems in Engineering – Physical properties of soil – Phase relations – Index properties of soil –Grain size distribution – Atterberg limits – Soil classification-different methods- their significance – BIS classification system – Field identification – Simple tests.

UNIT II	**STRESSES IN SOILS**	**9**

Soil water statics – Concept of effective and neutral stresses – Capillary phenomenon – Vertical stress distribution in soils – Boussinesq equation – Line load – Uniformly distributed loads – New marks chart – Construction and use –Approximate methods – Pressure bulb – Westergaards

equation.		
UNIT III	**PERMEABILITY AND SEEPAGE**	**9**
One dimensional flow through soil – permeability – Darcy‘s law – field and laboratory permeability tests – Flow through stratified soil – Seepage pressure – Quick sand condition – Soil liquefaction – Two dimensional flow – Laplace equation – Electrical analogy – Flow net – Methods of construction – Properties – Applications – Phreatic line.		
UNIT IV	**COMPACTION AND CONSOLIDATION**	**9**
Compaction – Factors affecting compaction – Laboratory and Field compaction methods – Compaction control. Consolidation – Consolidation settlement – Laboratory test – Determination of C_v by curve fitting methods – Terzaghi’s one dimensional consolidation — Normally, over, under consolidated clay – Pre consolidation pressure – e- log p curve.		
UNIT V	**SHEAR STRENGTH**	**9**
Shear strength of soil – Importance and use – Mohr – Coulomb‘s theory – Factors affecting the shear strength – Laboratory test – Direct shear test – Triaxial compression test – Triaxial tests based on drainage conditions – Cyclic loading – Pore pressure parameters – UCC test – Vane shear test – Insitu vane shear test.		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	State the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation	
CO2:	Demonstrate the flow through soil medium and its impact in engineering solution	
CO3:	Identify various types of soils and its properties, formulate and solve engineering Problems	
CO4:	Determine the stress, permeability, compaction and consolidation of soil.	
CO5:	Compute the shear strength of soils using laboratory test methods.	
TEXT BOOKS:		
1.	Murthy, V.N.S., “Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi. 2015.	
2.	Gopal Ranjan and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age Ltd. International Publisher New Delhi (India) 2006.	
REFERENCES:		
1.	McCarthy, D.F., “Essentials of Soil Mechanics and Foundations”. Prentice-Hall, 2006.	
2.	Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt.Ltd. New Delhi, 2010.	
3.	Das, B.M., “Principles of Geotechnical Engineering”. Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.	
4.	Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 2005.	

5.	Venkatramaiah.C., Geotechnical Engineering, New Age International Pvt. Ltd., New Delhi, 2017.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	1	1	-	-	-	-	-	-	2	3	-	1	2
CO2	3	2	2	2	-	2	2	-	-	2	2	3	-	2	2
CO3	3	3	2	2	2	-	2	2	-	1	-	3	-	2	2
CO4	3	3	3	2	2	-	-	-	-	2	-	3	-	2	2
CO5	3	3	2	2	-	-	-	-	-	1	-	3	-	2	2
CO	3	3	2	2	2	2	2	2	-	2	2	3	-	2	2

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Basic Properties of Soils	2	1 either or	2(2) –CO1		1 either or (16) – CO3	-
Unit-II: Stresses in Soils	2	I either or	2(2) – CO1	1 either or (16) — CO2	-	-
Unit-III: Permeability and Seepage	2	1 either or	1(2) — CO3	1(2) — CO3	1 either or (16) — CO3	-
Unit-IV: Compaction and Consolidation	2	1 either or	1(2) –CO1	1(2) — CO4	1 either or (16) — CO4	-
Unit-V: Shear Strength	2	1 either or	I(2) – CO5	1(2) — CO5	1 either or (16) — CO5	-
Total Qns. Soil Mechanics	10	5 either or	7(2)	3(2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	14	22	64	-
Weightage	20%	80%	14%	22%	64%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	10	16	36	18	20
Weightage	10%	16%	36%	18%	20%

CE22303	SURVEYING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To introduce the principles of plane and geodetic surveying and to learn the various methods of plane and geodetic surveying to solve the real world problems.

UNIT I	INTRODUCTION	9

Surveying definition – Classification - Principles of surveying - Plans and maps - Scales - Distances and direction: Distance measurement – Use of chain and tape, Electronic distance measurements – Bearings - Computation of angles - Compass surveying - Local attraction - Calculation of corrected angles and bearings.

UNIT II	LEVELLING	9

Definition - Methods of leveling - Levelling instruments - Temporary adjustments of a level – Terms and abbreviations - Differential leveling - Height of instrument method - Rise and fall method - Profile leveling - contouring – methods – characteristics and uses of contours.

UNIT III	THEODOLITE AND TACHEOMETRIC SURVEYING	9

Theodolite: Introduction, The essentials of transit theodolite - Definitions and terms – Temporary adjustments - Measurement of horizontal and vertical angles - Sources of errors in theodolite work.

Tacheometric Surveying: Stadia and tangential methods of Tacheometry - Distance and Elevation formulae for Staff vertical position.

UNIT IV	MODERN SURVEYING	9

Total Station: Fundamental quantities measured – Parts and accessories – Working principle – Field procedure – Errors and Good practices

GPS Surveying: Different segments –Satellite configuration – Signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability – Hand Held and Geodetic receivers – Data processing – Traversing and triangulation - Drone surveying.

UNIT V	MISCELLANEOUS	9

Curves - Simple curves – Compound and reverse curves – Transition curves - Vertical curves Astronomical Surveying –Astronomical terms and definitions – Celestial coordinate systems – Different time systems – Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

Chain Surveying

1. Study of chains and its accessories, Aligning, Ranging, Chaining, Marking Perpendicular offset and Setting out of Foundation

Compass Surveying

2. Compass Traversing – Measuring Bearings & arriving included angles

Levelling

3. Fly leveling and Check levelling using a Dumpy level &Tilting level.

Theodolite

4. Measurements of horizontal angles by reiteration and repetition and vertical angles.
5. Determination of elevation of an object using the single plane method when base is accessible/ inaccessible.

Tacheometry

6. Determination of Tacheometric Constants.
7. Heights and distances by stadia Tacheometry.

Total Station

8. Study of Total Station, Measuring Horizontal and vertical angles, distance and difference in elevation.	
TOTAL: 30 PERIODS	
TOTAL(T + P) : 75 hours	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Define the basics and principles of conventional and modern surveying.
CO2:	Describe the principles of surveying and the working of surveying instruments.
CO3:	Compute the bearings, levels, distances, latitude and longitude.
CO4:	Apply the principle of surveying in the field to determine azimuth and corrected values from the observed error.
CO5:	Make use of total station, GPS and drone for surveying.
TEXT BOOKS:	
1.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
2.	T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 2008.
REFERENCES:	
1.	R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2.	James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001.
3.	Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.
4.	S. K. Roy, Fundamentals of Surveying, Second Edition, Prenticeˆ Hall of India2010.
5.	K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	-	-	-	1	-	-	-	-	-	2	1	2	-	1
CO2	3	-	-	1	2	2	-	-	2	2	2	2	2	-	1
CO3	3	2	2	2	3	2	-	-	2	1	2	2	3	-	1
CO4	3	-	2	3	3	1	-	-	3	-	2	2	2	-	
CO5	3	-	2	3	3	2	-	-	2	-	2	1	3	-	1
CO	3	2	2	2	2	2	-	-	2	2	2	2	2	-	1

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
			No. of Qns. (marks) and CO			
Unit-I: Introduction	2	1 either or	2(2) -CO1	1 either or (16) - CO2	-	-
Unit-II: Levelling	2	I either or	2(2) - CO2	-	1 either or (16) -CO3	-
Unit-III: Theodolite And Tacheometric Surveying	2	1 either or	1(2) - CO1	1(2) — CO3	1 either or (16) - CO3	-
Unit-IV: Modern Surveying	2	1 either or	1(2) – CO1	1(2) — CO4	1 either or (16) - CO4	-
Unit-V: Miscellaneous	2	1 either or	1(2) – CO1	1(2) — CO5	1 either or (16) - CO5	-
Total Qns. Surveying	10	5 either or	7(2)	3(2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	14	22	64	-
Weightage	20%	80%	14%	22%	64%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	10	20	34	18	18
Weightage	10%	20%	34%	18%	18%

CE22304	CONCRETE TECHNOLOGY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To impart knowledge to the students on the properties of materials of concrete.
- Test and mix design for concrete and special concretes.

UNIT I	CONSTITUENT MATERIALS	6

Cement –types – Chemical composition and Properties – Hydration of cement – Tests on cement –Aggregates – Classification –Mechanical properties and tests as per BIS –Water – Quality of water for use in concrete.

UNIT II	CHEMICAL AND MINERAL ADMIXTURES	6

Accelerators – Retarders – Plasticizers – Superplasticizers – Waterproofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolin – Effects on concrete properties.

UNIT III	PROPORTIONING OF CONCRETE MIX	6

Principles of Mix Proportioning – Properties of concrete related to Mix Design – Physical properties of materials required for Mix Design – Design Mix and Nominal Mix – BIS Method of Mix Design –Mix Design Examples.

UNIT IV	FRESH AND HARDENED PROPERTIES OF CONCRETE	6

Workability – Tests for workability of concrete – Segregation and Bleeding – Determination of strength Properties of Hardened concrete – Compressive strength – split tensile strength – Flexural strength – Non-destructive test– durability of concrete– corrosion test.		
UNIT V	**SPECIAL CONCRETES**	**6**
Light weight concrete – foam concrete- self compacting concrete – vacuum concrete – High strength concrete – Fibre reinforced concrete – Ferrocement – Ready mixed concrete –Polymer concrete – High performance concrete – Geopolymer Concrete.		
TOTAL: 30 PERIODS		

LIST OF EXPERIMENTS:

1. Workability of fresh concrete by Compaction Factor test, Slump Test, Vee Bee Consistometer test, flow table test.
2. Compressive strength of Concrete at 7days
3. Split tensile strength of Concrete at 7days
4. Flexural strength of Concrete at 7days
5. Nondestructive testing of concrete (Rebound hammer test, Ultrasonic Pulse Velocity test)
6. Test on self-compacting concrete (L box, V Funnel, J ring)

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1:	List the types of cement, special concretes and properties of fresh and hardened concrete.
CO2:	Demonstrate the properties and types of concrete and its ingredients.
CO3:	Make use of suitable materials, admixtures and mix proportion required for the preparation of concrete.
CO4:	Compute concrete mix design, properties and strength of concrete.
CO5:	Select suitable types of special concretes based on the type of construction.

TEXT BOOKS:

1.	Gupta.B.L.,Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2.	Shetty, M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003.

REFERENCES:

1.	IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.
2.	Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015.
3.	Gambhir.M.L. ConcreteTechnology, Fifth Edition, McGraw Hill Education,2017.
4.	Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2015.
5.	S. S. Bhavikatti, “Concrete Technology”, 2019.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	3	1	2	-	-	3	-	3	3	3	-	3
CO2	3	2	2	3	2	2	1	2	2	-	2	3	3	-	2
CO3	3	3	3	3	3	3	3	2	2	-	3	3	3	-	3
CO4	3	3	3	2	2	2	2	3	2	2	1	3	3	-	2
CO5	3	3	3	2	1	2	2	2	3	2	1	3	3	-	3
CO	3	3	3	3	2	2	2	2	2	2	2	3	3	-	3

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate(Ev)
			No. of Qns.(marks) and CO			
Unit-I: Constituent Materials	2	1 either or	2(2)–CO1	1 either or (16) – CO2	-	-
Unit-II :Chemical And Mineral Admixtures	2	1 either or	2(2)– CO3	1 either or (16) — CO3	-	-
Unit-III: Proportioning Of Concrete Mix	2	1either or	1(2)—CO3 1(2) – CO4	-	1 either or (16)—CO4	-
Unit-IV: Fresh And Hardened Properties Of Concrete	2	1 either or	1(2)–CO1	1(2) — CO4	1 either or (16)—CO2	-
Unit-V: Special Concretes	2	1 either or	1(2)–CO1	1(2) — CO2	1 either or (16)—CO5	-
Total Qns: Concrete Technology	10	5eitheror	8(2)	2(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	16	36	48	-
Weightage	20%	80%	16%	36%	48%	-

Weightage for COs					
	COI	CO2	CO3	CO4	CO5
Total Marks	16	34	28	18	16
Weightage	16%	34%	18%	18%	16%

CE22305	COMPUTER AIDED BUILDING DRAWING	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF DRAWINGS

1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. layout plan
3. Different types of staircases – Dog legged, Open well
4. Steel truss
5. Single and double story residential building.
6. Hostel building
7. Hospital building
8. School building

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1:	Label the plan, elevation and sectional views of the buildings, industrial structures, and framed buildings.
CO2:	Demonstrate the plan of a structure using AutoCAD.
CO3:	Model a building using BIM softwares.
CO4:	Choose AutoCAD for drafting and designing a building.
CO5:	Develop new models using BIM softwares.

TEXT BOOKS:

1.	Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K.Kataria and Sons, 2015.
2.	George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008.

REFERENCES:

1.	Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook:A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 2011.
2.	Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3.	Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
4.	Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.
5.	Ibrahim Zeid, "Mastering CAD/CAM", McGraw Hill, 2nd Edition, 2006.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	3	1	2	2	-	-	-	-	2	3	2	3	3
CO2	3	1	3	1	2	2	-	-	-	-	2	3	2	3	3

CO3	3	2	3	1	3	3	-	-	-	-	3	3	2	3	3
CO4	3	3	3	1	3	3	-	-	-	-	3	3	2	3	3
CO5	3	3	3	1	3	3	1	-	-	-	3	3	2	3	3
CO	3	2	3	1	3	2	1	-	-	2	2	3	2	3	3

SD22301	**CODING SKILLS AND SOFT SKILLS TRAINING – PHASE I**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To make the students to solve basic programming logics.
- To help the students develop logics using decision control statements.
- To make them develop logics using looping statements and arrays.
- To train the students for effective communication and identify the common errors in formal writings.
- To guide and motivate the students for setting their goals with positive thinking.

UNIT I	**FUNDAMENTALS IN PROGRAMMING**	**8**

Output of Programs: I/O Functions, Data types, Constants, Operators – Mathematical Problems – Debugging – Puzzles - Company Specific Programming Examples.

UNIT II	**DECISION CONTROL STATEMENTS**	**8**

Logic Building Using Conditional Control Statements – Output of Programs – Mathematical Problems - Puzzles – Company Specific Programming Examples.

UNIT III	**LOOPING STATEMENTS AND ARRAYS**	**14**

Logic Building Using Looping Statements – Number Programs – Programs on Patterns – Array Programs – Programs on Sorting and Searching - Matrix Programs – Puzzles - Output of Programs - Company Specific Programming Examples.

UNIT IV	**COMMUNICATION IN GENERAL**	**15**

Introduction to communication-Types of communication – Effective Communication-Barriers to communication. Language Study: Vocabulary-Formation of sentences-Sentence and sentence structures-Common errors – Writing paragraphs & essays. Professional writing: Job application &Resume writing.

UNIT V	**PERSONALITY DEVELOPMENT**	**15**

Study of personality & ways to improve. Soft Skills: Self-evaluation / self-awareness – Goal setting and positive thinking – Self-esteem and confidence – Public speaking – Extempore – Body language and Observation skills.

TOTAL: 60 PERIODS

SUGGESTIVE ASSESSMENT METHODS

1. Pre Assessment Test – To check the student's previous knowledge in Programming skills.
2. Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20.

3. Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20.
4. Model Exam for coding skills will be conducted for 100 marks which are then calculated to 20.
5. A test for Communication skills will be conducted for 100 marks which will be then calculated to 40.
6. For assignments, students should attend all the practice tests conducted online on Hacker Rank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks.
7. The total of 100 marks obtained from the tests will be then calculated to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.

COURSE OUTCOMES:

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

CO1:	Solve problems on basic I/O constructs.
CO2:	Develop problem solving skills using decision control statements.
CO3:	Develop logics using looping statements and arrays.
CO4:	Avoid / fix the common errors they commit in academic and professional writings and prepare standard resumes and update the same for future career.
CO5:	Recognize the value of self-evaluation and grow with self-confidence.

TEXT BOOKS:

1.	Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

1.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
2.	Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
3.	E Balagurusamy, "Programming in ANSI C", Eighth edition, McGrawHill Publications, 2019.
4.	S.Sobana, R.Manivannan, G.Immanuel, 'Communication and Soft Skills' VK Publications', 2016.
5.	Zed Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding", Zed Shaw's Hardway Series, 2015.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1

CO2	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO3	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO4	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO5	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1

AC22301	**CONSTITUTION OF INDIA**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**

COURSEOBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I	**INTRODUCTION**	**6**

History of Making of the Indian Constitution - Drafting Committee - Philosophy of the Indian Constitution - Preamble - Salient Features.

UNIT II	**CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES**	**6**

Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - \Right to Freedom of Religion - Cultural and Educational Rights - Fundamental Duties.

UNIT III	**ORGANISATIONS OF GOVERNANCE**	**7**

Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive President - Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges - Qualifications, Powers and Functions.

UNIT IV	**EMERGENCY PROVISIONS**	**4**

Emergency Provisions - National Emergency, President Rule, Financial Emergency.

UNIT V	**LOCAL ADMINISTRATION**	**7**

District's Administration head - Role and Importance -Municipalities - Introduction- Mayor and role of Elected Representative - CEO of Municipal Corporation - Pachayati raj - Introduction - PRI- Zila Pachayat-Elected officials and their roles.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Understand history and philosophy of Indian Constitution.
CO2:	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3:	Understand powers and functions of Indian government.
CO4:	Understand emergency rule.
CO5:	Understand structure and functions of local administration.

TEXT BOOKS:	
1.	Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2.	Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.
REFERENCES:	
1.	Jain M P, Indian Constitution Law, 7th Edn, Lexis Nexis, 2014.
2.	The Constitution of India (Bare Act), Government Publication, 1950.
3.	M.V.Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication, 2005.
4.	Durga Das Basu (DD Basu), "Introduction to the constitution of India", (Student Edition), 19th Edition, Prentice-Hall EEE, 2008.
5.	Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga publication, 2007.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO3	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO4	-	-	-	1	-	-	1	-	1	1	1	1	-	-	-
CO5	-	-	1	-	-	-	1	-	-	1	-	1	-	-	-
CO	-	1	1	1	1	1	1	1	1	1	1	1	-	-	-

HS22301	VALUE EDUCATION – I	L	T	P	C
		1	0	0	1
COURSEOBJECTIVES:					
• To give the students a deeper understanding about the purpose of life.					
• To animate the students to have a noble vision and a right value system for their life.					
• To help the students to set short term and long-term goals in their life.					
UNIT I	**MY LIFE AND MY PLACE IN THE UNIVERSE**				**4**
Value of my life – My Uniqueness, strengths and weakness – My self-esteem and confidence – My identity in the universe.					
UNIT II	**MY LIFE AND THE OTHER**				**4**
Realising the need to relate with other persons and nature – My refined manners and conduct in relationships – Basic communication and relationship skills – Mature relationshipattitudes.					
UNIT III	**MY LIFE IS MY RESPONSIBILITY**				**3**
Personal autonomy – developing a value system and moral reasoning skills – setting goals for life.					
UNIT IV	**UNDERSTANDING MY EDUCATION AND DEVELOPING MATURITY**				**4**

Importance of my Engineering education – Managing emotions - personal problem solving skills.
TOTAL: 15 PERIODS

COURSE OUTCOMES:

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

CO1:	Explain the importance of value based living.
CO2:	Set realistic goals and start working towards them.
CO3:	Apply the interpersonal skills in their personal and professional life.
CO4:	Emerge as responsible citizens with a clear conviction to be a role model in the society.

REFERENCES:

1.	David Brooks. The Social Animal: The Hidden Sources of Love, Character, and Achievement. Random House, 2011.
2.	Mani Jacob. Resource Book for Value Education. Institute of Value Education, 2002.
3.	Eddie de Jong. Goal Setting for Success. CreateSpace Independent Publishing, 2014.
4.	Dr.Abdulkalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO2	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO3	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO4	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-

GE3252	**TAMILS AND TECHNOLOGY**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

COURSE OBJECTIVES:

- To facilitate the students to understand weaving and ceramic technology of sangam Age.k2
- To create an awareness on structural design of Tamils during sangam age.
- To help students to distinguish between all the levels of manufacturing technology in ancient period.
- To understand the ancient Knowledge of agriculture and irrigation technology.
- To enable the students to understand the digitalization of Tamil language.

UNIT I	**WEAVING AND CERAMIC TECHNOLOGY**	**3**

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

UNIT II	**DESIGN AND CONSTRUCTION TECHNOLOGY**	**3**

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**	**3**
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 beats - Archeological evidences - Gem stone types described in Silappathikaram.		
UNIT IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	**3**
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu 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**	**3**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		
TOTAL: 15 PERIODS		

COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Describe the importance of weaving and ceramic technology of sangam Age.
CO2:	Illustrate the knowledge on structural design of Tamils during sangam age.
CO3:	Demonstrate a strong foundational knowledge in manufacturing technology of ancient Tamils.
CO4:	Desck8ribe the importance of ancient agriculture and irrigation technology of Tamils.
CO5:	Explain the concept of digitalization of Tamil language.

TEXT & REFERENCE BOOKS:	
1.	கணிணித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
2.	கீழடி – வைகை நதிக்கரயில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு) / Keeladi - 'Sangam City Civilization on the banks of river Vaigai', Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
3.	பொருநை – ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு) / "Porunai Civilization", Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
4.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
5.	Dr.S.Singaravelu, "Social Life of the Tamils - The Classical Period", International Institute of Tamil Studies.
6.	R.Balakrishnan, "Journey of Civilization Indus to Vaigai", RMRL.

GE3252	**தமிழரும் தொழில் நுட்பமும்**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

COURSE OBJECTIVES:

- சங்க காலத்தின் நெசவு மற்றும் பீங்கான் தொழில் நுட்பத்தை மாணவர்கள் புரிந்துகொள்ள வசதி செய்தல்.

- சங்க காலத் தமிழர்களின் வடிவமைப்பு தொழில்நுட்பம் பற்றிய விழிப்புணர்வை ஏற்படுத்துதல்.
- பண்டைய கால உற்பத்தி தொழில்நுட்பத்தின் அனைத்து நிலைகளையும் வேறுபடுத்தி அறிய மாணவர்களுக்கு உதவுதல்.
- விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் பண்டைய அறிவைப் புரிந்துக் கொள்ள செய்தல்.
- தமிழ் மொழியின் டிஜிட்டல் மயமாக்கல் பற்றிப் புரிந்துக் கொள்ள செய்தல்.

UNIT I	**நெசவு மற்றும் பானைத் தொழில்நுட்பம்**	**3**

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

UNIT II	**வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**	**3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோவில்கள் – மாதிரி கட்டமைப்புகள் கற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.

UNIT III	**உற்பத்தித் தொழில் நுட்பம்**	**3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எ.ஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள்- கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் - எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT IV	**வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்**	**3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்கான வடிவமைக்கபட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

UNIT V	**அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்**	**3**

அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

இப்பாடத் திட்டத்தின் மூலம் மாணவர்கள் பெறும் பயன்கள்:

CO1:	சங்க காலத்தின் நெசவு மற்றும் பீங்கான் தொழில் நுட்பத்தின் முக்கியத்துவத்தை விவரிக்க முடியும்.
CO2:	சங்க காலத் தமிழர்களின் வடிவமைப்பு தொழில்நுட்பம் பற்றிய அறிவை விளக்க முடியும்.
CO3:	பண்டைய தமிழர்களின் உற்பத்தி தொழில்நுட்பம் பற்றிய வலுவான அடித்தள அறிவை வெளிப்படுத்த முடியும்.
CO4:	தமிழர்களின் விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் பண்டைய அறிவை விவரிக்க முடியும்.
CO5:	தமிழ் மொழியின் டிஜிட்டல் மயமாக்கல் பற்றிய கருத்தை விளக்க முடியும்.

TEXT & REFERENCE BOOKS:

1	கணிணித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
2	கீழடி – வைகை நதிக்கரயில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு) / Keeladi - 'Sangam City Civilization on the banks of river Vaigai', Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
3	பொருநை – ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு) / "Porunai Civilization", Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
4	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
5	Dr.S.Singaravelu, "Social Life of the Tamils - The Classical Period", International Institute of Tamil Studies.
6	R.Balakrishnan, "Journey of Civilization Indus to Vaigai", RMRL.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand** (Un)	**Apply** (Ap)	**Analyse(An) Evaluate(Ev)**
			No. of Qns. (marks) and CO			
Unit-I: Weaving and Ceramic Technology	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Design and Construction Technology	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-
Unit-III: Manufacturing Technology	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Agriculture and Irrigation Technology	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Scientific Tamil & Tamil Computing	2	1 either or	1(2)-CO5	1(2)-CO5 1either or (16)- CO5	-	-
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-
Weightage	20%	80%	14%	86%	-	-
Weightage for COs						

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

SEMESTER - IV

CE 22401	STRUCTURAL ANALYSIS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

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

UNIT I	INDETERMINATE FRAMES	12

Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointed frames - rigid frames (Degree of statistical indeterminacy up to two) - Energy and consistent deformation methods.

UNIT II	SLOPE DEFLECTION METHOD	12

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements– Spread sheet.

UNIT III	MOMENT DISTRIBUTION METHOD	12

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Neylor's simplification.

UNIT IV	MOVING LOADS AND INFLUENCE LINES	12

Influence lines for reactions shear force and bending moment in statically determinate structures –Muller Breslau's principle – Influence lines for reactions, shear force and bending moment in continuous beams.

UNIT V	ARCHES AND CABLES	12

Arches as structural forms – Examples of arch structures – Types of arches and cables – Analysis of three hinged, two hinged, parabolic and circular arches – Settlement and temperature effects-analysis of cables with stiffening girder.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1:	Recall the methods of analysing a structure and its basic terms.
CO2:	Interpret the position of shear force and maximum bending moment in the structural elements.
CO3:	Explain the analysing techniques based on its ease and application.

CO4:	Experiment with pin-jointed and rigid jointed indeterminate plane frames using alternate methods.
CO5:	Determine the bending moment, shear force, slope and deflection using alternate methods.
TEXT BOOKS:	
1.	Vaidyanadhan, R and Perumal, P, “Comprehensive Structural Analysis – Vol. 1 & Vol. 2”, Laxmi Publications Pvt. Ltd, New Delhi, 2019.
2.	Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain," Theory of structures", LaxmiPublicationsPvt. Ltd., New Delhi, 2019.
REFERENCES:	
1.	Wang C.K. , “Indeterminate Structural Analysis”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
2.	Reddy. C.S., “Basic Structural Analysis”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.
3.	Ghali.A.,Nebille and Brown. T.G., "Structural Analysis - A unified classical and matrix approach" Sixth Edition, SPON press, New York, 2013.
4.	Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.
5.	BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., NewDelhi, 2013.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	1	-	1	-	-	1	1	-	3	1	1	-
CO2	3	2	1	1	-	1	-	-	1	2	-	3	2	2	-
CO3	3	2	2	2	1	2	-	-	1	2	-	3	2	2	1
CO4	3	1	2	2	1	2	-	-	1	1	-	3	2	2	1
CO5	3	3	3	2	2	2	-	-	1	1	-	3	2	2	1
CO	3	2	2	2	1	2	-	-	1	1	-	3	2	2	1

Table of specification for end semester question paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand (Un)**	**Apply (Ap)**	**Analyse(An) Evaluate(Ev)**
			No. of Qns. (marks) and CO			
Unit-I: Indeterminate Frames	2	1 either or	2(2) –CO1		1 either or (16) – CO4	-
Unit-II: Slope Deflection Method	2	I either or	2(2) – CO1		1 either or (16) — CO5	-
Unit-III: Moment Distribution Method	2	1 either or	1(2) — CO1	1(2) — CO3 I either or	-	-

				(16) — CO2		
Unit-IV: Moving Loads And Influence Lines	2	1 either or	1(2) - CO4	1(2) — CO4 1 either or (16) — CO3		-
Unit-V: Arches And Cables	2	1 either or	1(2) – CO5	1(2) — CO2	1 either or (16) — CO5	-
Total Qns. Structural Analysis	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	10	18	18	20	34
Weightage	10%	16%	18%	20%	20%

CE 22402	**FOUNDATION ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To gain knowledge on field investigation of soil, types of foundation and design based on bearing capacity and settlement.
- To study about the concept of earth pressure and stability of slopes in retaining wall.

UNIT I	**SELECTION OF FOUNDATION AND SOIL EXPLORATION**	**9**

Types of foundation – Requirements of good foundation – Factors governing location and depth — Choice of types of foundation. Soil exploration – Methods – Augering and boring – Wash boring and rotary drilling–Disturbed and undisturbed samples– Samplers – Number and spacing of bore holes – Sounding tests – SPT – SCPT – DCPT – Bore log.

UNIT II	**BEARING CAPACITY**	**9**

Bearing capacity – Terzaghi‘s formula – Types of failure – Effect of water table – Shape of foundation –Inclination of load and eccentricity of load on bearing capacity – BIS formula - Bearing capacity based on N‘ value. Allowable bearing pressure — Plate load test – Seismic consideration in bearing capacity evaluation –methods of improving bearing capacity.

UNIT III	**SETTLEMENT AND DESIGN OF FOUNDATION**	**9**

Settlement – Immediate and time dependent settlements – Differential settlement – Causes – Effect – Control – Permissible settlement – BIS code provisions – Contact pressure distribution – Design – Proportioning – Isolated footing, combined footing and strap footing - raft foundation – Types – Floating foundation.

UNIT IV	**PILE FOUNDATIONS**	**9**

Classification of piles – Functions– Load carrying capacity – Dynamic analysis – Hammers – Static analysis – Pile load test – Capacity from penetration test - Pile group (Feld‘s rule, Converse – Labarre formula and block failure criterion) – Spacing and group action – Efficiency of pile group – Settlement – Negative skin friction –Under reamed pile foundation.

UNIT V	**STABILITY OF SLOPES AND EARTH PRESSURE**	**9**

Stability of slopes – Infinite and finite slopes – Types of failure – Slip circle and Friction circle method – Taylor‘s stability chart. Lateral earth pressure– Rankine‘s theory – Surcharge – Inclined and Stratified backfill – Coulomb‘s theory – Earth pressure on retaining walls of simple configurations- Stability analysis of retaining wall – Drainage of backfill.	
TOTAL: 45 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	List the types of foundations and piles, soil exploration methods, bearing capacity failures and settlement of foundation.
CO2:	Summarize the soil exploration methods, importance of bearing capacity of soil regarding the design of foundation and stability of slopes.
CO3:	Design the footings in soil according to the codal provisions.
CO4:	Identify the factors governing design of foundations and retaining walls.
CO5:	Calculate the stability of pile foundations, slopes and retaining walls.
TEXT BOOKS:	
1.	Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
2.	Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.
REFERENCES:	
1.	Kaniraj, S.R. “Design aids in Soil Mechanics and Foundation Engineering”, Tata McGraw Hill publishing company Ltd., New Delhi, 2014.
2.	Joseph E bowles, “Foundation Analysis and design”, McGraw Hill Education, 5th Edition, 28th August 2015.
3.	IS Code 6403: 1981 (Reaffirmed 1997) “Bearing capacity of shallow foundation”, Bureau of Indian Standards, New Delhi.
4.	IS Code 8009 (Part 1):1976 (Reaffirmed 1998) “Shallow foundations subjected to symmetrical static vertical loads”, Bureau of Indian Standards, New Delhi.
5.	GopalRanjan and A. S. Rao, “Basic and Applied Soil Mechanics”, New Age International Publishers, (2010)

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	-	1	-	-	1	2	-	-	-	-	2	2	-	-
CO2	3	-	2	2	-	-	1	1	-	-	2	3	2	-	-
CO3	3	3	3	2	2	2	2	2	2	1	2	3	2	-	1
CO4	3	3	3	2	2	2	1	-	2	2	1	2	2	-	1

CO5	3	3	2	1	-	2	2	1	-	1	2	1	2	-	1
CO	3	3	2	2	2	2	2	1	2	1	2	2	2	-	1

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Selection of Foundation and Soil Exploration	2	1 either or	2(2) – CO1	1 either or (16) – CO2	-	-
Unit-II: Bearing Capacity	2	I either or	2(2) – CO1	1 either or (16) — CO2	-	-
Unit-III: Settlement and Design of Foundation	2	1 either or	2(2) — CO1	-	1 either or (16) — CO3	-
Unit-IV: Pile Foundations	2	1 either or	2(2) – CO1	-	1 either or (16) — CO4	-
Unit-V: Stability of Slopes And Earth Pressure	2	1 either or	1(2) – CO4	1(2) – CO2	1 either or (16) — CO5	-
Total Qns. Foundation Engineering	10	5 either or	9(2)	1(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	18	34	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	16	34	16	18	16
Weightage	18%	34%	16%	18%	16%

CE 22403	**HIGHWAY AND RAILWAY ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To know about the highway and railway systems of transportation.
- To know about the basic concepts of planning and design of highways and railways.

UNIT I	**HIGHWAY PLANNING AND ALIGNMENT**	**9**

Significance of highway planning – Modal limitations towards sustainability – History of road development in India – Factors influencing highway alignment – Soil suitability analysis – Road ecology – Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads.

UNIT II	**DESIGN OF HIGHWAY ELEMENTS**	**9**

Cross sectional elements – Sight distances - Horizontal curves, superelevation, transition curves, widening of curves – Vertical curves, gradients – Pavement components and their role – Design practice for flexible and rigid pavements (IRC methods only).

UNIT III	**HIGHWAY CONSTRUCTION AND MAINTENANCE**	**9**

Highway construction materials, properties, testing methods – Construction practice of flexible and rigid pavements - Highway drainage – Pavement distress in flexible and rigid pavements - Types of maintenance - Pavement evaluation by deflection measurements – Strengthening of pavements.		
UNIT IV	**RAILWAY PLANNING AND DESIGN**	**9**
Elements of permanent way – Rails, Sleepers, Ballast, Rail fixtures and fastenings, Selection of gauges – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys - Conventional and modern methods – Geometric design of railway, gradient, superelevation, widening of gauge on curves - Points and Crossings.		
UNIT V	**RAILWAY CONSTRUCTION, MAINTENANCE AND OPERATION**	**9**
Earthwork – Stabilization of track on poor soil – Track drainage – Calculation of Materials required for track laying – Construction and maintenance of tracks – Conventional and modern methods - Railway stations and yards - Passenger amenities – Signalling – Urban transportation systems.		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Define the concepts of planning, design and construction of highways and railways.	
CO2:	Describe the planning, design and construction aspects of highways and railways.	
CO3:	Demonstrate the structural components, testings and design aspects of highways and railways.	
CO4:	Make use of conventional and modern methods for construction and maintenance of highways and railways.	
CO5:	Design the geometrics of highways and railways.	
TEXT BOOKS:		
1.	S.K Khanna, and C E G. Justo and A. Veeraragavan, “Highway Engineering”, New Chand and Bros, Roorkee, 10th edition, 2015.	
2.	S C Saxena, S P Arora , "Text Book of Railway Engineering”, Dhanpat Rai Pblications, 2015.	
REFERENCES:		
1.	Kadiyali, L.R., “Principles and Practice of Highway Engineering”, Khanna Publishers Ltd. New Delhi, 2011.	
2.	Satishchandra, Agarwal M M, “Railway Engineering”, Oxford University Press,2010.	
3.	Venkatappa Rao. G, “Principles of Transportation and Highway Engineering”, Tata McGraw Hill Pub.Co, Ltd, New Delhi, 2007.	
4.	Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements (Third Revision), IRC: 37-2012.	
5.	The Indian Road Congress (IRC), Guideline for the Design of Rigid Pavements for Highways, New Delhi, IRC 58-2012.	

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	-	1	2	2	2	2	-	-	-	2	2	2	-	-
CO2	3	1	2	2	2	2	2	2	-	-	2	2	2	-	-
CO3	3	1	2	2	2	2	2	2	-	2	2	2	2	1	-
CO4	3	2	3	2	2	2	2	-	-	-	2	2	2	1	-
CO5	3	3	3	3	2	3	3	3	2	2	2	2	2	1	
CO	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1

Table of specification for end semester question paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
			No. of Qns. (marks) and CO			
Unit-I: Highway Planning and Alignment	2	1 either or	2(2)–CO1	1 either or (16) – CO2	-	-
Unit-II: Design of Highway Elements	2	1 either or	2(2)– CO1	-	1 either or (16) – CO5	-
Unit-III: Highway Construction and Maintenance	2	1 either or	1(2)– CO1	1(2)– CO3, 1 either or (16) – CO3	-	-
Unit-IV: Railway Planning and Design	2	1 either or	1(2)– CO1	1(2) – CO4	1 either or (16) – CO4	-
Unit-V: Railway Construction, Maintenance and Operation	2	1 either or	1(2)–CO1	1(2) – CO5	1 either or (16) – CO5	-
Total Qns. Highway and Railway Engineering	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	14	16	18	18	34
Weightage	14%	16%	18%	18%	34%

CE 22404	FLUID MECHANICS & HYDRAULIC MACHINES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To impart idea about the properties of fluids, concept of control volume, conservation laws, dimensional analysis, hydraulic machines.

UNIT I	FLUID PROPERTIES AND FLOW CHARACTERISTICS	9
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – application of continuity equation, energy equation and momentum equation.		
UNIT II	**FLOW THROUGH CIRCULAR CONDUITS**	**9**
Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – friction factor- commercial pipes- minor losses – Flow through pipes in series and parallel.		
UNIT III	**DIMENSIONAL ANALYSIS**	**9**
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.		
UNIT IV	**TURBINES**	**9**
Classification of Turbines – Pelton wheel – Francis turbine – Kaplan turbine - Specific speed – Characteristic Curves of Turbines Draft tube and cavitation.		
UNIT V	**PUMPS**	**9**
Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump - NPSH - Multistage pumps – Characteristics curve - Reciprocating pumps - Negative slip - Indicator diagrams and its variations – Air vessels - Savings in work done.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	List the fluid properties, its flow, dimensional analysis, and hydraulic machines.	
CO2:	Summarize the characteristics of different turbines and pumps.	
CO3:	Experiment with fluids, its parameters and different hydraulic machines.	
CO4:	Model a prototype using dimensional analysis.	
CO5:	Find the efficiency of hydraulic machines.	
TEXT BOOKS:		
1.	Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.	
2.	ChandramouliP.N.,"Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.	
REFERENCES:		

1.	Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2.	Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3.	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
4.	Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
5.	R. K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2010

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	-	-	1	1	-	-	-	-	2	3	1	1
CO2	3	1	-	-	-	1	1		-	-	-	2	3	1	1
CO3	3	2	-	-	-	1	1	-	-	-	-	2	3	1	1
CO4	3	2	2	-	-	2	1	-	-	-	-	2	3	2	3
CO5	3	2	3	2	1	2	1	-	1	-	-	2	3	3	3
CO	3	2	2	2	1	1	1	-	1	-	-	2	3	2	2

Table of specification for end semester question paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand (Un)**	**Apply (Ap)**	**Analyse (An) Evaluate (Ev)**
			No. of Qns. (marks) and CO			
Unit-I: Fluid Properties And Flow Characteristics	2	1 either or	2(2) –CO1	-	1 either or (16) – CO3	-
Unit-II: Flow Through Circular Conduits	2	1 either or	2(2) – CO1	-	1 either or (16) — CO3	-
Unit-III: Dimensional Analysis	2	1 either or	2(2) –CO1		1 either or (16) – CO4	-
Unit-IV: Turbines	2	1 either or	1(2) – CO1	1(2) –CO2	1 either or (16) – CO5	-
Unit-V: Pumps	2	1 either or	1(2) – CO1	1(2)–CO2 1 either or (16) – CO2	-	-
Total Qns. Fluid Mechanics & Hydraulic Machines	10	5 either or	8(2)	2(2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	16	20	64	-
Weightage	20%	80%	16%	20%	64%	-

Weightage for Cos					
	COI	CO2	CO3	CO4	CO5
Total Marks	16	20	32	16	16
Weightage	16%	20%	20%	20%	20%

CE 22405	ENVIRONMENTAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce students to various components and design of water supply scheme, water treatment methods, water storage distribution system, sewage treatment and disposal and design of intake structures and sewerage system.

UNIT I	WATER SUPPLY	9

Estimation of surface and subsurface water resources - Predicting demand for water – Impurities of water and their significance - Physical, chemical and bacteriological analysis - Standards for potable water - Intake of water: Pumping and gravity schemes.

UNIT II	WATER TREATMENT	9

Objectives - Unit operations and processes - Surface water treatment: Coagulation and flocculation – Clariflocculator - Sand filters – Disinfection - Sub-surface water treatment: Aeration – Softening - Removal of iron and manganese - Defluoridation - Desalination - Advanced water treatment: Membrane filtration, Reverse Osmosis - Residue Management.

UNIT III	WATER STORAGE AND DISTRIBUTION	9

Storage and balancing reservoirs - Types, location and capacity - Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters - Analysis of distribution systems - Leak detection - Maintenance of distribution systems - House service connections.

UNIT IV	PLANNING AND DESIGN OF SEWERAGE SYSTEM	9

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design – Storm drainage - Storm runoff estimation - Sewer appurtenances - Corrosion in sewers – Prevention and control – Sewage pumping - Drainage in buildings - Plumbing systems for drainage.

UNIT V	SEWAGE TREATMENT AND DISPOSAL	9

Objectives - Septic tanks - Layout of treatment plants - Biological treatment system of waste water - Suspended growth process - Attached growth process - Trickling filter – Waste Stabilization Ponds - Advanced wastewater treatment techniques - Anaerobic treatment of wastewater - Reclamation and Reuse of sewage - Sludge treatment - Disposal of sludge.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Outline the fundamentals of water supply and sewerage system.
CO2:	Explain the properties, standards and treatment process available for water and wastewater.
CO3:	Identify a suitable treatment method for water supply and sewage disposal.

CO4:	Plan a water distribution and sewage disposal system for a community.
CO5:	Design a water treatment and disposal system.
TEXT BOOKS:	
1.	Garg, S.K., Environmental Engineering, Vol. I & II, Khanna Publishers, New Delhi, 2010.
2.	Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.
REFERENCES:	
1.	Punmia B.C, Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
2.	Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3.	Syed R. Qasimand Edward, M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
4.	Metcalf and Eddy – Waste water Engineering – Treatment and Reuse, Tata Mc. Graw – Hill Company, New Delhi, 2010.
5.	N NBasak, Environmental Engineering, McGraw Hill Education (1 July 2017).

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	1	-	2	2	-	-	-	-	2	2	1	1
CO2	3	1	-	1	-	2	2	-	-	-	-	1	2	1	1
CO3	3	2	-	2	-	2	2	-	-	-	-	1	3	2	1
CO4	3	2	-	2	-	2	2	-	-	-	-	1	3	3	2
CO5	3	2	3	2	-	2	2	1	-	-	-	1	3	3	3
CO	3	2	3	2	-	2	2	1	-	-	-	1	3	2	2

Table of specification for end semester question paper

Unit No. and Title	**Total 2 Marks Qns.**	**Total 16 Marks Qns.**	**Cognitive Level**			
			Remember (Kn)	**Understand (Un)**	**Apply (Ap)**	**Analyse(An) Evaluate(Ev)**
			No. of Qns. (marks) and CO			
Unit-I: Water Supply	2	1 either or	2(2) - CO1	1 either or (16) - CO2	-	-
Unit-II: Water Treatment	2	1 either or	2(2) - CO1	1 either or (16) – CO3	-	-
Unit- III: Water Storage And Distribution	2	1 either or	1(2) - CO1	1(2) – CO2	1 either or (16) – CO4	-
Unit-IV: Planning And Design Of Sewerage System	2	1 either or	2(2) - CO1	-	1 either or (16) –CO5	-

Unit-V: Sewage Treatment And Disposal	2	1 either or	1(2) - CO1	1(2) –CO2	1 either or (16) – CO3	-
Total Qns. Environmental Engineering	10	5 either or	8(2)	2(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	16	36	48	-
Weightage	20%	80%	16%	36%	48%	-

Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	16	20	32	16	16
Weightage	16%	20%	32%	16%	16%

CE 22406	**STRENGTH OF MATERIALS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS

1. Tension test on metal specimens.
2. Compression test on wooden specimen.
3. Shear test on metal specimens
4. Torsion test on metal specimen
5. Impact tests on metal specimens
6. Hardness tests on metal specimens
7. Bending test – Determination of Young's modulus and flexural rigidity
8. Tests on open coil helical springs
9. Tests on closed coil helical springs
10. Study on mechanical and electrical strain gauges

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS

1. UTM
2. Torsion testing machine
3. Izod impact testing machine
4. Hardness testing machine
5. Beam deflection test apparatus
6. Extensometer
7. Compressometer
8. Dial gauges Few
9. Le Chatelier's apparatus
10. Vicat's apparatus
11. Mortar cube moulds

COURSE OUTCOMES:

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

CO1:	Understand the basic concept of stress, strain, deformation and material behaviour

	under different types of loading (axial, torsion and bending).
CO2:	Demonstrate the testing of different material under the action of tensile load, compressive load, double shear and torsion.
CO3:	Calculate the young's modulus of steel and wooden materials by considering deflection testing.
CO4:	Determine the stiffness of open coil and closed coil springs by applying compressive and tensile load respectively.
CO5:	Make use of equipment to assess special strength characteristics such as toughness and hardness experimentally.
TEXT BOOKS:	
1.	Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2.	PunmiaB.C."Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
REFERENCES:	
1.	Rattan.S.S. "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
2.	Srinath, L.S, "Advanced mechanics and solids", Tata-McGraw Hill publishing company ltd, 2005.
3.	IS 432-1 (1982) and IS 1810-38 (1984).
4.	IS1786-2008 (Fourth Revision, Reaffirmed 2013), High strength deformed bars and wires for concrete reinforcement – Specification, 2008.
5.	Strength of Materials Lab Manual, Notion Press November 6,2020

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	2	-	-	-	-	2	-	2	3	2	-	1
CO2	3	2	-	2	-	-	-	-	2	-	2	3	2	-	1
CO3	3	2	-	3	2	1	-	1	2	-	-	3	3	-	1
CO4	3	2	1	3	2	-	-	1	2	-	-	3	3	-	-
CO5	3	2	1	2	3	1	-	-	2	-	-	3	3	-	-
CO	3	2	1	2	2	1	-	1	2	-	2	3	3	-	1

CE 22407	**HYDRAULIC ENGINEERING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
COURSE OBJECTIVES:					
Students should be able to verify the principles studied in theory by performing the experiments in lab.					

LIST OF EXPERIMENTS

A. Flow Measurement

1. Determination of coefficient of discharge using Rotameterin a pipe.
2. Determination of coefficient of discharge using Venturimeter/ Orificemeterin a pipe.
3. Bernoulli's Experiment.

B.Losses in Pipes

1. Determination of friction factor in pipes
2. Determination of minor losses

C. Pumps

1. Characteristics study of Centrifugal pumps/ Gear pump
2. Characteristics study of Submersible pump/ Reciprocating pump

D. Turbines

1. Characteristics study of Pelton wheel turbine
2. Characteristics study of Francis turbine/Kaplan turbine

E. Determination of Metacentric height

1. Determination of Metacentric height of floating bodies

LIST OF EQUIPMENTS

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1:	Explain the concept of flow measuring devices.
CO2:	Calculate the frictional losses in pipes and fittings.
CO3:	Find the efficiency of pumps for specific applications.
CO4:	Determine the efficiency of turbines based on flow and head.
CO5:	Compute the meta centric height of floating body.

TEXT BOOKS:

1.	SarbjitSingh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2.	"Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.

REFERENCES:	
1.	Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
2.	Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing.Company, 2001.
3.	ChandramouliP.N., "Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.
4.	Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
5.	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	2	-	-	-	-	-	-	-	3	-	-
CO2	2	3	3	2	2	2	-	-	1	-	-	1	3	1	-
CO3	2	3	3	2	2	2	-	-	1	-	1	2	3	1	-
CO4	2	2	3	2	2	2	-	-	1	-	1	2	3	1	1
CO5	2	2	3	2	2	-	-	-	1	-	-	-	3	1	1
CO	2	2	3	2	2	2	-	-	1	-	1	2	3	1	1

CE22408	SURVEY CAMP	L	T	P	C
		0	0	0	1

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS

1. Traverse – Area measurement for irregular field- using Total station.
2. Contouring
   (i). Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line 65.
   (ii). Block Level/ By squares of size at least 100 Meter x 100 Meter atleat 20 Meter interval.
3. L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30 m and C.S at every 90 m.
4. Offset of Buildings and Plotting the Location.
5. Sun observation to determine azimuth (guidelines to be given to the students).
6. Traversing using GPS.

7. Curve setting by deflection angle. Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.	
TOTAL: 2 weeks	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Survey the field length, area, volume, L.S. and C.S, contouring and traversing.
TEXT BOOKS:	
1.	T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 24th Reprint, 2015.
2.	Dr. B. C. Punmia, Ashok K. JainandArun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition, 2016.
REFERENCES:	
1.	James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGSOraw Hill 2001.
2.	Bannisterand S. Raymond, Surveying, Seventh Edition, Longman 2004 .
3.	David Clark and James Clendinning, Plane and Geodetic Surveying for Engineers, Volume I & II, Constable and Company Ltd, London, CBS, 6th Edition, 2004.
4.	S. K. Roy, Fundamentals of Surveying, Second Edition, Prentice 'Hall of India 2004.
5.	K. R. Arora, Surveying Vol. I & II, Standard Book house, Eleventh Edition, 2013.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	2	2	2	-	-	2	2	2	2	2	-	1
CO	3	2	2	2	2	2	-	-	2	2	2	2	2	-	1

SD22401	**CODING SKILLS AND SOFT SKILLS TRAINING – PHASE II**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
COURSE OBJECTIVES:					
• To help students on developing modular applications using functions. • To train them on building logics using strings and pointers. • To make them develop applications using user defined data types. • To train the students on speaking skills for group discussions. • To set them correctly on the track of presentation skills and management skills.					
UNIT I	**FUNCTIONS**				**12**
Logic Building Using Functions – Programs on Recursion – Puzzles - Output of Programs – Company Specific Programming Examples.					

UNIT II	STRINGS AND POINTERS	12
Logic Building Using Strings – Programs on Strings - Logic Building Using Pointers – Puzzles - Output of Programs - Company Specific Examples.		
UNIT III	**USER DEFINED DATATYPES**	**6**
Working with User Defined Datatypes – Puzzles - Output of Programs - Company Specific Examples.		
UNIT IV	**COMMUNICATION SKILLS / LANGUAGE SKILLS**	**15**
Receptive Skills and productive skills - Skills together - Integration of skills - Input and output. Receptive Skills: Listening and Reading - Lead-in - Pre-existent knowledge - General understanding of the audio or the written text - Discussion in pairs or small groups – feedback - Text-related task in detail - Focus on aspects of language in the text. Productive Skills: Speaking and Writing - lead-in - engaging students with the topic - setting the task - role-play - Monitoring the task - Giving the feedback-positive- task-related follow up - repetition / re-setting of task. Activities: Pronunciation: syllable, stress, intonation - Writing memos, e-mails and formal letters - Oral presentations / seminars - Written and Oral Descriptions Group discussions.		
UNIT V	**SOFT SKILLS: SEARCH AND FIND FOR CAREER DEVELOPMENTS**	**15**
Self-motivation: Interpersonal relationship - Attitudes and interpersonal integrity – Time management – prioritizing - Leadership quality – In the team: Team building and Team work - Memory technique. Problem solving: – emotional intelligence – positive attitude towards life – taking up initiatives – developing mind set –openness to feed back – adaptability – active listening – work ethics. Presentation of skills: creative thinking – critical thinking – logical thinking - decision making. Management ability: empathy – selflessness – humility – cultural respectfulness – versatility – generosity – trustworthiness – planning and executing – target achievement – listening to others' views – friendliness - active participation – empowering healthy atmosphere – exchange of ideas – mediation – negotiation – qualities – updating the knowledge – pre-work for performance – respect forrules and regulations.		
TOTAL: 60 PERIODS		
SUGGESTIVE ASSESSMENT METHODS		
1) Pre Assessment Test – To check the student's previous knowledge in Programming skills. 2) Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20. 3) Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20. 4) Model Exam for coding skills will be conducted for 100 marks which are then reduced to 20. 5) A test for Communication skills will be conducted for 100 marks which will be then calculated to 40. 6) For assignments, students should attend all the practice tests conducted online on Hacker Rank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks. 7) The total of 100 marks obtained from the tests will be then reduced to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.		
COURSE OUTCOMES:		

At the end of the course, the students will be able to:	
CO1:	Develop and implement modular applications using functions.
CO2:	Develop logics using strings and pointers.
CO3:	Develop applications in C using user defined data types.
CO4:	Practice both receptive skills (listening and reading) and productive skills (writing and speaking) and speak English with standard pronunciation using correct stress and intonation.
CO5:	Practice team building and team work procedures and develop memory techniques and manage abilities like empathy, selflessness, cultural respectfulness and trustworthiness preparing themselves for target achievement.

TEXT BOOKS:	
1.	Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:	
1.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
2.	Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
3.	E Balagurusamy, "Programming in ANSI C", Eighth edition, McGrawHill Publications, 2019.
4.	S.Sobana, R.Manivannan, G.Immanuel, 'Communication and Soft Skills' VK Publications', 2016.
5.	Zed Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding", Zed Shaw's Hardway Series, 2015.

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO2	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO3	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1
CO	3	2	2	-	2	-	-	-	-	-	-	2	-	1	1

AC22401	**INDUSTRIAL SAFETY ENGINEERING**	**L**	**T**	**P**	**C**
		2	0	0	0

COURSEOBJECTIVES:

- Explaining the fundamental concept and principles of industrial safety
- Applying the principles of maintenance engineering.
- Analyzing the wear and its reduction.
- Evaluating faults in various tools, equipment and machines.

- Applying periodic maintenance procedures in preventive maintenance.

UNIT I	INDUSTRIAL SAFETY	9

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II	MAINTENANCE ENGINEERING	9

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III	WEAR AND CORROSION AND THEIR PREVENTION	9

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV	FAULT TRACING	9

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump, iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V	PERIODIC AND PREVENTIVE MAINTENANCE	9

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:	Explain the fundamental concept and principles of industrial safety
CO2:	Apply the principles of maintenance engineering.
CO3:	Apply periodic maintenance procedures in preventive maintenance.

CO4:	Analyze the wear and its reduction.
CO5:	Evaluate faults in various tools, equipment and machines

TEXT BOOKS:	
1.	L M Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 2005.
2.	Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.
REFERENCES:	
1.	Edward Ghali, V. S. Sastri, M. Elboujdaini, Corrosion Prevention and Protection: Practical Solutions, John Wiley & Sons, 2007.
2.	Garg, HP, Maintenance Engineering, S. Chand Publishing.
3.	J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017.
4.	R. Keith Mobley, Maintenance Fundamentals, Elsevier, 2011.
5.	W. E. Vesely, F. F. Goldberg, Fault Tree Handbook, Create space Independent Pub, 2014

Course outcomes	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO2	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO3	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO4	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO5	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-

HOD **DEAN ACADEMICS** **PRINCIPAL**