THAMIRABHARANI ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

REGULATIONS 2024

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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	24MA0306	Linear Algebra and Numerical Methods	BSC	3	1	0	4	4
2	24AD6301	C and Data Structures	PCC	3	0	0	3	3
3	24AD6302	Fundamentals of Data Science	PCC	3	0	0	3	3
4	24AD6303	Artificial Intelligence	PCC	3	0	0	3	3
5	24AD6304	Operating Systems	PCC	3	0	0	3	3
PRACTICALS								
6	24AD6305	C and Data Structures Laboratory	PCC	0	0	4	4	2
7	24AD6306	Data Science Laboratory	PCC	0	0	4	4	2
8	24AD6307	Artificial Intelligence Laboratory	PCC	0	0	4	4	2
9	24AD6308	Linux Administration Laboratory	PCC	0	0	4	4	2
			TOTAL	**15**	**1**	**16**	**32**	**24**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24MA0407	Probability and Statistics	BSC	3	1	0	4	4
2	24AD6401	Data Exploration and Visualization	PCC	3	0	0	3	3
3	24AD6402	Machine Learning	PCC	3	0	0	3	3
4	24AD6403	Database Design and Management	PCC	3	0	0	3	3
5	24CS5401	Design and Analysis of Algorithms	PCC	3	0	0	3	3
PRACTICALS								
6	24AD6404	Machine Learning Laboratory	PCC	0	0	4	4	2
7	24AD6405	Database Design and Management Laboratory	PCC	0	0	4	4	2
8	24AD6406	Data Exploration and Visualization Laboratory	PCC	0	0	4	4	2
8	24GE0412	Soft Skills I	EEC	0	0	4	4	2
TOTAL				**15**	**1**	**16**	**32**	**24**

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24AD6501	Deep Learning	PCC	3	0	0	3	3
2	24CS5404	Computer Networks	PCC	3	0	2	5	4
3	24AD6502	Data and Information Security	PCC	3	0	0	3	3
4	24AD6503	Full Stack Development	PCC	3	0	0	3	3
5	24HS0505	English for Competitive Examinations	HSMC	3	0	0	3	3
6	24AD65XX	Professional Elective I	PEC	3	0	0	3	3
PRACTICALS								
7	24AD6504	Deep Learning Laboratory	PCC	0	0	4	4	2
8	24AD6505	Full Stack Development Laboratory	PCC	0	0	4	4	2
			TOTAL	**18**	**0**	**10**	**28**	**23**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24AD6601	Big Data Analytics	PCC	3	0	2	5	4
2	24CS5601	Distributed Computing	PCC	3	0	0	3	3
3	24AD6602	Predictive Analytics	PCC	3	0	2	5	4
4	24AD66XX	Professional Elective II	PEC	3	0	0	3	3
5	24OXX6XX	Open Elective I	OEC	3	0	0	3	3
PRACTICALS								
6	24AD6603	Societal Oriented Project	EEC	0	0	4	4	2
7	24GE0614	Soft Skills II	EEC	0	0	4	4	2
			TOTAL	**15**	**0**	**12**	**27**	**21**

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	24AD6701	MLOPS	PCC	3	0	2	5	4
2	24AD6702	Business Intelligence	PCC	3	0	2	5	4
3	24AD67XX	Professional Elective III	PEC	3	0	0	3	3
4	24AD67XX	Professional Elective IV	PEC	3	0	0	3	3
5	24AD67XX	Open Elective II	OEC	3	0	0	3	3
PRACTICALS								
6	24AD6703	Capstone Project Work I	EEC	0	0	6	6	3
7	24AD6704	Internship	EEC	0	0	0	0	2
			TOTAL	**15**	**0**	**10**	**25**	**22**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	24AD6801	Capstone Project Work II	EEC	0	0	16	16	8

TOTAL CREDITS: 168

PROFESSIONAL ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	24AD6506	Natural Language Processing	PEC	3	0	0	3	3
2	24AD6507	Recommender Systems	PEC	3	0	0	3	3
3	24AD6508	Social Networks	PEC	3	0	0	3	3
4	24AD6509	Web Technologies for Advanced Data Visualization	PEC	3	0	0	3	3
5	24AD6510	Reinforcement Learning	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	24AD6604	Distributed AI	PEC	3	0	0	3	3
2	24AD6605	Game Design and Development	PEC	3	0	0	3	3
3	24AD6606	AI for Industrial Applications	PEC	3	0	0	3	3
4	24AD6607	Ethics in AI	PEC	3	0	0	3	3
5	24AD6608	Computational Intelligence	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	24AD6705	Social, Text and Media Analytics	PEC	3	0	0	3	3
2	24AD6706	Optimization Techniques	PEC	3	0	0	3	3
3	24AD6707	Image and Video Analytics	PEC	3	0	0	3	3
4	24AD6708	Healthcare Analytics	PEC	3	0	0	3	3
5	24AD6709	Blockchain Technologies	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	24AD6710	Maritime AI	PEC	3	0	0	3	3
2	24AD6711	Metaverse	PEC	3	0	0	3	3
3	24AD6712	AI for Robotics	PEC	3	0	0	3	3
4	24AD6713	AI in Cyber Security	PEC	3	0	0	3	3
5	24AD6714	Generative AI	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	24OPH601	Nanomaterials for Engineers	OEC	3	0	0	3	3
2	24OCY601	Water Technology for Industries	OEC	3	0	0	3	3
3	24OEC601	Electronics Engineering	OEC	3	0	0	3	3
4	24OEC602	Wireless Technologies	OEC	3	0	0	3	3
5	24OEE601	Energy Technology	OEC	3	0	0	3	3
6	24OEE602	Batteries and Management System	OEC	3	0	0	3	3
7	24OEE603	Sensors and Actuators	OEC	3	0	0	3	3
8	24OCE601	Air and Noise Pollution Control Engineering	OEC	3	0	0	3	3
9	24OCE602	Solid and Hazardous Waste Management	OEC	3	0	0	3	3
10	24OME601	Manufacturing Technology	OEC	3	0	0	3	3
11	24OME602	Hydraulic and Pneumatic Machines	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	24OHS701	English for Engineers	OEC	3	0	0	3	3
2	24OCY701	Chemistry of Products	OEC	3	0	0	3	3
3	24OEC701	Consumer Electronics	OEC	3	0	0	3	3
4	24OEC702	Principles of Modern Communication System	OEC	3	0	0	3	3
5	24OEE701	Electric and Hybrid Vehicles	OEC	3	0	0	3	3
6	24OEE702	Energy Conservation and Management	OEC	3	0	0	3	3
7	24OCE701	Rehabilitation/Heritage Restoration	OEC	3	0	0	3	3
8	24OCE702	Prefabricated Structures	OEC	3	0	0	3	3
9	24OCE703	Airports and Harbours	OEC	3	0	0	3	3
10	24OME701	Reverse Engineering	OEC	3	0	0	3	3
11	24OME702	Sustainable Manufacturing	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	-	-	-	**6**	**10**
2	BSC	12	9	4	4	-	-	-	-	**17**	**29**
3	ESC	5	11	-	-	-	-	-	-	**10**	**16**
4	PCC	-	-	20	18	17	11	8	-	**44**	**74**
5	PEC	-	-	-	-	3	3	6	-	**7**	**12**
6	OEC	-	-	-	-	-	3	3	-	**3.5**	**6**
7	EEC	1	1	-	2	-	4	5	8	**12.5**	**21**
8	Non-Credit/ Mandatory	-	-	-	-	-	-	-	-	**0**	**-**
Total		**22**	**24**	**24**	**24**	**23**	**21**	**22**	**8**	**100**	**168**

Legends

HSMC	Humanities, Social Sciences and Management Courses
BSC	Basic Sciences Courses
ESC	Engineering Sciences Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
EEC	Employability Enhancement Courses

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

24MA0306	LINEAR ALGEBRA AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand vector spaces and its basis and dimension.
- To understand the linear maps between vector spaces and their matrix representations.
- To understand the diagonalization of a real symmetric matrix.
- To understand Inner product spaces and its projections.
- To understand numerical techniques for solving linear systems, eigenvalue problems and generalized inverses.

UNIT I	VECTOR SPACES	9+3

Vector Spaces - Subspaces - Linear Combinations - Linear Span - Linear Dependence - Linear Independence - Bases and Dimensions (statement only).

UNIT II	LINEAR TRANSFORMATIONS	9+3

Linear Transformation - Null Space, Range Space - Dimension Theorem (statement only) - Matrix and Representation of Linear Transformation – Eigen values and Eigen vectors of Linear Transformation -Diagonalization of Linear Transformation

UNIT III	INNER PRODUCT SPACES	9+3

Inner Products and Norms - Inner Product Spaces - Orthogonal Vectors - Gram Schmidt Orthogonalization Process (statement only) - Orthogonal Complement - Least Square Approximations.

UNIT IV	NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS	9+3

Solution of Linear System of Equations - Direct Methods: Gauss Elimination Method - Pivoting, Gauss Jordan Method – Iterative Methods: Gauss-Jacobi Method, Gauss-Seidel Method, Eigen values of a matrix by Power Method.

UNIT V	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	9+3

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 Adam's – Bash Forth Predictor Corrector Methods for Solving first order equations.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Solve system of linear equations using matrix operations and vector spaces.

CO2: Understand the linear maps between vector spaces and its utilities.

CO3: Apply the concept of inner product of spaces in solving problems.

CO4: Understand the common numerical methods for approximate solutions.

CO5: Analyze and evaluate the accuracy of common numerical methods.

TEXT BOOKS

1. Williams, G, "Linear Algebra with Applications", Jones & Bartlett Learning, First Indian Edition, New Delhi, 2019.
2. Faires, J. D. and Burden, R., "Numerical Methods", Brooks/Cole (Thomson Publications), Fourth Edition, New Delhi, 2012.

REFERENCE BOOKS:

1. Friedberg, S. H., Insel, A. J. and Spence, E., "Linear Algebra", Pearson Education, Fifth Edition, New Delhi, 2018.
2. Bernard Kolman and David R. Hill, "Introductory Linear Algebra", Pearson Education, First Reprint, New Delhi, 2010.
3. Kumaresan, S., "Linear Algebra - A geometric approach", Prentice - Hall of India, 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	3	3	-	-	-	-	-	3	-	-	-
2	3	3	2	3	3	3	-	-	-	-	-	3	-	-	-
3	3	3	2	3	3	3	-	-	-	-	-	3	-	-	-
4	3	3	2	3	3	3	-	-	-	-	-	3	-	-	-
5	3	3	2	3	3	3	-	-	-	-	-	3	-	-	-

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

24AD6301	C AND DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of C programming and control structures.
- To develop proficiency in using functions, arrays, pointers, and file handling.
- To learn the concepts of linear data structures and their implementations.
- To explore non-linear data structures like trees and hashing techniques.
- To understand graph structures and apply traversal and path-finding algorithms.

UNIT I	C PROGRAMMING PHASE I	9

Getting started with C – Instructions – Decision control structure - Loop Control Structure – Case control structure – Preprocessor

UNIT II	C PROGRAMMING PHASE II	9

Functions & pointers - Arrays – Strings – Structures – File Input/Output

UNIT III	LINEAR DATA STRUCTURES	9

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly-Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications

UNIT IV	NON-LINEAR DATA STRUCTURES	9

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – AVL Tree - Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing.

UNIT V	GRAPH STRUCTURES	9

Graph ADT - Representations of Graph - Graph Traversals - Shortest Paths - Minimum Spanning Trees – Applications - Introduction to NP-Completeness

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Write structured programs in C using various control constructs.

CO2: Implement functions, arrays, pointers, and file operations in C.

CO3: Apply linear data structures for problem solving.

CO4: Build and manipulate trees, AVL trees, and hashing mechanisms.

CO5: Represent and traverse graphs using standard algorithms.

TEXT BOOKS:

1. Yashavant Kanetkar, “Let Us C”, Nineteenth Edition, BPB Publications, 2023.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. Reema Thareja, “Data Structures using C”, Third Edition, Oxford University Press, 2023.

2. Paul J. Deitel, Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, “Fundamentals of Data Structures”, Galgotia, 2008.

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	-	-	-	1	-	1	2	2	2	1
2	2	2	3	-	3	-	-	-	2	-	1	2	1	1	1
3	3	2	3	-	3	-	-	-	1	-	1	2	1	1	1
4	3	3	3	-	3	-	-	-	1	-	1	2	1	1	1
5	3	3	3	-	3	-	-	-	1	-	1	2	1	1	1

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

24AD6302	FUNDAMENTALS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python.

UNIT I	INTRODUCTION	9

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications – Basic Statistical descriptions of Data

UNIT II	DESCRIBING DATA	9

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

UNIT III	DESCRIBING RELATIONSHIPS	9

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r^2 –multiple regression equations –regression towards the mean

UNIT IV	DATA HANDLING AND MODEL EVALUATION	9

Data aggregation – Data Transformation: merging datasets, reshaping data – Data enrichment: missing values - Normalization - Cross-validation techniques - Accuracy metrics for evaluation of models – Contingency table, ROC curve, Precision-recall curves - A/B testing

UNIT V	DATA ANALYTICS	9

Introduction- Information-based learning- Handling alternative feature selection - Impurity metrics -Continuous descriptive features and targets- Similarity-based learning- Feature space - Predicting continuous targets-Error based learning- Measuring Error-Error surfaces

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the data science process and basic statistical concepts.

CO2: Summarize and describe data using tables, graphs, and averages.

CO3: Analyze relationships using correlation and regression techniques.

CO4: Represent the useful information using mathematical skills

CO5: Can apply the knowledge for data describing and visualization using tools.

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016 (Chapter 1 and 2).
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

REFERENCE BOOKS:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, "Fundamentals of Data Science", CRC Press, 2022.
3. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.
4. Vineet Raina, Srinath Krishnamurthy, "Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice", Apress, 2021.

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	-	-	-	-	2	-	2	3	2	-
2	3	3	2	2	2	-	-	-	-	-	-	2	3	2	-
3	3	3	3	2	3	-	-	-	-	2	-	3	3	3	2
4	3	3	3	2	3	-	-	-	-	-	2	3	3	3	2
5	2	3	2	2	3	-	-	-	-	2	2	3	3	3	3

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

24AD6303	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide students with a strong foundation in the core principles of Artificial Intelligence.
- To equip students with the knowledge and skills to implement adversarial search strategies.
- To cultivate students' proficiency in using lower-order logics for reasoning within AI.
- To prepare students to apply AI planning methods and natural language processing
- To design simple AI applications across various domains, such as chatbots, AI assistants, and expert systems.

UNIT I	INTELLIGENT AGENTS AND SEARCH TECHNIQUES	9

Foundations of AI: Importance of AI, Evolution of AI, Applications of AI – Agents and Environments – The Nature of Environments – The Structure of Agents – Problem Solving by Search – Uninformed Search– Informed State Space Search – Heuristic Search: Greedy – A* Search – Constraint Satisfaction Problems

UNIT II	ADVERSARIAL SEARCH AND KNOWLEDGE REPRESENTATION	9

Game Search - Min-max Search, Heuristic Alpha-Beta Tree Search, Knowledge Representation Issues – Approaches for Knowledge Representation: Simple Relational Knowledge – Inherited Knowledge – Semantic Nets – Frames – Semantic Web – Ontology.

UNIT III	REASONING WITH LOWER ORDER LOGICS	9

Logical Agent – Proposition Logic – Syntax and Semantics – Theorem Proving – Model Checking – Inference in First Order Logic: Forward Chaining – Backward Chaining – Resolution.

UNIT IV	AI PLANNING AND NATURAL LANGUAGE PROCESSING	9

Classical Planning – Types – Partial Order Planning – Graph Plan and SAT Plan – Natural Language Processing Basics: Syntax – Semantics – Introduction to Statistical NLP.

UNIT V	APPLICATIONS IN AI	9

Applications of AI – Chatbot: types, architecture – AI assistants – Recommendation system – Expert systems: medical, commerce, societal application - Autonomous driving - AI in security

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the foundations of AI and apply search techniques

CO2: Implement adversarial search algorithms and techniques.

CO3: Develop the ability to construct and manipulate logical agents.

CO4: Gain proficiency in classical AI planning methods and understand the basics of natural language processing.

CO5: Explore and apply AI concepts to real-world applications.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2008.
3. Xufei Huang, *"*Chatbot: Design, Architecture, and Applications*"*, Senior Capstone Thesis, University of Pennsylvania, School of Engineering and Applied Science, May 3, 2021
4. Valavanidis, Athanasios. (2023). "Artificial Intelligence (AI) Applications. The most important technology we ever develop and we must ensure it is safe and beneficial to human civilization", Scientific Reviews, Vol.1, pp. 1-49.

REFERENCE BOOKS:

1. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013.
2. Mohammad Mustafa Taye, *"*Understanding Semantic Web and Ontologies: Theory and Applications*"*, arXiv preprint arXiv:1006.4567 [cs.AI], June 23, 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	1	3	3	-	-	-	-	2	3	3	1	2	1	1
2	2	2	1	1	1	-	-	-	2	2	3	1	3	2	2
3	2	1	2	1	-	-	-	-	2	1	1	3	1	2	1
4	2	1	2	2	-	-	-	-	2	1	2	2	1	3	3
5	3	2	2	1	1	-	-	-	3	2	1	2	2	2	1

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

24AD6304	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the architecture of computer.
- To analyze various process scheduling algorithms.
- To understand various process synchronization methods.
- To analyze various memory management schemes.
- To be familiar with I/O management and File systems.

UNIT I	FUNDAMENTALS OF COMPUTERS	9

Structure of a Computer System - Design; Assembly Language – Basics; Processor Design – Design of Basic Processor – Units in a Processor – The control unit; Principles of pipelining – Design – Stages – Hazards.

UNIT II	PROCESS SCHEDULING	9

Operating –System Structures - Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; Threads – Multicore Programming - Multithreading Models - Threading issues; CPU Scheduling - Scheduling criteria - Scheduling algorithms – Multiple processor scheduling

UNIT III	PROCESS SYNCHRONIZATION AND DEADLOCK	9

Process Synchronization - The critical-section problem - Peterson's Solution - Synchronization hardware - Semaphores - Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT IV	MEMORY MANAGEMENT	9

Main Memory – Swapping – Contiguous Memory Allocation – Segmentation – Paging – Structure of page table – Intel 32 and 64 bit architectures; Virtual Memory - Demand Paging - Copy on Write - Page Replacement - Allocation of Frames - Thrashing.

UNIT V	STORAGE MANAGEMENT	9

Mass Storage system - Disk Structure - Disk Scheduling and Management - Swap-Space Management; File-System Interface; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems - I/O Hardware - Kernel I/O subsystem - Transforming I/O Requests to Hardware Operations

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the architecture of computer.

CO2: Analyze various scheduling algorithms

CO3: Explain process synchronization and deadlock concepts.

CO4: Compare and contrast various memory management schemes

CO5: Explain the functionality of file systems and I/O systems.

TEXT BOOKS:

1. Smruti R. Sarangi, "Computer Organisation and Architecture", McGrawHill, 2015. (Chapter- 1, 3, 9, 10)
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2018. (Chapter- 2 to 13)

REFERENCE BOOKS:

1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.
3. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.
4. William Stallings, "Computer Organization and Architecture - Designing for Performance", Tenth Edition, Pearson Education, 2016.

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	1	-	-	-	-	1	1	1	2	2	1	2
2	2	3	1	3	1	-	-	-	3	2	2	3	3	3	1
3	2	2	3	3	2	-	-	-	3	1	1	2	1	1	1
4	2	2	1	2	1	-	-	-	1	3	2	1	1	1	2
5	2	3	3	2	1	-	-	-	3	1	2	1	3	1	2

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

24AD6305	C AND DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand control structures and logic building in C
- To explore modular programming using functions, pointers, and macros.
- To implement file handling and structure-based data storage.
- To apply linear and non-linear data structures in C programs.
- To solve problems using trees, graphs, and their traversal algorithms.

LIST OF EXPERIMENTS:

1. Write a program using if-else, switch-case, and loops (for, while, do-while) to perform various numerical operations.
2. Demonstrate the use of macros, #define, #include, and conditional compilation in a C program.
3. Write a C program to swap two variables using call-by-value and call-by-reference (pointers).
4. Develop a program to manage student records using arrays, strings, and structures.
5. Create a program to read from and write to a file, count the number of lines, words, and characters.
6. Implement stack operations (push, pop, display) using arrays and demonstrate its application in expression evaluation.
7. Implement insertion and deletion in singly and circular linked lists.
8. Write programs for queue and priority queue operations using arrays and/or linked lists.
9. Create a binary search tree and implement in-order, pre-order, and post-order traversal.
10. Represent a graph using adjacency matrix/list and perform BFS and DFS.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Write efficient C programs using decision and loop constructs.
CO2: Use pointers, structures, and file operations effectively
CO3: Implement and apply stack, queue, and linked list operations.
CO4: Build and traverse binary trees for structured data access.
CO5: Represent and explore graphs using standard traversal methods

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	-	-	-	1	-	1	2	2	2	1
2	2	2	3	-	3	-	-	-	2	-	1	2	1	1	1
3	3	2	3	-	3	-	-	-	1	-	1	2	1	1	1
4	3	3	3	-	3	-	-	-	1	-	1	2	1	1	1
5	3	3	3	-	3	-	-	-	1	-	1	2	1	1	1

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

24AD6306	DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To introduce and explore core Python libraries essential for data science workflows.
- To develop skills in data acquisition, preprocessing, and exploratory data analysis.
- To enable learners to apply statistical techniques and interpret data.
- To equip students with regression modeling and evaluation techniques for analytics.
- To train students in feature selection, similarity-based learning, and performance assessment of models.

LIST OF EXPERIMENTS:

1. Install and explore the core Python libraries (NumPy, SciPy, Pandas, Statsmodels, and Jupyter Notebook) used in data science. Understand their individual roles and how they integrate to support data analysis workflows.
2. Read data from CSV, Excel, and web sources using Pandas. Analyze the Iris dataset to perform basic descriptive statistics and explore data using head(), describe(), and visualization commands.
3. Create and manipulate Pandas DataFrames to perform indexing, slicing, filtering, merging, grouping, and generating pivot tables. Practice handling missing data and computing summary statistics.
4. Analyze univariate characteristics of the Diabetes and Pima Indians datasets. Compute frequency, mean, median, mode, variance, standard deviation, skewness and Kurtosis to summarize individual variables.
5. Perform bivariate and multivariate regression (linear and logistic) on Diabetes and Pima datasets. Build regression models and compare their effectiveness using error metrics and R^2 values across both datasets.
6. Compute correlation coefficients and visualize relationships using scatter plots. Develop regression models and interpret the regression line, standard error of estimate, and R^2 values.
7. Given a dataset with missing values and multiple features, perform data normalization and data transformation.
8. Apply cross-validation to evaluate the performance of a predictive model, and use accuracy metrics such as ROC curves and precision-recall curves to assess the model’s effectiveness.
9. Using a dataset with continuous and categorical features, apply feature selection techniques to identify the most relevant features for predicting a continuous target.
10. Implement a similarity-based learning method and evaluate the model's performance by measuring errors and analyzing error surfaces to refine the model's accuracy.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply Python libraries (NumPy, Pandas, SciPy, Statsmodels) to perform data analysis and manipulation.

CO2: Analyze and visualize structured datasets using descriptive statistics and advanced plotting tools.

CO3: Apply descriptive and inferential statistical methods on real-world datasets.

CO4: Build and evaluate regression and classification models using appropriate metrics.

CO5: Perform feature selection and model validation using cross-validation and error analysis techniques.

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	2	3	-	-	-	-	2	2	3	3	3	2	1
2	1	2	1	2	2	-	-	-	1	2	3	1	3	2	1
3	2	2	2	2	2	-	-	-	3	1	1	2	2	3	1
4	2	3	1	3	2	-	-	-	2	3	1	2	2	1	3
5	3	1	1	1	2	-	-	-	1	2	2	3	2	2	1

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

24AD6307	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand and explore the fundamentals of Artificial Intelligence through practical tool-based learning.
- To implement various AI search strategies using Python programming.
- To analyze problem-solving approaches using real-world scenarios like games and puzzles.
- To apply decision-making techniques in constraint satisfaction problems.
- To develop basic AI applications using classical algorithms and open-source AI tools.

LIST OF EXPERIMENTS:

1. Study Experiment – AI tools: Working and Installation.
2. Write a program to implement heuristic search procedure.
3. Design a program to implement depth limited search.
4. Write a program to implement Bidirectional Search.
5. Write a program to implement search problem of 3 x 3 puzzles.
6. Write a program to implement Hangman game.
7. Write a program to implement tic-tac-toe game for O and X.
8. Write a program to implement water jug problem.
9. Program to implement A* / AO* algorithm.
10. Implementation of n-Queens problem.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply heuristic and uninformed search strategies to solve defined problems.

CO2: Design and develop AI models for puzzles, games, and problem-solving.

CO3: Implement decision-based systems like A*, AO*, and water jug algorithms.

CO4: Demonstrate understanding of classical AI through hands-on programming.

CO5: Use open-source AI tools to build simple and intelligent applications.

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	3	–	–	–	–	2	–	3	3	3	3
2	3	3	3	2	3	–	–	–	2	2	–	3	3	3	3
3	3	3	3	2	3	2	–	2	2	3	–	3	3	3	3
4	3	2	3	2	3	–	–	–	2	3	3	3	3	2	2
5	3	2	3	2	2	2	2	3	3	3	3	3	3	3	3

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

24AD6308	LINUX ADMINISTRATION LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand the fundamentals in system installation and configuration.
- To develop proficiency in command-line interface usage for user and system management.
- To configure networking, remote access, and security policies for system administration.
- To implement service and package management, backup operations.
- To analyze logs and system performance to troubleshoot issues.

LIST OF EXPERIMENTS:

1. Installation of Linux operating system.
   a. Partitioning drives
   b. Configuring boot loader
   c. Network configuration
   d. Setting time zones, creating password and user accounts
2. Explore the shell interface, check the current system's status, and learn how to access help on unknown commands.
   a. Open the terminal and determine your current directory, username, and system hostname.
   b. Display the current date and calendar.
   c. Use the manual (man) and --help options to explore commands like ls, pwd, and uname.
   d. Clear the screen after each task.
3. Create a folder structure for storing team reports. Organize the files into folders based on teams and project categories, move files into appropriate directories, and clean up unused files.
   a. Create directories for HR, Finance, and Tech.
   b. Within each, create a Reports folder.
   c. Create dummy files using touch, copy them between folders using cp, and move them using mv.
   d. Delete unwanted files or empty directories.
   e. Use cat, more, less, head, and tail to view contents.
4. An organization has hired three new employees. The Linux admin, have to create user accounts, add them to a group named developers, and configure an environment variable to store the project path for every new user.
   a. Create user accounts with useradd and set passwords.
   b. Create a group called developers and add users to it using usermod.
   c. Use the id command to verify group membership.
   d. Edit .bashrc to export a variable PROJECT_PATH=/home/shared/project.
5. Admin need to configure file access so that only the developers group can read and write project files. Others should not have any access. Additionally, a file must be shared with specific read-only access for another user.
   a. Create a project.txt file and set its permissions to 770 using chmod.
   b. Change its ownership to a developer using chown.

c. Set umask appropriately so new files default to restricted access.
d. Use setfacl to allow another user to read the file, and verify with getfacl.

6. A recent system crash needs investigation. The objective is to search logs for error messages, identify the service that failed, and document the event with a timestamp.
   a. Use journalctl and dmesg to scroll through logs.
   b. Use grep to filter logs for “error”, “fail”, or service names.
   c. Document the findings in a report using cat > report.txt.
7. A secondary disk has been added to the system. Disk need to be mounted for data backup and compress backup files for storage efficiency.
   a. Identify the new disk using lsblk.
   b. Mount it temporarily using mount, and verify using df -h.
   c. Create sample files and compress them using tar, gzip, or zip.
   d. Unmount the disk using umount.
8. Admin need to automate a backup script to run daily at midnight and configure firewall rules to allow SSH and HTTP while blocking others.
   a. Write a shell script to copy files to a backup location.
   b. Schedule it using crontab -e for 12:00 AM.
   c. Enable firewall using firewalld or ufw, allow ports 22 and 80, and deny all others.
   d. List rules to verify configuration.
9. Configure and Manage System Services Using system. The objective is to ensure specific services are enabled at boot, monitor their status, and create a custom service for a script.
   a. List all active and inactive services using systemctl list-units --type=service.
   b. Enable and start the cron or cups service using systemctl enable and start.
   c. Create a shell script (/usr/local/bin/hello.sh) that writes a timestamp to a file every minute.
   d. Create a custom systemd service file in /etc/systemd/system/hello.service to manage the script.
   e. Reload systemd with systemctl daemon-reexec and enable the new service.
   f. Verify execution by checking the output file and service logs using journalctl -u hello
10. Monitor Resource Usage and Manage Processes. The objective is to track system resource usage, identify heavy processes, and manage them appropriately.
    a. Use top, htop, or ps aux to list running processes and identify top memory/CPU consumers.
    b. Use nice and renice to adjust process priority.
    c. Kill a test process safely using kill, pkill, or killall.
    d. Create a script that logs memory and CPU usage every 5 seconds for 1 minute and stores it in usage.log.
    e. Use vmstat, iostat, and free -h to get snapshots of system performance

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Install and configure Linux systems with essential components including partitions, users, and network.

CO2: Execute fundamental shell commands to manage files, directories, and system information.

CO3: Manage users, groups, permissions, and access control to secure system resources.

CO4: Monitor system processes, configure services, and automate administrative tasks using scripts.

CO5: Troubleshoot errors using logs, configure remote access, and manage backup and firewall settings

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	–	–	–	–	–	–	2	–	2	–
2	3	2	–	–	3	–	–	–	–	2	–	2	–	2	–
3	3	2	2	–	3	2	–	2	–	–	–	2	2	3	2
4	3	3	2	2	3	–	–	–	2	2	2	3	3	3	-
5	3	3	2	2	3	–	2	2	–	2	–	3	3	3	2

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

SEMESTER IV

24MA0407	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To familiarize the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I	PROBABILITY AND RANDOM VARIABLES	9+3

Probability - Conditional probability - Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential distribution

UNIT II	TWO - DIMENSIONAL RANDOM VARIABLES	9+3

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and linear regression - Transformation of random variables

UNIT III	SAMPLING AND ESTIMATION	9+3

Sampling distributions - Basic knowledge on Random variable, simple random, stratified and cluster sampling - Testing of Hypothesis-concepts- Point estimation and interval estimation.

UNIT IV	THEORY OF INFERENCE	9+3

Large sample tests - test for single and difference proportions, single mean and difference of means, difference of variances confidence intervals, small sample tests - student's t test, F-test, Chi-square test on theory of goodness of fit and analysis of independence of attributes.

UNIT V	DESIGN OF EXPERIMENTS	9+3

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand fundamental probability concepts and standard distributions.

CO2: Comprehend one- and two-dimensional random variables and their application in engineering.

CO3: Apply hypothesis testing for small and large samples in real-life problems.

CO4: Apply design of experiments concepts in agriculture and statistical quality control.

CO5: Understand sampling distributions and statistical techniques for engineering and management problems.

TEXT BOOKS

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCE BOOKS:

1. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", 2020.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S. M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M. R., Schiller. J. and Srinivasan, R. A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

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	-	-	2	-	-	-
2	3	3	-	-	-	-	-	-	3	-	-	2	-	-	-
3	3	3	-	-	-	-	-	-	3	-	-	2	-	-	-
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

24AD6401	DATA EXPLORATION AND VISUALIZATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use data exploration and visualization techniques for multivariate and time series data.

UNIT I	EXPLORATORY DATA ANALYSIS	9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulation

UNIT II	VISUALIZING USING MATPLOTLIB	9

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT III	UNIVARIATE ANALYSIS	9

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing - Inequality - Smoothing Time Series.

UNIT IV	BIVARIATE ANALYSIS	9

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines - Transformations.

UNIT V	MULTIVARIATE AND TIME SERIES ANALYSIS	9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data - Fundamentals of TSA - Characteristics of time series data - Data Cleaning - Time-based indexing - Visualizing - Grouping - Resampling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of exploratory data analysis.

CO2: Implement the data visualization using Matplotlib.

CO3: Perform univariate data exploration and analysis.

CO4: Apply bivariate data exploration and analysis.

CO5: Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016.
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Eric Pimpler, "Data Visualization and Exploration with R", Geo Spatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 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	1	3	3	-	-	-	-	2	3	3	3	2	2	2
2	2	2	2	1	1	-	-	-	3	2	3	1	3	1	3
3	2	1	2	1	1	-	-	-	3	2	1	2	2	2	1
4	2	2	2	1	-	-	-	-	1	2	1	3	1	3	2
5	3	1	1	2	1	-	-	-	3	2	1	2	2	2	3

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

24AD6402	MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified.

UNIT I	INTRODUCTION TO MACHINE LEARNING	9

Introduction to Machine Learning (ML) - Essential concepts of ML - Data understanding, representation and visualization

UNIT II	SUPERVISED LEARNING	9

Linear Models for Regression - Linear Models for Classification - Decision trees - Support Vector Machines

UNIT III	REINFORCEMENT AND UNSUPERVISED LEARNING	9

Reinforcement learning - Exploration and Exploitation - Theory of Reinforcement Learning - Unsupervised learning

UNIT IV	NEURAL NETWORKS AND LINEAR DISCRIMINANTS	9

The Brain and The Neuron – Neural Networks – The Perceptron – Linear Separability – Linear Regression

UNIT V	DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS	9

Featurization - Designing and Tuning Model pipelines - Performance Measurement

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the basic concepts of machine learning.

CO2: Construct supervised learning models.

CO3: Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models.

CO5: Apply machine learning models.

TEXT BOOKS:

1. Ameet V Joshi, “Machine Learning and Artificial Intelligence”, Springer Publications, 2020.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer Publications, 2011.

REFERENCE BOOKS:

1. Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, “Foundations of Machine Learning”, Second Edition, MIT Press, 2018.
2. Sebastain Raschka and Vahid Mirjalili, “Python Machine Learning”, Packt publishing, 3rd 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	2	1	2	1	-	-	-	-	3	3	2	2	2	2	1
2	1	3	3	1	2	-	-	-	2	2	2	1	3	1	1
3	2	1	3	3	2	-	-	-	1	1	1	1	1	2	1
4	2	3	3	2	1	-	-	-	3	2	3	2	1	2	1
5	1	1	3	3	1	-	-	-	3	1	1	3	3	3	2

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

24AD6403	DATABASE DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand database development life cycle and conceptual modeling.
- To learn SQL for data definition, manipulation and querying a database.
- To learn relational database design using conceptual mapping and normalization.
- To learn transaction concepts and serializability of schedules.
- To assess advanced database concepts and technologies, including data warehousing, distributed databases, and NoSQL databases.

UNIT I	RELATIONAL DATABASES	9

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL.

UNIT II	DATABASE DESIGN	9

Entity-Relationship Model – ER Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III	TRANSACTION MANAGEMENT	9

Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols - Timestamp-Based Protocols – Deadlock Handling – Recovery System – Failure Classification – Recovery Algorithm - ARIES.

UNIT IV	IMPLEMENTATION TECHNIQUES	9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization

UNIT V	NO-SQL DATABASES	9

Need for NoSQL - Characteristics of NoSQL - Key-Value Database - Columnar Databases - Apache Cassandra – ClickHouse - Document Databases - MongoDB: CRUD Operations with MongoDB - MongoDB JDBC Connectivity - MongoDB Testing - Graph Databases - Metabase

THEORY : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the database development life cycle and apply conceptual modeling.

CO2: Apply SQL and programming in SQL to create, manipulate and query the database.

CO3: Apply the conceptual-to-relational mapping and normalization to design relational database.

CO4: Determine the serializability of any non-serial schedule using concurrency techniques.

CO5: Describe and differentiate the principles and common features of the distributed, and NoSQL databases

TEXT BOOKS:

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 6th Edition, Tata McGraw Hill, 2011.
2. Shakuntala Gupta Edward and Navin Sabharwal, "Practical MongoDB: Architecting, Developing, and Administering MongoDB", Apress, 2015.

REFERENCE BOOKS:

1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation, and Management", Sixth Edition, Global Edition, Pearson Education, 2015.
2. Han, Kamber, Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier-Morgan Kauffmann, 2012.
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson, 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	2	3	3	-	-	-	-	3	1	2	1	2	3	3
2	2	3	1	3	1	-	-	-	1	2	2	1	3	3	3
3	2	2	2	1	1	-	-	-	2	3	1	2	1	1	2
4	2	2	3	1	-	-	-	-	1	2	1	2	2	2	2
5	3	1	3	2	1	-	-	-	1	3	1	1	2	1	1

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

24CS5401	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To analyze iterative improvement technique to solve optimization problems.
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT I	INTRODUCTION	9

Notion of an Algorithm - Fundamentals of Algorithmic Problem Solving - Important Problem Types -Fundamentals of the Analysis of Algorithm Efficiency.

UNIT II	BRUTE FORCE AND DIVIDE AND CONQUER	9

Brute-Force String Matching - Exhaustive Search. Divide and Conquer Methodology - Multiplication of Large Integers and Strassen's Matrix Multiplication - Closest-Pair and Convex - Hull Problems. Decrease and Conquer - Topological Sorting - Transform and Conquer: Presorting - Heaps and Heap Sort.

UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9

Dynamic programming - Principle of optimality - Change-making problem - Warshall's and Floyd's algorithms - Optimal Binary Search Trees - Knapsack Problem and Memory functions. Greedy Technique - Dijkstra's algorithm - Huffman Trees and codes.

UNIT IV	ITERATIVE IMPROVEMENT	9

The Simplex Method - The Maximum-Flow Problem - Maximum Matching in Bipartite Graphs - The Stable marriage Problem.

UNIT V	LIMITATIONS OF ALGORITHM POWER	9

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking - Branch and Bound - Approximation Algorithms for NP-Hard Problems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Analyze the efficiency of recursive and non-recursive algorithms.

CO2: Evaluate brute force, divide and conquer, and other algorithmic techniques.

CO3: Solve problems using dynamic programming and greedy methods.

CO4: Use iterative techniques for optimization.

CO5: Solve problems using backtracking and branch-and-bound methods.

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2019.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

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	1	1	-	-	-	1	1	2	2	3	2	1
2	2	1	1	3	2	-	-	-	2	2	1	2	2	2	2
3	3	2	1	2	2	-	-	-	2	1	1	2	1	3	3
4	3	2	3	2	2	-	-	-	3	3	3	2	2	1	2
5	3	1	2	3	3	-	-	-	2	2	2	2	3	1	3

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

24AD6404	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand the datasets and apply suitable algorithms for selecting the appropriate features.
- To implement supervised machine learning algorithms on standard datasets and evaluate it.
- To implement unsupervised machine learning algorithms on datasets and evaluate it.
- To build the graph based learning models for standard data sets.
- To compare the performance of ML algorithms based on the application.

LIST OF EXPERIMENTS:

1. Create an Image Classifier Using Teachable Machine. Train and test an image classifier using webcam or system images.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
6. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
7. Write a program to construct a Bayesian network to diagnose CORONA infection using standard WHO Data Set.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit datapoints. Select an appropriate data set for your experiment and draw graphs.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply algorithms to select the right features for analysis.

CO2: Implement and evaluate supervised machine learning algorithms on standard datasets.

CO3: Apply and evaluate unsupervised machine learning algorithms on standard datasets.

CO4: Build graph-based learning models for standard datasets.

CO5: Assess and compare the performance of different ML algorithms.

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	2	1	-	-	-	-	1	2	3	3	3	2	1
2	2	1	1	3	2	-	-	-	3	2	3	2	3	1	1
3	2	2	1	1	2	-	-	-	1	1	1	1	2	3	3
4	2	2	3	3	2	-	-	-	1	2	1	1	1	2	2
5	2	2	3	1	2	-	-	-	3	1	1	1	2	1	2

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

24AD6405	DATABASE DESIGN AND MANAGEMENT LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand the database development life cycle
- To learn database design using conceptual modeling and normalization
- To implement database using DDL, DML and SQL programming.
- To implement database applications using IDE/RAD tools.

LIST OF EXPERIMENTS:

Design a Project for the following applications (Not limited to)

- Food Ordering System
- Movie Ticket Booking System
- Parking System
- Hotel Room Booking System

1. ER Diagrams
   Create an Entity Relationship model for the above applications
2. SQL Queries
   Develop the SQL Queries using the following commands for the database:
   a. DDL commands – Create, Alter (Add, Modify, Rename), Truncate, Drop commands
   b. DML commands – Insert, Update, and Delete commands
   c. DQL commands – Select and its basic operations
   d. DCL commands – Commit, Rollback, and Savepoint operations
   e. TCL commands – Grant and Revoke operations for the different users
3. Implementation of Key Constraints
   Build the Integrity Constraints – UNIQUE, NOT NULL, AUTO_INCREMENT, PRIMARY KEY, FOREIGN KEY, CHECK, DEFAULT constraints for the given databases
4. Advanced SQL Queries
   Implementation of Aggregate Functions
   a. Find the total count of all the records in the table
   b. Find the average value of a specific column in the table
   c. Find the maximum/min/sum value of a specific column in the table
   d. Find the count of all distinct values in a specific column in the table
5. Implementation of GROUP BY Clause
   a. Find the average/max/min/sum of all values of a specific column for each group of records in the table
   b. Find the count/average/max/min of all records in the table grouped by multiple columns
6. Implementation of ORDER BY Clause
   a. Sort the list of all records in the table by multiple columns/specific columns in ascending or descending order
   b. Find the top/bottom 10 records in the table sorted by a specific column/multiple columns

c. Find the list of all records in the table sorted by a specific column/multiple columns and limited to a certain range

7. Implementation of String Functions
   a. Find the length of characters in a specific string
   b. Find the leftmost/rightmost portion of a specific string up to a certain character or length
   c. Find the specific portion of a string extracted using a regular expression pattern
   d. Find the specific string with all occurrences of a certain character or pattern replaced with another character or string
   e. Find the specific string converted to uppercase or lowercase
   f. Find the specific string with leading or trailing whitespace characters removed
   g. Find the specific string with a certain character or substring removed or replaced
   h. Find the specific string with a certain character or substring added at a certain position
   i. Find the specific string with all occurrences of a certain substring concatenated with another substring
8. Implementation of Date Function
   a. Find the current date and time in MySQL
   b. Find the day of the week for a specific date in MySQL
   c. Find the month/year for a specific date in MySQL
   d. Find the difference between two specific dates in MySQL
   e. Find the date in MySQL after adding/subtracting a specific number of days to a specific date
   f. Find the number of days/average time between two specific dates in MySQL
   g. Find the earliest or latest date in a specific column of the table in MySQL
9. Implementation of Nested Queries
   a. Find the maximum/min/count/sum/average/distinct count value of a specific column in the table for a specific subset of records using a nested query
   b. Find the average/max/sum/count/min value of a specific column in the table where the value of another column is equal to a specific value selected using a nested query
   c. Find the maximum value of a specific column in the table for a specific subset of records selected using a nested query within another nested query.
10. Implementation of Joins

    Find the result of an inner/left/right/full outer/cross join between two/multiple tables on a specific column in MySQL
11. Construction of Index

    Create an index for the database and show the comparative analysis of query execution time with and without using an index for the given scenario
12. Implementation of Views
    a. Perform the DDL, DML, and DQL operations on the views and check the consistency of the relations
    b. Create different types of views and their categories of the REFRESH command
    c. Implement the materialized views with Aggregate and Join queries PL/SQL

13. PL/SQL

Develop a program in PL/SQL using BEFORE/AFTER trigger, row-level and statement-level trigger, and INSTEAD OF trigger

a. Develop a program in PL/SQL using BEFORE/AFTER trigger, row and statement trigger, and INSTEAD OF trigger
b. Create a trigger and check for the BEFORE/AFTER insertion, update, and deletion operations in the table

14. NoSQL

a. Implementation of MongoDB application and CRUD operations
b. Command to create a collection and a document in MongoDB
c. Command to insert/update/delete a document in a MongoDB collection
d. Command to query a MongoDB collection to retrieve documents that meet certain criteria
e. Command to use aggregation pipelines to perform more complex queries in MongoDB
f. Command to create an index in MongoDB to improve query performance.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the database development life cycle.
CO2: Design relational database using conceptual-to-relational mapping and normalization.
CO3: Apply SQL for creation, manipulation and retrieval of data.
CO4: Apply normalization techniques.
CO5: Develop a database applications for real-time problems.

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	3	-	-	-	-	1	1	1	3	2	2	1
2	2	2	1	3	1	-	-	-	3	2	3	1	1	1	2
3	2	1	3	1	-	-	-	-	3	3	1	1	2	1	1
4	2	2	3	1	-	-	-	-	2	3	2	1	2	1	2
5	2	3	1	3	1	-	-	-	1	3	2	3	3	3	2

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

24AD6406	DATA EXPLORATION AND VISUALIZATION LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To introduce tools for data analysis and visualization such as Python, R, Tableau, and Power BI.
- To develop skills in performing exploratory data analysis (EDA) on various datasets.
- To enable learners to clean, manipulate, and visualize data using programming and GUI-based tools.
- To familiarize students with time series and geographic data visualization techniques.
- To encourage application of EDA techniques in real-world mini projects and case studies

LIST OF EXPERIMENTS:

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data
3. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc.
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report
10. Develop data exploration and visualization for an application - Mini Project

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Install and operate data analysis tools

CO2: Perform exploratory data analysis on structured and unstructured datasets.

CO3: Apply data cleaning, transformation, and visualization.

CO4: Conduct time series and map-based visual analysis for spatial and temporal insights.

CO5: Develop and present a mini project with comprehensive data exploration and visualization outputs.

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	3	-	-	1	1	2	3	3	3	2	2	2
2	2	2	2	1	1	-	1	1	3	2	3	1	3	1	3
3	2	1	2	1	1	-	1	1	3	2	1	2	2	2	1
4	2	2	2	1	1	-	1	1	1	2	1	3	2	2	3
5	3	1	1	2	1	-	1	1	2	2	2	2	2	2	2

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

24GE0412	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 basics in web development.

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 I	12

Logical Reasoning - Phase I 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

HTML5 structure and elements - CSS basics, Flexbox, Grid, responsive design - JavaScript - DOM manipulation, event handling - Basic form validation and data handling

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 script programming and develop web applications.

TEXT BOOKS:

1. Dr. R S Aggarwal, "A Modern Approach to Verbal and Nonverbal Reasoning", Revised Editions, S. Chand Publications.
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Fourth Edition, McGraw Hill Publications.
3. Vasan Subramanian, "Pro Mern Stack, Full Stack Web App Development with Mongo, Express, React and Node", Second edition, Apress, 2019.
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. Chris Northwood, "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", Apress, First Edition, 2018.
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	1	3	2	3	-	-	-	-	-	-	2	-	-	-

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