THAMIRABHARANI ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

REGULATIONS 2024
B. E. CIVIL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24IP0101	Induction Programme	-	-	-	-	-	0
THEORY								
2	24HS0101	Professional English I	HSMC	3	0	0	3	3
3	24MA0101	Matrices and Calculus	BSC	3	1	0	4	4
4	24PH0101	Engineering Physics I	BSC	3	0	0	3	3
5	24CY0101	Engineering Chemistry	BSC	3	0	0	3	3
6	24GE0101	Problem Solving and Python Programming	ESC	3	0	0	3	3
7	24GE0102	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
8	24GE0103	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
9	24BS0101	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10	24HS0102	English Laboratory I	EEC	0	0	2	2	1
		TOTAL		**16**	**1**	**10**	**27**	**22**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24HS0203	Professional English II	HSMC	2	0	0	2	2
2	24MA0202	Ordinary Differential Equations and Transform Techniques	BSC	3	1	0	4	4
3	24PH0202	Engineering Physics II	BSC	3	0	0	3	3
4	24GE0204	Environmental Science and Engineering	BSC	2	0	0	2	2
5	24GE0205	Engineering Graphics	ESC	2	0	4	6	4
6	24GE0206	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
7	24GE0207	தமிழரும் தொழில் நுட்பமும்/ Tamils and Technology	HSMC	1	0	0	1	1
PRACTICALS								
8	24GE0208	Basic Electrical and Electronics Engineering Laboratory	ESC	0	0	4	4	2
9	24GE0209	Engineering Practices Laboratory	ESC	0	0	4	4	2
10	24HS0204	English Laboratory II	EEC	0	0	2	2	1
			TOTAL	**16**	**1**	**14**	**31**	**24**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24MA0303	Numerical Methods	BSC	3	1	0	4	4
2	24ME2301	Engineering Mechanics	ESC	3	0	0	3	3
3	24CE1301	Fluid Mechanics	PCC	3	0	0	3	3
4	24CE1302	Construction Materials and Technology	PCC	3	0	0	3	3
5	24CE1303	Surveying and Leveling	PCC	3	0	2	5	4
PRACTICALS								
6	24CE1304	Materials Testing Laboratory	PCC	0	0	4	4	2
7	24GE0310	Professional Development	EEC	0	0	2	2	1
			TOTAL	**15**	**1**	**8**	**24**	**20**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24CE1401	Applied Hydraulics Engineering	PCC	3	0	2	5	4
2	24CE1402	Strength of Materials	PCC	3	0	0	3	3
3	24CE1403	Concrete Technology	PCC	3	0	0	3	3
4	24CE1404	Soil Mechanics	PCC	3	0	2	5	4
5	24CE1405	Highway Engineering	PCC	3	0	0	3	3
PRACTICALS								
6	24CE1406	Strength of Materials Laboratory	PCC	0	0	4	4	2
7	24CE1407	Concrete Technology Laboratory	PCC	0	0	4	4	2
8	24GE0411	Soft Skills I	ESC	0	0	4	4	2
			TOTAL	**15**	**0**	**16**	**31**	**23**

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24CE1501	Design of Reinforced Concrete Structural Elements	PCC	3	1	0	4	4
2	24CE1502	Structural Analysis I	PCC	3	1	0	4	4
3	24CE1503	Foundation Engineering	PCC	3	0	0	3	3
4	24CE1504	Railways, Airports and Harbours Engineering	PCC	3	0	0	3	3
5	24HS0505	English for Competitive Examinations	HSMC	3	0	0	3	3
6	24CE15XX	Professional Elective I	PEC	3	0	0	3	3
PRACTICALS								
7	24CE1505	Highway Engineering Laboratory	PCC	0	0	4	4	2
8	24CE1506	Building Drawing Laboratory (Using AUTOCAD)	PCC	0	0	4	4	2
			TOTAL	**18**	**2**	**8**	**28**	**24**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24CE1601	Design of Steel Structural Elements	PCC	3	1	0	4	4
2	24CE1602	Structural Analysis II	PCC	3	1	0	4	4
3	24CE1603	Construction Planning and Scheduling	PCC	3	0	0	3	3
4	24CE1604	Water Supply and WasteWater Engineering	PCC	3	0	2	5	4
5	24CE16XX	Professional Elective II	PEC	3	0	0	3	3
6	24OXX6XX	Open Elective I	OEC	3	0	0	3	3
PRACTICALS								
7	24CE1605	Building Drawing Laboratory (using STAAD.Pro)	PCC	0	0	4	4	2
8	24CE1606	Survey Camp (4 Weeks)	EEC	0	0	0	0	2
9	24GE0613	Soft Skills II	EEC	0	0	4	4	2
		TOTAL		**18**	**2**	**10**	**30**	**27**

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24CE1701	Estimation, Costing and Valuation Engineering	PCC	3	0	0	3	3
2	24CE1702	Structural Dynamics and Earthquake Engineering	PCC	3	0	0	3	3
3	24GE0714	Professional Ethics	HSMC	3	0	0	3	3
4	24CE17XX	Professional Elective III	PEC	3	0	0	3	3
5	24CE17XX	Professional Elective IV	PEC	3	0	0	3	3
6	24OXX7XX	Open Elective II	OEC	3	0	0	3	3
PRACTICALS								
7	24CE1703	Beam and Frame Analysis Laboratory	EEC	0	0	4	4	2
8	24CE1704	Internship	EEC	0	0	0	0	2
			TOTAL	**18**	**0**	**4**	**22**	**22**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24CE1801	Project Work	EEC	0	0	20	20	10

TOTAL CREDITS: 172

PROFESSIONAL ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24CE1507	Concrete Structures	PEC	3	0	0	3	3
2	24CE1508	Steel Structures	PEC	3	0	0	3	3
3	24CE1509	Prefabricated Structures	PEC	3	0	0	3	3
4	24CE1510	Prestressed Concrete Structures	PEC	3	0	0	3	3
5	24CE1511	Rehabilitation/Heritage Restoration	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24CE1607	Formwork Engineering	PEC	3	0	0	3	3
2	24CE1608	Construction Equipment and Machinery	PEC	3	0	0	3	3
3	24CE1609	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3
4	24CE1610	Advanced Construction Techniques	PEC	3	0	0	3	3
5	24CE1611	Construction Management and Safety	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24CE1705	Airports and Seaports	PEC	3	0	0	3	3
2	24CE1706	Traffic Engineering and Management	PEC	3	0	0	3	3
3	24CE1707	Urban Planning and Development	PEC	3	0	0	3	3
4	24CE1708	Smart Cities	PEC	3	0	0	3	3
5	24CE1709	Intelligent Transport Systems	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24CE1710	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3
2	24CE1711	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3
3	24CE1712	Environmental Impact Assessment	PEC	3	0	0	3	3
4	24CE1713	Industrial Wastewater Management	PEC	3	0	0	3	3
5	24CE1714	Solid and Hazardous Waste Management	PEC	3	0	0	3	3

OPEN ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24OAD601	Foundations of Artificial Intelligence	OEC	3	0	0	3	3
2	24OAD602	Programming For Data Science	OEC	3	0	0	3	3
3	24OCS601	Software Engineering Fundamentals	OEC	3	0	0	3	3
4	24OCS602	C Programming	OEC	3	0	0	3	3
5	24OMG601	Business Essentials for Engineers	OEC	3	0	0	3	3

OPEN ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24OAD701	Machine Learning Using Python	OEC	3	0	0	3	3
2	24OAD702	Deep Learning And Neural Networks	OEC	3	0	0	3	3
3	24OCS701	IoT Concepts and Applications	OEC	3	0	0	3	3
4	24OCS703	Data Structures And Algorithm	OEC	3	0	0	3	3
5	24OMG701	Management Concepts and Organization Behavior	OEC	3	0	0	3	3

SUMMARY

S. No	Subject Area	Credits per Semester								% of Subject Area	Total Credits
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC	4	3	-	-	3	-	3	-	**8**	**13**
2	BSC	12	9	4	-	-	-	-	-	**15**	**25**
3	ESC	5	11	3	2	-	-	-	-	**12**	**21**
4	PCC	-	-	12	21	18	17	6	-	**43**	**74**
5	PEC	-	-	-	-	3	3	6	-	**7**	**12**
6	OEC	-	-	-	-	-	3	3	-	**3**	**6**
7	EEC	1	1	1	-	-	4	4	10	**12**	**21**
8	Non-Credit/ Mandatory	-	-	-	-	-	-	-	-	**0**	**-**
Total		**22**	**24**	**20**	**23**	**24**	**27**	**22**	**10**	**100**	**172**

SEMESTER I

24IP0101	INDUCTION PROGRAMME	L	T	P	C
		-	-	-	0

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character."

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's,

but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

REFERENCES:

Guide to Induction program from AICTE

24HS0101	PROFESSIONAL ENGLISH I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To improve the communicative competence of learners.
- To learn to use basic grammatic structures in suitable contexts.
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.
- To help learners use language effectively in professional contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

UNIT I	INTRODUCTION TO EFFECTIVE COMMUNICATION	9

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One-word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II	NARRATION AND SUMMATION	9

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III	DESCRIPTION OF A PROCESS / PRODUCT	9

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV	CLASSIFICATION AND RECOMMENDATIONS	9

Reading – Newspaper articles; Journal reports and Non Verbal Communication (tables, pie charts) - Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing

recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.

UNIT V	EXPRESSION	9

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Use appropriate words in a professional context.

CO2: Gain understanding of basic grammatical structures and use them in right context.

CO3: Read and infer the denotative and connotative meanings of technical texts.

CO4: Read and interpret information presented in tables, charts and other graphic forms.

CO5: Write definitions, descriptions, narrations and essays on various topics.

TEXT BOOKS:

1. "English for Engineers & Technologists", Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition).
2. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, "English for Science & Technology", Cambridge University Press, Authored by, Department of English, Anna University, 2021.

REFERENCE BOOKS:

1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication – Principles and Practices", Oxford Univ. Press, 2016, New Delhi.
2. Lakshminarayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt. Ltd.
3. Aysha Viswamohan, "English for Technical Communication" (With CD), Mcgraw Hill Education, ISBN: 0070264244.
4. Kulbhusan Kumar and RS Salaria, "Effective Communication Skill", Khanna Publishing House.
5. Dr. V. Chellammal, "Learning to Communicate", Allied Publishing House, New Delhi, 2003.

ASSESSMENT PATTERN

Two internal assessments and an end semester examination to test students' reading and writing skills along with their grammatical and lexical competence.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24MA0101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

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 make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I	MATRICES	9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

UNIT II	DIFFERENTIAL CALCULUS	9+3

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	9+3

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	INTEGRAL CALCULUS	9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V	MULTIPLE INTEGRALS	9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Use the matrix algebra methods for solving practical problems.

CO2: Apply differential calculus tools in solving various application problems.

CO3: Able to use differential calculus ideas on several variable functions.

CO4: Apply different methods of integration in solving practical problems.

CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCE BOOKS:

1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K. "Calculus", Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics", Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24PH0101	ENGINEERING PHYSICS I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- To equip the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I	MECHANICS	9

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II	ELECTROMAGNETIC WAVES	9

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

UNIT III	OSCILLATIONS, OPTICS AND LASERS	9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection – interference – Michelson interferometer – Theory of air wedge and experiment. Theory of laser – characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV	BASIC QUANTUM MECHANICS	9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V	APPLIED QUANTUM MECHANICS	9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the importance of mechanics.

CO2: Express their knowledge in electromagnetic waves.

CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

CO4: Understand the importance of quantum physics.

CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. "An Introduction to Mechanics", McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, "Electricity and Magnetism", Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw- Hill (Indian Edition), 2017.

REFERENCE BOOKS:

1. R. Wolfson. "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, "Physics" – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K. Thyagarajan and A. Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019.
4. D. Halliday, R. Resnick and J. Walker. "Principles of Physics", Wiley (Indian Edition), 2015.
5. N. Garcia, A. Damask and S. Schwarz. "Physics for Computer Science Students", Springer-Verlag, 2012.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24CY0101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I	WATER AND ITS TREATMENT	9

Water: Sources and impurities, Water quality parameters: Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, Nano rod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III	PHASE RULE AND COMPOSITES	9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV	FUELS AND COMBUSTION	9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil

- cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO_2 emission and carbon foot print.

UNIT V	ENERGY SOURCES AND STORAGE DEVICES	9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles-working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO2: Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

CO3: Apply the knowledge of phase rule and composites for material selection requirements.

CO4: Understand the importance of quantum physics. Recommend suitable fuels for engineering processes and applications.

CO5: Recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCE BOOKS:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

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, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II	DATA TYPES, EXPRESSIONS, STATEMENTS	9

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III	CONTROL FLOW, FUNCTIONS, STRINGS	9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV	LISTS, TUPLES, DICTIONARIES	9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V	FILES, MODULES, PACKAGES	9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Write simple Python programs using conditionals and looping for solving problems.

CO3: Decompose a Python program into functions.

CO4: Represent compound data using Python lists, tuples, dictionaries etc.

CO5: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginners Guide to Problem Solving and programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 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.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0102	தமிழர் மரபு	L	T	P	C
		1	0	0	1
அலகு 1	மொழி மற்றும் இலக்கியம்			3	
இந்திய மொழிக் குடும்பங்கள் திராவிட மொழிகள் தமிழ் ஒரு செம்மொழி தமிழ் செவ்விவக்கியங்கள் சங்க இலக்கியத்தின் சமயச் சார்பற்ற 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					
அலகு 2	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 வினை, யாழ், நாதஸ்வரம், மிருதங்கம், பறை, தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு					
அலகு 3	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்			3	
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம். தமிழர்களின் விளையாட்டுகள்.					
அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்			3	
தமிழகத்தின் தாவரங்களும், விலங்குகளும் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும். கல்வியும் சங்ககால நகரங்களும் துறை முகங்களும் சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.					
அலகு 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் 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

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0102	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I	LANGUAGE AND LITERATURE	3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

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

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

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

24GE0103	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

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:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions. (exchange the values of two variables, circulate the values of n variables, distance between two points)
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries. (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Implement programs in Python using conditionals and loops for solving problems.

CO3: Deploy functions to decompose a Python program.

CO4: Process compound data using Python data structures.

CO5: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 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.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24BS0101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2
PHYSICS LABORATORY		L	T	P	C
(Any Seven Experiments)		0	0	2	1

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 as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus.
4. Uniform bending – Determination of Young's modulus.
5. Laser- Determination of the wave length of the laser using grating.
6. Air wedge - Determination of thickness of a thin sheet/wire.
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle.
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect.
12. Michelson Interferometer.
13. Melde's string experiment.
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the functioning of various physics laboratory equipment.

CO2: Use graphical models to analyze laboratory data.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4: Access, process and analyze scientific information.

CO5: Solve problems individually and collaboratively.

Rubrics:

(i) CIA

Description	Marks
Pre Lab Test	10
Observation	30
Post Lab Test	10
Record	25
Model exam	25
Total	**100**
CIA = 6(x) / 10	

*x- Student CIA total marks

(ii) ESE

Description	Marks
Aim/Apparatus required	10
Formula	10
Figure/Circuit diagram/Model graph	10
Tabulations/Observation	30
Calculations	20
Result	10
Viva voce	10
Total	**100**
ESE = 4(x) / 10	

*x- Student ESE total marks

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

CHEMISTRY LABORATORY	L	T	P	C
(Any Seven Experiments)	**0**	**0**	**2**	**1**

OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters such as acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nano particles.

LIST OF EXPERIMENTS:

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of sodium /potassium present in water using flame photometer.
10. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method.
11. Corrosion experiments – weight loss method.
12. Proximate analysis of Coal.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Analyze the quality of water samples with respect to their acidity, hardness and DO.

CO2: Determine the amount of metal ions through volumetric and spectroscopic techniques.

CO3: Analyze and determine the composition of coal and demonstrate the corrosion.

CO4: Learn simple method of synthesis nanoparticles.

CO5: Quantitatively analysis the impurities in solution by Electro analytical techniques.

Rubrics:

(i) CIA

Description	Marks
Pre Lab Test	10
Observation	30
Post Lab Test	10
Record	25
Model exam	25
Total	**100**
CIA = 6(x) / 10	

*x- Student CIA total marks

(ii) ESE

Description	Marks
Aim/Apparatus required	10
Formula	10
Figure/Circuit diagram/Model graph	10
Tabulations/Observation	30
Calculations	20
Result	10
Viva voce	10
Total	**100**
ESE = 4(x) / 10	

*x- Student ESE total marks

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24HS0102	ENGLISH LABORATORY I	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To improve the communicative competence of learners.
- To help learners use language effectively in academic /work contexts.
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6

Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).

UNIT II	NARRATION AND SUMMATION	6

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / Events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities.

UNIT III	DESCRIPTION OF A PROCESS / PRODUCT	6

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)-talking about precautions.

UNIT IV	CLASSIFICATION AND RECOMMENDATIONS	6

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.

UNIT V	EXPRESSION	6

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Listen to and comprehend general as well as complex academic information.

CO2: Listen to and understand different points of view in a discussion.

CO3: Speak fluently and accurately in formal and informal communicative contexts.

CO4: Describe products and processes and explain their uses and purposes clearly and accurately.

CO5: Express their opinions effectively in both formal and informal discussions.

ASSESSMENT PATTERN

1. One online / app based assessment to test listening /speaking.
2. End Semester ONLY listening and speaking will be conducted online.
3. Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

SEMESTER II

24HS0203	PROFESSIONAL ENGLISH II	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT I	MAKING COMPARISONS	6

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases.

UNIT II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	6

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds.

UNIT III	PROBLEM SOLVING	6

Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences.

UNIT IV	REPORTING OF EVENTS AND RESEARCH	6

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions.

UNIT V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	6

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Compare and contrast products and ideas in technical texts.

CO2: Identify and report cause and effects in events, industrial processes through technical texts.

CO3: Analyze problems in order to arrive at feasible solutions and communicate them in the written format.

CO4: Present their ideas and opinions in a planned and logical manner.

CO5: Draft effective resumes in the context of job search.

TEXT BOOKS:

1. "English for Engineers & Technologists", Orient Blackswan Private Ltd, Department of English, Anna University, 2020.
2. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN.Shoba, and Dr. Lourdes Joevani, "English for Science & Technology", Department of English, Anna University, Cambridge University Press 2021.

REFERENCE BOOKS:

1. Raman. Meenakshi and Sharma Sangeeta, "Professional English", Oxford university press, New Delhi, 2019.
2. V.N. Arora and Laxmi Chandra, "Improve Your Writing ed.," Oxford Univ. Press, New Delhi, 2001.
3. Dr. V. Chellammal, "Learning to Communicate", Allied Publishers, New Delhi, 2003.
4. Prof. R.C. Sharma & Krishna Mohan, "Business Correspondence and Report Writing", Tata McGrawHill & Co. Ltd., New Delhi, 2001.
5. Krishna Mohan and Meera Bannerji, "Developing Communication Skills", Macmillan India Ltd. Delhi, 1990.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24MA0202	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To acquaint the students with differential equations which are significantly used in engineering problems.
- To make the students to understand the vector calculus techniques.
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series.
- To acquaint the student with Fourier, transform techniques used in wide variety of situations in which the functions used are not periodic.
- To develop Z-transform techniques in solving difference equations.

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	9+3

Higher order linear differential equation with constant coefficient - Method of variation of parameters -Homogeneous equations of Euler–Cauchy and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II	VECTOR CALCULUS	9+3

Gradient and directional derivative- Divergence and curl-Vector identities – irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface- Volume integral- Green's, Gauss divergence and Stoke's theorem.

UNIT III	FOURIER SERIES	9+3

Dirichlet's conditions–General Fourier series–Odd and even functions – Half-range Sine and Cosine series – Parseval's identity – Computation of harmonics.

UNIT IV	FOURIER TRANSFORMS	9+3

Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transforms – Properties – Transform of elementary functions – Inverse Fourier Transforms - Convolution theorem (without proof) – Parseval's identity.

UNIT V	Z–TRANSFORM AND DIFFERENCE EQUATIONS	9+3

Z-transform – Properties of Z-transform – Initial and final value theorem - Inverse Z-transform – Evaluation of Inverse Z transform using partial fraction method and convolution theorem– Formation of difference equations–Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Solve higher order ordinary differential equations which arise in engineering applications.

CO2: Understand the concept of Vector calculus.

CO3: Apply Fourier series techniques in engineering applications.

CO4: Understand the Fourier transforms techniques in solving engineering problems.

CO5: Understand the Z-transforms techniques in solving difference equations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45th Edition, New Delhi, 2020.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Pvt Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. N. P. Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
2. Greenberg M. D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R. K. and Iyengar S. R. K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
5. Ramana B. V. "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24PH0202	ENGINEERING PHYSICS II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of elasticity, stress-strain relationships, and material deformation under various forces.
- To enable the students to gain knowledge in conductor and semiconductor physics.
- To impart knowledge on the magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.
- To instill an understanding of the significance of nanostructures, quantum confinement, and their resulting applications in nanodevices.

UNIT I	PROPERTIES OF MATTER	9

Elasticity- Hooke's law- Relationship between three modulii of elasticity (qualitative) - Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength. Torsional stress and deformations - twisting couple - bending of beams. Bending moment - cantilever: theory and experiment. Uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II	CONDUCTING AND SEMICONDUCTING MATERIALS	9

Classical free electron theory of metals – Expression for electrical conductivity-Thermal conductivity expression – Wiedemann-Franz law –Quantum free electron theory - Postulates-Fermi-Dirac Statistics –Density of energy states. Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors.

UNIT III	MAGNETIC PROPERTIES OF MATERIALS	9

Origin of magnetic moment - magnetic permeability and susceptibility–Magnetic material classification: diamagnetism– paramagnetism–ferromagnetism–Domain theory - Hysteresis curve – Soft and Hard magnetic materials – antiferromagnetism – ferrimagnetism - Magnetic principle in computer data storage –Magnetic hard disc (GMR sensor).

UNIT IV	OPTICAL PROPERTIES OF MATERIALS	9

Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode – optical processes in organic semiconductor devices – excitonic state – Electro-optics and nonlinear optics: Modulators and switching devices – plasmonics.

UNIT V	NANOELECTRONIC DEVICES	9

Introduction – quantum confinement – quantum structures: quantum wells, wires and dots – Tunneling – Single electron phenomena: Coulomb blockade – resonant-tunneling diode – single electron transistor –quantum states – classical bits – quantum bits or qubits – photo processes –

spintronics – carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Analyze and apply elasticity concepts to real-world structural and material applications.

CO2: Acquire knowledge on basics of conductor and semiconductor physics and its applications in various devices.

CO3: Illustrate the optical properties and their applications to optical devices.

CO4: Get knowledge on magnetic properties of materials and their applications in data storage.

CO5: Understand and apply quantum concepts and nanostructures in modern electronic and material technologies.

TEXT BOOKS:

1. S. O Pillai, "Solid State Physics", 10th edition, NEW AGE International Publishers, 2022.
2. Hilmi Unlu and Norman. "Progress in Nano scale and Low-Dimensional Materials and Devices", Springer International Publishers.
3. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
4. Arumugam M, "Engineering Physics", Anuradha Publishers, 2010.
5. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", McGraw-Hill Education (Indian Edition), 2020.

REFERENCE BOOKS:

1. Charles Kittel, "Introduction to Solid State Physics" Wiley India Edition, 2019.
2. Senthil Kumar G. "Engineering Physics" VRB Publications, 2023.
3. Mani P. "Engineering Physics" Dhanam Publications, 2023.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0204	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and their functions.
- To acquire the knowledge about biodiversity and emphasize on the biodiversity of India and its conservation.
- To gain the knowledge about the different types of waste, how to handle them and their environmental impact.
- To learn about the causes effects and control measures of various pollutions and know the individual role in it.
- To learn how environmental issues, such as pollution, climate change and global warming to relate sustainable development.

UNIT I	ECOSYSTEMS	6

Concept of an ecosystem (Abiotic and biotic environment) - structure and function of an ecosystem–Producers-Consumers and decomposers. Energy flow in the ecosystem, (Nutrient cycle in the ecosystem) - Ecological succession - Food Chain - food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystems, Forest ecosystem, Grass land ecosystem, Desert ecosystems aquatic ecosystems [ponds, streams, lakes, rivers, ocean estuaries].

UNIT II	BIODIVERSITY	6

Introduction to biodiversity-genetic, species and ecosystem diversity- value of biodiversity - consumptive use- productive use –social, ethical, aesthetic and option values. India as a mega-diversity nation – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III	WASTE MANAGEMENT	6

Municipal solid waste management: Sources, characteristics, collection and transportation, waste processing and disposal (including reuse options, biological methods, energy recovery processes and land filling) Hazardous waste management: Characteristics, generation, fate of materials in the environment, treatment and disposal Management of biomedical waste, plastic waste and E-waste: Sources, generation and characteristics; Waste management practices including storage, collection and transfer

UNIT IV	ENVIRONMENTAL POLLUTION	6

Definition a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution d) Noise pollution-Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in pollution control. Flood Case study

UNIT V	SOCIAL ISSUES AND THE ENVIRONMENT	6

From unsustainable to sustainable development – urban problems related to energy water

conservation, rain water harvesting, watershed management- resettlement and rehabilitation of people; its problem and concerns. Issues and possible solutions: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Recognize and understand the functions of environment, ecosystems.

CO2: Know the bio diversity and their values and conservation.

CO3: Learn about proper waste disposal and minimize waste.

CO4: Understand the causes, effects of pollution and how to control it.

CO5: Understand the relationship between environment and society.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushiks "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2016.
3. John Pichtel, "Waste management practices", 2nd edition, Dev publication.
4. Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", Prentice Hall.
5. Bradley. A.S, Adebayo, A.O, and Maria, P. "Engineering applications in sustainable design and development", Cengage learning.
6. Dr. Ashutosh Tripathi, "Environment and social issues", publication in 2019.
7. Mackenthun, K. M., "Basic Concepts in Environmental Management", Lewis Publication, London, 1998.

REFERENCE BOOKS:

1. R. K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. edition, 2010.
2. Cunningham,W. P. Cooper and T.H.Gorhani, Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Yung Tse Hung, lawrence K wang and Nazih K shammas, "Handbook of Environment and waste management", volume 2.
4. Rajagopalan, R, "Environmental Studies From Crisisto Cure", Oxford University Press, Third Edition, 2015.
5. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Orient Blackswan Pvt.Ltd. 2013.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0205	ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4

OBJECTIVES:

- To draw engineering curves.
- To draw freehand sketch of simple objects.
- To draw orthographic projection of solids and section of solids.
- To draw development of solids.
- To draw isometric and perspective projections of simple solids.

UNIT I	PLANE CURVES AND FREEHAND SKETCHING	6+12

Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves - ortho graphic projection - principles - principle planes-first angle projection-projection of points.

UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACE	6+12

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 both the principal planes by rotating object method.

UNIT III	PROJECTION OF SOLIDS	6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	6+12

Sectioning of above solids 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 AND PERSPECTIVE PROJECTIONS	6+12

Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method.

TOTAL: 90 PERIODS

COURSE OUTCOMES:

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

CO1: Use BIS conventions and specifications for engineering drawing.

CO2: Construct the conic curves, involutes and cycloid.

CO3: Solve practical problems involving projection of lines.

CO4: Draw the orthographic, isometric and perspective projections of simple solids.

CO5: Draw the development of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

REFERENCE BOOKS:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edit ion, 2019.
2. Gopalakrishna K.R., "Engineering Drawing (Vol. I & II combined)", Subhas Publications, Bangalore, 27th Edition, 2017.
3. 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.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0206	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the basics of electric circuits and analysis.
- To impart knowledge in the basics of working principles and application of electrical machines.
- To introduce semiconductor diodes characteristics.
- To educate on the fundamental concepts of transistors.
- To introduce the basics of power system.

UNIT I	INTRODUCTION TO DC & AC CIRCUITS	9

DC Circuits: Electrical Parameters – Ohm‘s Law - Kirchhoff‘s Laws –Independent and Dependent Sources –Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power.

UNIT II	BASIC CONCEPTS OF ELECTRICAL MACHINES	9

Faraday‘s Law - working principle and applications of Transformer – DC motor – types and applications – AC motor, types & applications.

UNIT III	SEMICONDUCTOR DIODES	9

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode –application of diode – half wave and full wave rectifier - Zener diode and its characteristics – applications.

UNIT IV	TRANSISTORS	9

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – working of FET & UJT.

UNIT V	BASICS OF POWER SYSTEM	9

Power system structure – Generation, Transmission and Distribution - earthling – methods of earthling, protective devices – switch fuse unit – Miniature circuit breaker – types, safety precaution and First Aid.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Compute the electric circuit parameters for simple problems.

CO2: Explain the working principle and applications of electrical machines.

CO3: Analyze the characteristics of semiconductors.

CO4: Explain the basic concepts of transistors.

CO5: Explain the basic power system structure and protection schemes.

TEXT BOOKS:

1. Kothari DP and I. J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. S. Salaivahanan, "Digital Electronics", McGraw Hill Education (India) Private Limited, 18th Sept 2018.
3. Sedha R. S., "A textbook book of Applied Electronics", S. Chand & Co., 2008.
4. V K Mehta and Rohit Mehta, "Principles of Electrical Machines", S Chand and Company limited, second edition, 2019.

REFERENCE BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2017.
3. Albert Malvino, David Bates, "Electronic Principles", McGraw Hill Education; 7th edition, 2017.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum'Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill, New Delhi, 2010.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

24GE0207	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

அலகு 1	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3

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

அலகு 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3

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

அலகு 3	உற்பத்தித் தொழில் நுட்பம்	3

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

அலகு 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3

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

அலகு 5	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3

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

TOTAL: 15 PERIODS

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

24GE0207	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

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 Sang am 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

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு மக்களும் பண்பாடும். கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.
4. பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

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

24GE0208	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To train the students in conducting load tests on electrical machines.
- To gain practical experience in experimentally obtaining the characteristics of electronics devices and rectifiers.

LIST OF EXPERIMENTS:

1. Verification of ohms and Kirchhoff‘s Laws.
2. Study of starter.
3. Speed control on DC Shunt Motor.
4. Load test on DC Series Motor.
5. Load test on Single Phase Transformer.
6. Load Test on Single Phase Induction Motor.
7. Characteristics of PN Diodes.
8. Characteristics of BJT.
9. Characteristics of Zener Diodes.
10. Half wave and Full Wave rectifiers.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Construct the circuit with appropriate connections for the given DC machine/transformer.

CO2: Acquire hands on experience of conducting various tests on induction motors and obtaining their performance indices using standard analytical as well as graphical methods.

CO3: Analyse the characteristics of PN diodes and BJT experimentally.

CO4: Analyse the characteristics of half-wave and full-wave rectifier with and without filters experimentally.

CO5: Understand DC motor starters.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, ‘-‘– no correlation

24GE0209	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

- Drawing pipe line 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 wire work.
- 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 equipments; 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 & ELECTRICAL)

PART I	CIVIL ENGINEERING PRACTICES	15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing
b) Planning
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

WOOD WORK STUDY:

a) Studying joints in door panels and wooden furniture.
b) Studying common industrial trusses using models.

PART II	ELECTRICAL ENGINEERING PRACTICES	15

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.
b) Staircase wiring.
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration.
e) Study of Iron Box wiring and assembly.
f) Study of Fan Regulator. (Resistor type and Electronic type using Diac/Triac/quadrac)

g) Study of emergency lamp wiring/Water heater.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III	**MECHANICAL ENGINEERING PRACTICES**	**15**

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations

PART IV	**ELECTRONIC ENGINEERING PRACTICES**	**15**

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipment‘s; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO5: Apply safety protocols and use personal protective equipment (PPE) effectively in all engineering practices.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, ‘-‘– no correlation

24HS0204	ENGLISH LABORATORY II	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyses concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays.
- To give instructions and recommendations that are clear and relevant to the context.

UNIT I		6

Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-Writing: writing emails (formal & semi-formal).

UNIT II		6

Speaking: discussing news stories-talking about frequency-talking about travel problems-discussing travel procedures- talking about travel problems- making arrangements-describing arrangements discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.

UNIT III		6

Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.

UNIT IV		6

Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules-(example- discussing rental arrangements) - understanding technical instructions-Writing: writing instructions-writing a short article.

UNIT V		6

Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application (Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Speak effectively in group discussions held in a formal/semi-formal contexts.

CO2: Discuss, analyses and present concepts and problems from various perspectives to arrive at suitable solutions.

CO3: Write emails, letters and effective job applications.

CO4: Write critical reports to convey data and information with clarity and precision.

CO5: Give appropriate instructions and recommendations for safe execution of tasks.

REFERENCE BOOKS:

1. Butterfield Jeff, "Soft Skills for Everyone", Cengage Learning: New Delhi, 2015.
2. "Interact English Lab Manual for Undergraduate Students", Orient Blackswan: Hyderabad, 2016.
3. E. Suresh Kumar et al., "Communication for Professional Success", Orient Blackswan: Hyderabad, 2015.
4. Raman, Meenakshi and Sangeeta Sharma, "Professional Communication", Oxford University Press: Oxford, 2014,
5. S. Hariharan et al., "Soft Skills", MJP Publishers: Chennai, 2010.

CO – PO – PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-'– no correlation

SEMESTER III

24MA0303	NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	12

Solution of algebraic and transcendental equations - Newton Raphson method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method – Iterative methods of Gauss Jacobian and Gauss Seidel - Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II	INTERPOLATION AND APPROXIMATION	12

Interpolation with unequal intervals - Lagrange's interpolation - Newton's divided difference interpolation - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III	NUMERICAL DIFFERENTIATION AND INTEGRATION	12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule - Romberg's Method - Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV	INITIAL VALUE PROBLEMS FOR 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.

UNIT V	BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS	12

Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain - One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the basic concepts and techniques of solving algebraic and transcendental equations.

CO2: Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.

CO3: Apply the numerical techniques of differentiation and integration for engineering problems.

CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS :

1. Burden R. L and Faires J. D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal B. S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCE BOOKS:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald C. F. and Wheatley. P. O, "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews J. H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

24ME2301	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram.
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts - force, momentum, work and energy.

UNIT I	STATICS OF PARTICLES	9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle - Newton's First Law of Motion, Space and Free Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II	EQUILIBRIUM OF RIGID BODIES	9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varingon's Theorem, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force - Couple system - Reactions at Supports and Connections.

UNIT III	DISTRIBUTED FORCES	9

Centroids of lines and areas - Symmetrical and Unsymmetrical shapes. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Parallel Axis Theorem, Moments of Inertia of Composite Areas.

UNIT IV	FRICTION	9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V	DYNAMICS OF PARTICLES	9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics - Newton's Second Law of Motion - Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Illustrate the vector and scalar representation of forces and moments.

CO2: Analyze the rigid body in equilibrium.

CO3: Evaluate the properties of distributed forces.

CO4: Determine the friction and the effects by the laws of friction.

CO5: Calculate dynamic forces exerted in rigid body.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, "Vector Mechanics for Engineers: Statics and Dynamics", McGraw Higher Education., 12thEdition, 2019.

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCE BOOKS:

1. Boresi P and Schmidt J, "Engineering Mechanics: Statics and Dynamics", Cengage learning, 2008.
2. Hibbeller, R. C., "Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics", 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, "Engineering Mechanics - Statics and Dynamics", 4th Edition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, "Engineering Mechanics: Statics and Engineering Mechanics: Dynamics", 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, "Engineering Mechanics", 5th Edition, McGraw Hill Higher Education, 2013.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

24CE1301	FLUID MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the students about properties and behavior of the fluids under static conditions.
- To impart basic knowledge of the dynamics of fluids through the control volume.
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends.

UNIT I	FLUIDS PROPERTIES AND FLUID STATICS	9

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Continuum hypothesis - System and Control volume approach - Reynolds's transportation theorem - Fluid properties - Fluid statics –surface tension - viscosity - Manometry - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies.

UNIT II	BASIC CONCEPTS OF FLUID FLOW	9

Kinematics: Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; Dynamics : Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation - Application to Pipe bends - Moment of momentum equation.

UNIT III	DIMENSIONAL ANALYSIS AND MODEL STUDIES	9

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV	INCOMPRESSIBLE VISCOUS FLOW	9

Reynolds experiment - Laminar flow in pipes and between parallel plates - Development of laminar and turbulent flows in pipes - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Total energy line - Hydraulic grade line - Siphon - Pipes in series and parallel - Equivalent pipes.

UNIT V	BOUNDARY LAYERS	9

Definition of boundary layers - Laminar and turbulent boundary layers - Displacement, momentum and energy thickness - Momentum integral equation - Applications - Separation of boundary layer - Drag and Lift forces.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate the difference between solid and fluid, its properties and behavior in static conditions.

CO2: Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.

CO3: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.

CO4: Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO5: Explain the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.

TEXT BOOKS :

1. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2015.

2. Streeter, V.L. Wylie, E. B. and Bedford K.W, "Fluid Mechanics". (9th Ed.) Tata McGraw Hill,New Delhi, 1998.

REFERENCE BOOKS:

1. S K Som; Gautam Biswas and S Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Pani B S, "Fluid Mechanics: A Concise Introduction", Prentice Hall of India Private Ltd, 2016.
3. Jain A. K. "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 2014.
4. Narayana Pillai N. "Principles of Fluid Mechanics and Fluid Machines", (3rd Ed.) University Press (India) Pvt. Ltd. 2009.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

24CE1302	CONSTRUCTION MATERIALS AND TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce students to various construction materials and the techniques that is commonly used in civil engineering construction.

UNIT I	STONES - BRICKS - CONCRETE BLOCKS - LIME	9

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

UNIT II	OTHER MATERIALS	9

Timber - Market forms - Plywood - Veneer - False ceiling materials - Steel - Mechanical treatment - Aluminum - Uses - Market forms - Glass - Ceramics - Refractory's - Composite Materials - Types and applications - FRP - Fiber textiles - Geo membranes and Geo textiles for earth reinforcement.

UNIT III	CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS	9

Types of Foundations- Stone Masonry - Brick Masonry - Cavity Walls - Diaphragm Walls - Formwork - Centering and Shuttering - Shoring - Scaffolding - Underpinning - Roofing - Flooring - Joints in concrete - Fire Protection - Thermal Insulation - Ventilation and Air conditioning - Acoustics and Sound Insulation - Damp Proofing.

UNIT IV	CONSTRUCTION EQUIPMENTS	9

Selection of equipment for earthwork excavation, concreting, material handling and erection of structures - Dewatering and pumping equipment.

UNIT V	CONSTRUCTION PLANNING	9

Introduction to construction planning - Scheduling for activities - Critical path method (CPM) and PERT network modeling and time analysis - Case illustrations.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Identify the good quality brick, stone and blocks for construction..

CO2: Recognize the market forms of timber, steel, aluminum and applications of various composite materials.

CO3: Identify the best construction and service practices such as thermal insulations and air Conditioning of the building.

CO4: Select various equipments for construction works conditioning of building.

CO5: Understand the construction planning and scheduling techniques.

TEXT BOOKS :

1. Varghese.P.C, "Building Materials", Second Edition PHI Learning Ltd., 2015.
2. Arora S.P and Bindra S.P "Building construction", Dhanpat Rai and sons, 2013.

REFERENCE BOOKS:

1. Varghese.P.C, "Building Construction", Second Edition PHI Learning ltd., 2016.
2. Punmia , B.C "Building construction" , Laxmi publication (p)ltd..,2008.
3. Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., "Construction Planning Equipment and Methods", Tata McGraw-hill, 2011.
4. Srinath L.S., "PERT and CPM -Principles and applications", Affiliated East West Press 2001.

CO-PO-PSO MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
2	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
3	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
4	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
5	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

24CE1303	SURVEYING AND LEVELING	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world problems.
- To introduce the concepts of Control Surveying.
- To introduce the basics of Astronomical Surveying.

UNIT I	FUNDAMENTALS OF CONVENTIONAL SURVEYING	9

Definition - Classifications - Basic principles - Equipment and accessories for ranging and chaining - Methods of ranging - Well conditioned triangles - Chain traversing - Compass - Basic principles - Types - Bearing - System and conversions - Sources of errors and Local attraction - Magnetic declination - Dip - compass traversing.

UNIT II	LEVELING	9

Level line - Horizontal line - Datum - Benchmarks - Levels and staves - Temporary and permanent adjustments - Methods of leveling - Fly leveling - Check leveling - Procedure in leveling

UNIT III	THEODOLITE SURVEYING	9

Heights and distances - Tacheometric surveying - Stadia Tacheometry - Tangential Tacheometry - Trigonometric leveling - Single Plane method - Double Plane method.

UNIT IV	CONTROL SURVEYING AND ADJUSTMENT	9

Horizontal and vertical control - Methods - Triangulation - Traversing - Gale‘s table - Trilateration - Concepts of measurements and errors - Error propagation and Linearization - Adjustment methods - Least square methods - Angles, lengths and levelling network.

UNIT V	MODERN SURVEYING	9

Total Station: Digital Theodolite, EDM, Electronic field book - Advantages - Parts and accessories - Working principle - Observables - Errors - GPS: Advantages - System components - Signal structure - Selective availability and anti-spoofing receiver components and antenna.

THEORY : 45 PERIODS

PRACTICAL EXERCISES : 30 PERIODS

LIST OF EXPERIMENTS:

Chain Survey

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

Compass Survey

1. Compass Traversing - Measuring Bearings & arriving included angles.

Leveling - Study of levels and leveling staff

1. Fly leveling using Dumpy level &Tilting level.
2. Check leveling.

Theodolite - Study of Theodolite

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

COURSE OUTCOMES:

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

CO1: Introduce the rudiments of various surveying and its principles.

CO2: Imparts knowledge in computation of levels of terrain and ground features.

CO3: Imparts concepts of Theodolite Surveying for complex surveying operations.

CO4: Understand the procedure for establishing horizontal and vertical control.

CO5: Imparts the knowledge on modern surveying instruments.

TOTAL : 75 PERIODS

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 Vidyarthi Griha Prakashan, Pune, 2008.

REFERENCE BOOKS:

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, Mc Graw Hill 2001.
3. Bannister and S. Raymond, "Surveying", Seventh Edition, Longman 2004.
4. S. K. Roy, "Fundamentals of Surveying", Second Edition, Prenticeˆ Hall of India 2010.
5. K. R. Arora, "Surveying Vol I & II", Standard Book house, Twelfth Edition 2013.
6. C. Venkatramaiah, "Textbook of Surveying", Universities Press, Second Edition, 2011.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

24CE1304	MATERIALS TESTING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop skills to test various construction materials.

LIST OF EXPERIMENTS:

I. TESTS ON CEMENT

a. Determination of consistency of cement.
b. Determination of specific gravity of cement.
c. Determination of initial and final setting time of cement.

II. TESTS ON FINE AGGREGATE

a. Determination of specific gravity and water absorption of fine aggregate.
b. Determination of grading of fine aggregate.

III. TESTS ON COARSE AGGREGATE

a. Determination of impact value of coarse aggregate.
b. Determination of elongation index of coarse aggregate.
c. Determination of flakiness index of coarse aggregate.
d. Determination of aggregate crushing value of coarse aggregate.
e. Determination of specific gravity.

IV. TESTS ON BRICKS

a. Determination of compressive strength of bricks.
b. Determination of water absorption of bricks.
c. Determination of efflorescence of bricks.

V. TESTS ON WOOD

a. Determination of compressive strength of wood.

COURSE OUTCOMES:

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

CO1: Determine the mechanical properties of cement.
CO2: Determine the physical properties of fine aggregate.
CO3: Determine the physical properties of coarse aggregate.
CO4: Determine the workability and compressive strength of brick.
CO5: Determine the strength of wood.

TOTAL : 60 PERIODS

CO-PO-PSO MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	2	1	2	2	1	1	1	3	1	2	2
2	2	1	1	1	1	2	2	2	1	2	2	3	2	2	2
3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
4	3	3	3	3	3	2	2	3	3	3	3	2	3	3	3
5	2	3	3	3	3	2	2	3	2	2	2	3	2	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

24GE0310	PROFESSIONAL DEVELOPMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered.
- To create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

LIST OF EXPERIMENTS:

1. **MS WORD:**
   a. Create and format a document
   b. Working with tables
   c. Working with Bullets and Lists
   d. Working with styles, shapes, smart art, charts
   e. Inserting objects, charts and importing objects from other office tools
   f. Creating and Using document templates
   g. Inserting equations, symbols and special characters
   h. Working with Table of contents and References, citations
   i. Insert and review comments
   j. Create bookmarks, hyperlinks, endnotes footnote
   k. Viewing document in different modes
   l. Working with document protection and security
   m. Inspect document for accessibility
2. **MS EXCEL:**
   a. Create worksheets, insert and format data
   b. Work with different types of data: text, currency, date, numeric etc.
   c. Split, validate, consolidate, Convert data Sort and filter data
   d. Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,) Work with Lookup and reference formulae
   e. Create and Work with different types of charts Use pivot tables to summarize and analyse data Perform data analysis using own formulae and functions
   f. Combine data from multiple worksheets using own formulae and built-in functions to generate results
   g. Export data and sheets to other file formats Working with macros
   h. Protecting data and Securing the workbook
3. **MS POWERPOINT:**
   a. Select slide templates, layout and themes
   b. Formatting slide content and using bullets and numbering

c. Insert and format images, smart art, tables, charts
d. Using Slide master, notes and handout master
e. Working with animation and transitions, Organize and Group slides
f. Import or create and use media objects: audio, video, animation
g. Perform slideshow recording and Record narration and create presentable videos

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

CO1: Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements.

CO2: Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding.

CO3: Use MS EXCEL to create and work with different types of charts use pivot tables to summarize and analyze data perform data analysis using own formula and functions.

CO4: Use MS PowerPoint to create high quality academic presentations by including common tables, charts and graphs.

CO5: Use MS PowerPoint to create high quality academic presentations by including Interlinking other elements, and using media objects.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

SEMESTER IV

24CE1401	APPLIED HYDRAULICS ENGINEERING	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To impart basic knowledge to the students about the open channel flows with analysis of uniform flow, gradually varied flow and rapidly varied flow and to expose them to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, Centrifugal and Reciprocating pumps.

UNIT I	UNIFORM FLOW	9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Sub-critical, Super-critical and Critical flow - Velocity distribution in open channel - Steady uniform flow: Chezy's equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II	VARIED FLOWS	9

Dynamic equations of gradually varied - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method - Change in Grades.

UNIT III	RAPIDLY VARIED FLOWS	9

Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Positive and Negative surges

UNIT IV	TURBINES	9

Turbines - Classification - Impulse turbine - Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitations - Performance of turbine - Specific speed - Runaway speed - Minimum Speed to start the pump.

UNIT V	PUMPS	9

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation's in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work done.

THEORY : 45 PERIODS

PRACTICAL EXERCISES : 30 PERIODS

LIST OF EXPERIMENTS:

A. FLOW MEASUREMENT

1. Flow through Orifice meter/mouthpiece, Venturimeter and Notches.
2. Bernoulli's Experiment.

B. LOSSES IN PIPES

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

C. PUMPS

1. Characteristics of centrifugal pumps.
2. Characteristics of reciprocating pumps.

D. TURBINES

1. Characteristics of Pelton wheel turbine.

2. Characteristics of Francis turbine.

E. DETERMINATION OF METACENTRIC HEIGHT

1. Determination of metacentric height of floating bodies.

COURSE OUTCOMES:

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

CO1: Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application.

CO2: Analyze steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.

CO3: Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges.

CO4: Design turbines and explain the working principle.

CO5: Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.

TOTAL : 75 PERIODS

TEXT BOOKS :

1. Jain. A.K., "Fluid Mechanics", Khanna Publishers, Delhi, 2010.
2. Chandramouli P N, "Applied Hydraulic Engineering", Yes Dee Publisher, 2017.

REFERENCE BOOKS:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 19th edition, 2013.
3. Mays L. W., "Water Resources Engineering", John Wiley and Sons (WSE), New York, 2019.
4. Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2010.

CO-PO-PSO MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	2	1	2	2	1	1	1	3	1	2	2
2	2	1	1	1	1	2	2	2	1	1	2	3	2	2	2
3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
4	3	3	3	3	3	2	2	3	3	2	3	2	3	3	3
5	2	3	3	3	3	2	2	3	2	2	2	3	2	2	2

1 – low, 2 – medium, 3 – high, '-' – no correlation

24CE1402	STRENGTH OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamental concepts of Stress in simple and complex states and to know the mechanism of load transfer in beams and the induced stresses due to simple bending and unsymmetrical bending and to determine the deformation in determinate beams and to know the basic concepts of analysis of indeterminate beams.

UNIT I	SIMPLE AND COMPOUND STRESSES	9

Stresses in simple and compound bars – Thermal stresses – Elastic constants –Biaxial state of stress – Principal stresses and principal planes – Mohr's circle of stresses – Torsion on circular shafts.

UNIT II	BENDING OF BEAMS	9

Types of beams and transverse loadings- Shear force and bending moment for simply supported, cantilever and over-hanging beams – Theory of simple bending – Bending stress distribution – Shear stress distribution.

UNIT III	DEFLECTION OF BEAMS	9

Double Integration method – Macaulay's method – Area moment method - Conjugate beam method – Strain energy method for determinate beams.

UNIT IV	INDETERMINATE BEAMS	9

Propped Cantilever and Fixed Beams - Fixed end moments reactions, slope and deflection for standard cases of loading - - Continuous beams - support reactions and moments - Theorem of three moments - Shear Force and Bending Moment Diagrams.

UNIT V	THEORIES OF FAILURE AND CYLINDERS	9

Unsymmetrical bending of beams – shear center applied – Thin cylindrical, and shells Thick cylinders -Thick cylinders – Theories of failure - Principal stress, principal strain, shear stress, strain energy and distortion energy theories - application problems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the concepts of stress and strain, principal stresses and principal planes.

CO2: Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

CO3: Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.

CO4: Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements.

CO5**:** Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and study the various theories of failure.

TEXT BOOKS :

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S. Chand & company Ltd., New Delhi, 2018.
2. Rattan. S.S. "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

3. Punmia .B.C., Ashok Kumar Jain and Arun Kumar Jain, ”Theory of Structures (SMTS) Vol – II”, Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Basavarajiah and Mahadevapa, “Strength of Materials”, University press, Hyderabad, 2016.
5. Vazirani.V.N, Ratwani.M.M, Duggal .S.K “Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1”, Khanna Publishers, New Delhi 2014.

REFERENCE BOOKS:

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

CO-PO-PSO MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	2	3	1	2	2	2	1	3	3	3	3
2	3	3	3	3	2	3	1	2	2	2	1	3	3	3	3
3	3	3	3	3	2	3	1	2	2	2	1	3	3	3	3
4	3	3	3	3	2	3	1	2	2	2	1	3	3	3	3
5	3	3	3	3	2	3	1	2	2	2	1	3	3	3	3

1 – low, 2 – medium, 3 – high, ‘-‘ – no correlation

24CE1403	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the properties of concrete making materials.
- To have better knowledge about the chemical and mineral admixtures in concrete.
- To familiarize with the IS method of mix design as per the latest code.
- To understand the fresh and hardened properties of concrete.
- To know the importance and applications of special concretes.

UNIT I	CONSTITUENT MATERIALS	9

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

UNIT II	CHEMICAL AND MINERAL ADMIXTURES	9

Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline –Their effects on concrete properties.

UNIT III	PROPORTIONING OF CONCRETE MIX	9

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

UNIT IV	FRESH AND HARDENED PROPERTIES OF CONCRETE	9

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS – Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity.

UNIT V	SPECIAL CONCRETES	9

Light weight concretes – High strength concrete – Fibre reinforced concrete - Ferrocement – Ready mix concrete – SIFCON – Shotcrete - Polymer concrete – High performance concrete- self compacting concrete – Geopolymer Concrete.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the requirements of cement, aggregates and water for concrete.
CO2: Select suitable admixtures for enhancing the properties of concrete.
CO3: Design concrete mixes as per IS method of mix design.
CO4: Determine the properties of concrete at fresh and hardened state.
CO5: Know the importance of special concretes for specific requirements.

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.

REFERENCE BOOKS:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995.
2. Gambhir. M.L. "Concrete Technology", Fifth Edition, McGraw Hill Education, 2017.
3. Job Thomas., "Concrete Technology", Cencage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019, "Recommended Guidelines for Concrete Mix Design", Bureau of Indian Standards, New Delhi.

CO-PO-PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-' – no correlation

24CE1404	SOIL MECHANICS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils.
- To impart knowledge of design of both finite and infinite slopes.

UNIT I	SOIL CLASSIFICATION AND COMPACTION	9

History - formation and types of soil - composition – Index properties - clay mineralogy structural arrangement of grains - description - Classification - BIS - US - phase relationship - Compaction - theory - laboratory and field technology - field Compaction method - factors influencing compaction.

UNIT II	EFFECTIVE STRESS AND PERMEABILITY	9

Soil – water - Static pressure in water – Effective stress concepts in soils - Capillary phenomena- Permeability - Darcy's law - Determination of Permeability – field measurement pumping out in unconfined and confined aquifer - Factors influencing permeability of soils - Seepage – Two dimensional flow.

UNIT III	STRESS DISTRIBUTION AND SETTLEMENT	9

Stress distribution in homogeneous and isotropic medium - Boussinesq of theory - (Point load, Live load and udl)- Components of settlement - Immediate and consolidation settlement - Factors influencing settlement - Terzaghi's one dimensional consolidation theory - Computation of rate of settlement.

UNIT IV	SHEAR STRENGTH	9

Shear strength of cohesive and cohesion less soils - Mohr-Coulomb failure theory - shear strength – Direct shear, Triaxial compression- Pore pressure parameters.

UNIT V	SLOPE STABILITY	9

Infinite slopes and finite slopes – Friction circle method – Use of stability number- Slope protection measures.

THEORY : 45 PERIODS

PRACTICAL EXERCISES : 30 PERIODS

LIST OF EXPERIMENTS:

1. DETERMINATION OF INDEX PROPERTIES

a. Specific gravity of soil solids
b. Grain size distribution - Sieve analysis
c. Liquid limit, Plastic limit and Shrinkage limit tests.

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

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

3. DETERMINATION OF ENGINEERING PROPERTIES

a. One dimensional consolidation test (Determination of Co-efficient of consolidation only)
b. Direct shear test in cohesion less soil
c. Laboratory vane shear test in cohesive soil
d. California Bearing Ratio Test

TOTAL : 75 PERIODS

COURSE OUTCOMES:

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

CO1: classify the soil and assess the engineering properties, based on index properties.
CO2: Understand the stress concepts in soils.
CO3: Understand and identify the settlement in soils.
CO4: Determine the shear strength of soil.
CO5: Analyze both finite and infinite slopes.

TEXT BOOKS :

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

REFERENCE BOOKS:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of IndiaPvt. Ltd. New Delhi, 2010.
3. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India PrivateLimited, 8thEdition, 2014.
4. Palanikumar.M. "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private LimitedDelhi, 2013.
5. Craig.R.F. "Soil Mechanics", E & FN Spon, London and New York, 2012.
6. Purushothama Raj. P., "Soil Mechanics and Foundations Engineering", 2nd Edition, Pearson Education, 2013.
7. Venkatramaiah.C. "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017.

CO-PO-PSO MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	2	2	3	1	1	1	2	1	2	3	3	3	2
2	3	2	3	2	3	1	1	1	2	1	2	3	2	2	3
3	3	3	2	2	2	2	1	1	2	1	2	3	2	2	3
4	2	3	3	2	2	1	1	1	1	1	2	3	2	2	3
5	3	3	2	2	2	1	1	1	1	1	1	3	2	3	2

1 – low, 2 – medium, 3 – high, '-' – no correlation

24CE1405	HIGHWAY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and Methods.

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	GEOMETRIC DESIGN OF HIGHWAYS	9

Cross sectional elements – Sight distances - Horizontal curves, Super elevation, transition curves, widening at curves - Vertical curves – Gradients, Special consideration for hill roads – Hairpin bends - Lateral and vertical clearance at underpasses

UNIT III	DESIGN OF FLEXIBLE AND RIGID PAVEMENTS	9

Pavement components and their role – Design principles –Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.

UNIT IV	HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE	9

Highway construction materials, properties, testing methods - CBR Test for subgrade – tests on aggregate & bitumen - Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials - Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) - Quality control measures – Highway drainage - - Construction machineries.

UNIT V	EVALUATION AND MAINTENANCE OF PAVEMENTS	9

Pavement distress in flexible and rigid pavements - Types of maintenance - Pavement Management Systems – Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements - Strengthening of pavements – Highway Project formulation.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Get knowledge on planning and aligning of highway.
CO2: Geometric design of highways.
CO3: Design flexible and rigid pavements.
CO4: Gain knowledge on Highway construction materials, properties, testing methods.
CO5: Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.

TEXT BOOKS :

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. “Highway Engineering”, Nemchand Publishers, 2014.
2. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, Scitech Publications (India), Chennai, 2020.
3. Kadiyali.L.R. “Principles and Practice of Highway Engineering”, Khanna Technical Publications, 8th edition Delhi, 2022.

REFERENCE BOOKS:

1. Indian Road Congress (IRC), "Guidelines for the Design of Flexible Pavements", (Third Revision), IRC: 37-2012.
2. Indian Road Congress (IRC), "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", (Third Revision), IRC: 58-2012.
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012.
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA, 2011.
5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011.
6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.

CO-PO-PSO MAPPING:

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

1 – low, 2 – medium, 3 – high, '-' – no correlation

24CE1406	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

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

PRACTICAL EXERCISES:

1. Tension test on steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

CO1: The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

CO2: The students will have the required knowledge about calculate the deflection of beams used in different materials by different methods.

CO3: Equip the students with the ability to experimentally determine the mechanical properties.

CO4: The students will have the required knowledge in the material behavior under the various loading conditions.

CO5: Analyze and select the suitable materials for engineering design and applications.

TEXT BOOKS:

1. Basavarajiah and Mahadevapa, "Strength of Materials", University press, Hyderabad, 2016.
2. Vazirani.V.N, Ratwani.M.M, Duggal .S.K "Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1", Khanna Publishers, New Delhi 2014.

REFERENCE BOOKS:

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

CO-PO-PSO MAPPING:															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	3	2	1	1	1	1	3	3	1	3	3	3	2
2	2	1	3	2	1	1	1	1	3	3	1	3	3	3	2
3	3	1	3	2	1	1	1	1	3	3	1	3	3	3	2
4	3	1	3	2	1	1	1	1	3	3	1	3	3	3	2
5	3	1	3	2	1	1	1	1	3	3	1	3	3	3	2
1 - low, 2 - medium, 3 - high, '-' - no correlation															

24CE1407	CONCRETE TECHNOLOGY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To familiarize with the IS method of mix design as per the latest code.
- To understand the fresh and hardened properties of concrete. To know the importance and applications of special concretes

LIST OF EXPERIMENTS:

TESTS ON FRESH CONCRETE

1.Workability test on Slump cone
2. Vee-Bee consistometer test
3. Flow table test
4. Compaction factor test

TESTS ON HARDENED CONCRETE

5. Compression strength test
6. Split tensile test
7. Flexure test
8. Rebound Hammer test
9. Ultrasonic Pulse Velocity test

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the requirements of cement, aggregates and water for concrete.
CO2: Determine the properties of concrete at fresh and hardened state.
CO3: Know the importance of special concretes for specific requirements.
CO4: Understand the importance of workability of concrete.
CO5: Understand the strength requirements of concrete.

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.

REFERENCE BOOKS:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995.
2. Gambhir.M.L. "Concrete Technology", Fifth Edition, McGraw Hill Education, 2017.
3. Job Thomas., "Concrete Technology", Cencage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019 "Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards", New Delhi.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation

24GE0411	SOFT SKILLS I	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop students' comprehensive understanding and effective use of English grammar.
- To enhance students' analytical and logical thinking abilities.
- To make sense of problems, develop strategies to find solutions and persevere in solving them.
- To reason, model, and draw conclusion so make decision with mathematical, statistical, and quantitative information.
- To understand the fundamental principles of C programming.

UNIT I	ENGLISH PHASE I	12

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension Ordering.

UNIT II	LOGICAL REASONING PHASE I	12

Deductive Reasoning - Coding Deductive Logic, Directional Sense, Blood Relations, Objective Reasoning, Selection Decision Tables, Puzzles.

UNIT III	QUANTITATIVE REASONING PHASE I	12

Numbers- HCF & LCM of Numbers - Decimal Fractions - Simplification - Square Roots & Cube Roots - Average - Problems on Numbers - Problems on Ages - Surds & Indice.

UNIT IV	NUMERACY SKILLS PHASE I	12

Pipes & Cisterns - Problems on Trains - Boats & Streams - Allegation or Mixture - Simple Interest - Compound Interest -Logarithms - Area -Volume & Surface Areas.

UNIT V	CODING PROFICIENCY PHASE I	12

Introduction to C Programming - Operators and Expressions - Control Structures - Functions.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop vocabulary for effective communication and reading skills.
CO2: Build the logical reasoning and quantitative skills.
CO3: Solve various concepts of number systems and their techniques in solving the HCF, LCM factors and decimals.
CO4: Solve the problems on pipes and cisterns, simple interest, compound interest, growth and depreciation.
CO5**:**Understand the fundamental principles of structured programming and apply them to write efficient and error-free C programs.

TEXT BOOKS :

1. Dr. R. S Aggarwal, "A Modern Approach to Verbal and Non-Verbal Reasoning", Revised Edition, S. Chand Publications.
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Fourth Edition, McGraw Hill Publications.
3. Y. Kanetkar, "Let Us C", 16thed., BPB Publications, 2016.
4. R.Gopalan & V. Rajagopalan, "English for Competitive Examinations", Second Edition, Shorff Publishers.

REFERENCE BOOKS:

1. U. Mohan Rao, "Quantitative Aptitude for Competitive Examinations", Scitech Publications Pvt Ltd, India.
2. Dinesh Khattar, "The Pearson Guide to Quantitative Aptitude for Competitive Examinations", Third Edition, Pearson Education Pvt Ltd, India, 2016.
3. E. Balagurusamy, "*Programming in ANSI C"*, 7th ed., McGraw Hill Education, 2017.
4. "Logical Reasoning for Competitive Examinations", Veranda RACE Publications,2022.
5. "General English for Competitive Examinations", Veranda Learning Solutions Ltd, Volume-2, 2022.

CO-PO-PSO MAPPING:

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

1 - low, 2 - medium, 3 - high, '-' - no correlation