

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 ingenious 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	Seme ster	Course name	PO												PSO			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
I	I	EN22101	-	-	-	-	-	-	-	-	-	2	2	-	2	-	1	-
		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
		HS22101	3	2	2	1	-	-	2	-	2	-	1	1	-	-	-	3
		HS22102	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-	3
		BS22101	3	1	-	-	-	2	2	-	2	1	-	1	-	1	-	-
		CS22102	3	3	3	3	2	-	-	-	-	-	-	-	1	1	-	2
	II	EN22201	-	-	-	-	-	-	-	-	-	2	3	-	2	-	1	-
		MA22201	3	2	-	-	-	-	-	-	-	-	-	-	1	1	-	1
		PH22201	2	1	-	-	-	-	-	-	2	1	-	1	-	1	-	-
		ES22202	3	2	2	2	-	-	-	-	-	-	-	-	1	1	-	-
		CH22201	3	-	-	-	-	-	3	-	1	1	-	1	-	3	1	-
		CE22201	2	2	2	-	2	2	2	2	2	2	2	2	2	2	1	3
		ME22201	3	1	-	-	-	-	-	-	-	2	-	-	2	-	-	-
		CE22202	2	2	2	2	2	2	2	2	2	2	2	2	2	3	-	2
		ES22203	3	-	-	-	-	-	-	-	-	3	1	-	1	-	1	-

SEMESTER I

Sl. No.	Course Code	Course Title	Cate Gory	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	IP22101	Induction Programme	-	-	-	-	-	0
THEORY								
2.	EN22101	Communicative English	HSMC	2	0	2	4	3
3.	MA22101	Matrices and Calculus	BSC	3	1	0	4	4
4.	PH22101	Engineering Physics	BSC	3	0	0	3	3
5.	CH22101	Engineering Chemistry	BSC	3	0	0	3	3
6.	CS22101	Problem solving and Python Programming	ESC	3	0	0	3	3
7.	HS22101	Higher order thinking	MC	1	0	0	1	1
8.	HS22102	Universal Human Values : Understanding Harmony and Ethical Human Conduct	HSMC	2	0	0	2	2
PRACTICAL								
9.	BS22101	Physics & Chemistry Laboratory	BSC	0	0	4	4	2
10.	CS22102	Python programming Laboratory	ESC	0	0	4	4	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								
1.	EN22201	Technical English	HSMC	2	0	2	4	3
2.	MA22201	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	PH22201	Physics for Civil Engineers	BSC	2	0	2	4	3
4.	ES22202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
5.	CH22201	Environment and Sustainability	BSC	2	0	2	4	3
6.	CE22201	Building Materials and Techniques	ESC	3	0	0	3	3
7.	ME22201	Engineering Graphics	ESC	2	0	2	4	3
PRACTICAL								
8.	CE22202	Building Materials Laboratory	ESC	0	0	4	4	2
9.	ES22203	Engineering Practices Laboratory	ESC	0	0	4	4	2
TOTAL				17	1	16	34	26

SEMESTER I

EN22101	COMMUNICATIVE ENGLISH	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • 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 - <i>Types of Reading</i> : Intensive Reading and Extensive Reading- <i>Strategies</i> : 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) <i>Intensive Listening: Effective and Attentive Listening</i>					
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	-

MA22101	MATRICES AND CALCULUS	L	T	P	C	
		3	1	0	4	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> 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 parallelepiped.						

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 , $\sin ax$, $\cos ax$, $e^{ax} x^n$, $e^{ax} \sin bx$, $e^{ax} \cos bx$ – 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 Manicavachagom Pillai, 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

PH22101	ENGINEERING PHYSICS	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology 						
<ul style="list-style-type: none"> To help the students to interrelate the topics such as properties of matter, thermal physics, ultrasonics, quantum theory and crystals, learned in the course 						
<ul style="list-style-type: none"> To motivate students to compare and contrast the available equipment in the respective fields 						
<ul style="list-style-type: none"> 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.) 2 nd 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	-

CH22101	ENGINEERING CHEMISTRY				L	T	P	C
					3	0	0	3

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To make the students conversant with water treatment methods and electrochemistry concept
<ul style="list-style-type: none"> To gain basic knowledge of corrosion and protection methods

	<ul style="list-style-type: none"> 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
<p>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.</p>		
UNIT II	ELECTROCHEMISTRY AND CORROSION	12
<p>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 $\text{Cr}_2\text{O}_7^{2-}$).</p> <p>Corrosion – Types: Chemical corrosion and Electrochemical corrosion – Corrosion control methods: Sacrificial anodic and Impressed current Cathodic protection method</p>		
UNIT III	FUELS AND COMBUSTION	8
<p>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.</p> <p>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.</p>		
UNIT IV	ENERGY STORAGE DEVICES	8
<p>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.</p> <p>Nanomaterials in energy storage – CNT –Types, properties and applications.</p>		
UNIT V	ENGINEERING MATERIALS	8
<p>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</p>		
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	-

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					
● To do input/output with files in Python					

UNIT I	INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING STRATEGIES	9
Introduction- Components and functions of a computer system- Hardware and Software. Problem solving strategies- Programme design tools: Algorithms, Flow charts, Pseudo code		
UNIT II	DATA TYPES, EXPRESSIONS, STATEMENTS AND CONTROL FLOW	10
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	8
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		
Upon completion of the course, the students will be able to		
<ul style="list-style-type: none"> • Describe the algorithmic solutions to simple and complex computational problems • Apply functions, modules and packages in Python programme and use conditionals and loops for solving problems • Analyze conditional branching statements • Evaluate python programmes • Develop programmes 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”, 2 nd Edition, O’Reilly Publishers, 2016.	
REFERENCE BOOKS		
1.	Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and	

	Programming”, 1 st Edition, BCS Learning & Development Limited, 2017.
2.	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1 st 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”, 2 nd Edition, No Starch Press, 2019.
5.	Martin C. Brown, “Python: The Complete Reference”, 4 th 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	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO3	3	3	3	3	-	-	-	-	-	-	-	1	1	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	1	1	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	1	1	-	2
CO	3	3	3	3	-	-	-	-	-	-	-	1	1	-	2

HS22101	HIGHER ORDER THINKING	L	T	P	C	
		1	0	0	1	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> 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

HS22102	UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	0	0	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education. 					
<ul style="list-style-type: none"> To facilitate the students to understand harmony at all the levels of human living, and live accordingly. 					
<ul style="list-style-type: none"> To create an awareness on Engineering Ethics and Human Values. 					
<ul style="list-style-type: none"> 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.
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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

BS22101	PHYSICS & CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2
PHYSICS LABORATORY					
OBJECTIVES:					
<ul style="list-style-type: none"> 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					
<ul style="list-style-type: none"> 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 ₂ SO 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					
<ul style="list-style-type: none"> To understand the problem solving approaches 					
<ul style="list-style-type: none"> To learn the basic programming constructs in Python 					
<ul style="list-style-type: none"> To practice various computing strategies for Python-based solutions to real world problems 					

<ul style="list-style-type: none"> 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

SEMESTER II

EN22201	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To widen strategies and skills to augment ability to read and comprehend engineering and technology texts. 					
<ul style="list-style-type: none"> • To develop writing skill to make technical presentations. 					
<ul style="list-style-type: none"> • To draft convincing job applications and effective reports.. 					
<ul style="list-style-type: none"> • To strengthen listening skills to comprehend technical lectures and talks in their areas of Specialization. 					
<ul style="list-style-type: none"> • 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	10	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	-

MA22201	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> 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. 					
<ul style="list-style-type: none"> To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems. 					
<ul style="list-style-type: none"> To introduce the basic concepts of solving algebraic and transcendental equations. 					
<ul style="list-style-type: none"> 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. 					
<ul style="list-style-type: none"> 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 $r \times c$ 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 derivatives 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 ", 10 th 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, 4 th 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

PH22201	PHYSICS FOR CIVIL ENGINEERS	L	T	P	C	
		2	0	2	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To understand the concepts of light, electron transport properties and the essential principles of semiconductors. 						
<ul style="list-style-type: none"> To become proficient in factors affecting buildings 						
<ul style="list-style-type: none"> To know the basics of the functioning of advanced engineering materials 						
<ul style="list-style-type: none"> 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 - CO2 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 OPTICAL 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.	Jaspri 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	-

ES22202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> 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. 					
UNIT I	INTRODUCTION TO ELECTRICAL ENGINEERING	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	-	-

CH22201	ENVIRONMENT AND SUSTAINABILITY	L	T	P	C	
		2	0	2	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> 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 						
UNIT I	ECOSYSTEM AND BIODIVERSITY					6
Environment – Ecosystem – 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”, 2nd Edition, 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, 4 th 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

CE22201	BUILDING MATERIALS& TECHNIQUES	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To learn the various construction materials and the technique that is commonly used in Civil Engineering construction 					
UNIT I	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 of Construction", 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

ME22201	ENGINEERING GRAPHICS				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
• 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 and cones) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of 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.	Jeyapooan 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, 7 th 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	-	-

CE22202	BUILDING MATERIALS LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES					
<ul style="list-style-type: none"> 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					
<ol style="list-style-type: none"> Determination of Grading of fine aggregates using sieve analysis. Determination of specific gravity of fine and coarse aggregates. Determination of compacted and loose bulk density of fine aggregate. Determination of impact value of coarse aggregate. Determination of elongation and flakiness index of coarse aggregate. Determination of normal consistency of cement. Determination of initial and final setting time of cement. Determination of soundness of cement. Determination of compressive strength of bricks and blocks. 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					

<ul style="list-style-type: none"> • 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. 		
<ul style="list-style-type: none"> • Wiring various electrical joints in common household electrical wirework. 		
<ul style="list-style-type: none"> • 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. 		
<ul style="list-style-type: none"> • 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.	
WOODWORK	❖ Sawing	
	❖ Planning and	
	❖ 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	-