ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS AFFLIATED COLLEGES
CHOICE BASED CREDIT SYSTEM
REGULATION - 2021
B.E ELECTRICAL AND COMPUTER ENGINEERING
CURRICULUM FOR I & VIII SEMESTERS AND I & II SYLLABUS
SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	IP3151	Induction Programme	-	-			-	-
THEORY								
2	HS3152	Professional English I	HSMC	3	0	0	3	3
3	MA3151	Matrices and Calculus	BSC	3	1	0	4	4
4	PH3151	Engineering Physics	BSC	3	0	0	3	3
5	CY3151	Engineering Chemistry	BSC	3	0	0	3	3
6	CS3251	Programming in C	ESC	3	0	0	3	3
7	GE3152	தமிழர் மரபு / Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
8	CS3271	Programming in C Laboratory	ESC	0	0	4	4	2
9	BS3171	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10	GE3172	English Laboratory$	EEC	0	0	2	2	1$
			TOTAL	16	1	10	27	22

$ Skill based course

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	HS3252	Professional English II	HSMC	2	0	0	2	2
2	MA3202	Linear Algebra and Numerical Methods	BSC	3	1	0	4	4
3	CP3201	Problem Solving and Python Programming	ESC	3	0	3	6	4.5
4	BE3255	Basic Civil and Mechanical Engineering	ESC	3	0	0	3	3
5	GE3251	Engineering Graphics	ESC	2	0	4	6	4
6	CP3202	Electric Circuit Analysis	PCC	3	0	2	5	4
7		NCC Credit Course Level 1#		2	0	0	2	2*
8	GE3252	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1	1
PRACTICALS								
9	GE3271	Engineering Practices Laboratory	ESC	0	0	4	4	2
10	GE3272	Communication Laboratory / Foreign Language$	EEC	0	0	4	4	2
			TOTAL	19	1	17	37	26.5

#NCC credit course level1 is offered for NCC students only. The grades earned by the students will be recorded in the mark sheet, however the same shall

not be considered for the computation of CGPA.

$ Skill based course

SEMESETER III

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Probability and Statistics	BSC	3	1	0	4	4
2		Electromagnetic fields	PCC	3	0	0	3	3
3		Software Engineering	PCC	3	0	0	3	3
4		Analog and Digital Electronics	PCC	4	0	0	4	4
5		Data Structures	PCC	3	0	0	3	3
6		Signals and Systems	PCC	3	0	0	3	3
PRACTICALS								
7		Analog and Digital Electronics laboratory	PCC	0	0	3	3	1.5
8		Professional Development $	EEC	0	0	2	2	1
9		Data Structures Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**19**	**1**	**8**	**28**	**24**

$ - skill based course.

SEMESTER IV

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Environmental Science and Sustainability	BSC	2	0	0	2	2
2		Discrete Mathematics	BSC	3	0	0	3	3
3		Object Oriented Programming	PCC	3	0	0	3	3
4		Electrical Machines	PCC	3	0	0	3	3
5		Microprocessor and Microcontroller	PCC	3	0	2	5	4
6		Database Management Systems	PCC	3	0	0	3	3
7		NCC Credit course level 2[#]		3	0	0	3	3[&&]
PRACTICALS								
8		Database Management Systems Laboratory	PCC	0	0	3	3	1.5
9		Object Oriented Programming laboratory	PCC	0	0	3	3	1.5
10		Electrical Machines laboratory	PCC	0	0	3	3	1.5
			TOTAL	**20**	**0**	**11**	**31**	**22.5**

NCC credit course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER V

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Power Systems I	PCC	3	0	0	3	3
2		Power Electronics	PCC	3	0	0	3	3
3		Control Systems	PCC	3	0	0	3	3
4		Operating Systems	PCC	3	0	0	3	3
5		Professional Elective I	PEC	3	0	0	3	3
6		Professional Elective II	PEC	3	0	0	3	3
7		Computer Architecture		3	0	0	3	3
8		Mandatory Course I	MC	3	0	0	3	Non-credit course
PRACTICALS								
9		Power Electronics Laboratory	PCC	0	0	3	3	1.5
10		Operating Systems Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**21**	**0**	**6**	**30**	**24**

& Mandatory course-I is a Non-credit course (Student Shall select one course from the list given under MC-I)

SEMESTER VI

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Artificial Intelligence and Machine learning	PCC	3	0	0	3	3
2		Measurement & Instrumentation	PCC	3	0	0	3	3
3		Open Elective – I *	OEC	3	0	0	3	3
4		Power Systems II	PCC	3	0	0	3	3
5		Professional elective III	PEC	3	0	0	3	3
6		Professional Elective IV	PEC	3	0	0	3	3
7		Professional Elective V	PEC	3	0	0	3	3
8		Mandatory Course II	MC	3	0	0	3	Non-credit course
9		NCC Credit course level 3		3	0	0	3	3*
PRACTICALS								
10		Computer Aided Electrical System Laboratory	PCC	0	0	4	4	2
			TOTAL	**24**	**0**	**4**	**31**	**23**

& Mandatory course-II is a Non-credit course (Student Shall select one course from the list given under MC-II)
#NCC credit course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER VII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Electrical Drives	PCC	3	0	0	3	3
2		Human Values and Ethics	HSMC	2	0	0	2	2
3		Elective – Management &	HSMC	3	0	0	3	3
4		Embedded Systems and IOT	PCC	3	0	2	5	4
5		Open Elective- II **	OEC	3	0	0	3	3
6		Professional Elective VI	PEC	3	0	0	3	3
PRACTICALS								
7		Internship / Mini Project	EEC	0	0	0	0	2
			TOTAL	**17**	**0**	**2**	**19**	**20**

&-Shall be Chosen from the Elective Management Courses

SEMESTER VIII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
1		Project Work/ Internship	EEC	0	0	20	20	10
			TOTAL	**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 172

Professional Elective Courses (PEC)					
VERTICAL I **Power Engineering**	**VERTICAL II** **Control and Automation**	**VERTICAL III** **Electric Vehicle Technology**	**VERTICAL IV** **Data Science and AI**	**VERTICAL V** **Computer Technologies**	**VERTICAL VI** **Emerging Technologies**
Utilization and Conservation of Electrical Energy	PLC Programming	Electric Vehicle Architecture	Soft Computing	Computer Networks	Energy Storage Systems
Electrical Machines-II	Embedded System for Automotive Applications	Design of Motor and Power Converters for Electric Vehicles	Deep Learning	Algorithms	Robotic Process Automation
HVDC and FACTS	VLSI Design	Electric Vehicle Design, Mechanics and Control	Social Network Analysis	Cyber Security	Big data Analytics
Power Quality	Sensors and Transducers	Design of Electric Vehicle Charging System	Computer Vision	Block Chain Technologies	Health care Analytics
Smart Grid	Digital Signal Processor	Testing of Electric Vehicles	Bio-informatics	Ethical Hacking	Game Development
Control of Power Electronic Circuits	Embedded System Design	Grid Integration of Electric Vehicles	Natural Language Processing	Distributed and Cloud Computing	AR and VR
Distributed Power Generation	Computer Control of Process	Intelligent control of Electric Vehicles	Exploratory Data Analysis	Security and Privacy in Clouds	Dev Ops
	Integrated Circuits Design	Battery Management Systems	Responsible AI	Cyber Forensics and Malware Analysis	Quantum Computing
			Generative AI	Web Technologies	

PROFESSIONAL ELECTIVE COURSES : VERTICALS

VERTICAL I : POWER ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Utilization and Conservation of Electrical Energy	PEC	3	0	0	3	3
2.		Electrical Machines-II	PEC	3	0	0	3	3
3.		HVDC and FACTS	PEC	3	0	0	3	3
4.		Power Quality	PEC	3	0	0	3	3
5.		Smart Grid	PEC	3	0	0	3	3
6.		Control of Power Electronic Circuits	PEC	3	0	0	3	3
7.		Distributed Power Generation	PEC	3	0	0	3	3

VERTICAL II : CONTROL AND AUTOMATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		PLC Programming	PEC	3	0	0	3	3
2.		Embedded System for Automotive Applications	PEC	3	0	0	3	3
3.		VLSI Design	PEC	3	0	0	3	3
4.		Sensors and Transducers	PEC	3	0	0	3	3
5.		Digital Signal Processor	PEC	3	0	0	3	3
6.		Embedded System Design	PEC	3	0	0	3	3
7.		Computer Control of Process	PEC	3	0	0	3	3
8.		Integrated Circuits Design	PEC	3	0	0	3	3

VERTICAL III: ELECTRIC VEHICLE TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Electric Vehicle Architecture	PEC	3	0	0	3	3
2.		Design of Motor and Power Converters for Electric Vehicles	PEC	3	0	0	3	3
3.		Electric Vehicle Design, Mechanics and Control	PEC	3	0	0	3	3
4.		Design of Electric Vehicle Charging System	PEC	3	0	0	3	3
5.		Testing of Electric Vehicles	PEC	3	0	0	3	3
6.		Grid Integration of Electric Vehicles	PEC	3	0	0	3	3
7.		Intelligent control of Electric Vehicles	PEC	3	0	0	3	3
8.		Battery Management Systems						

VERTICAL IV: DATA SCIENCE AND AI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Soft Computing	PEC	3	0	0	3	3
2.		Deep Learning	PEC	3	0	0	3	3
3.		Social Network Analysis	PEC	3	0	0	3	3
4.		Computer Vision	PEC	3	0	0	3	3
5.		Bio-informatics	PEC	3	0	0	3	3
6.		Natural Language Processing	PEC	3	0	0	3	3
7.		Exploratory Data Analysis	PEC	3	0	0	3	3
8.		Responsible AI	PEC	3	0	0	3	3
9.		Generative AI	PEC	3	0	0	3	3

VERTICAL V: COMPUTER TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Computer Networks	PEC	3	0	0	3	3
2.		Algorithms	PEC	3	0	0	3	3
3.		Cyber Security	PEC	3	0	0	3	3
4.		Block Chain Technologies	PEC	3	0	0	3	3
5.		Ethical Hacking	PEC	3	0	0	3	3
6.		Distributed and Cloud Computing	PEC	3	0	0	3	3
7.		Security and Privacy in Clouds	PEC	3	0	0	3	3
8.		Cyber Forensics and Malware Analysis	PEC	3	0	0	3	3
9.		Web Technologies	PEC	3	0	0	3	3

VERTICAL VI: EMERGING TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Energy Storage Systems	PEC	3	0	0	3	3
2.		Robotic Process Automation	PEC	3	0	0	3	3
3.		Big data Analytics	PEC	3	0	0	3	3
4.		Health care Analytics	PEC	3	0	0	3	3
5.		Game Development	PEC	3	0	0	3	3
6.		AR and VR	PEC	3	0	0	3	3
7.		Dev Ops	PEC	3	0	0	3	3
8.		Quantum Computing	PEC	3	0	0	3	3

SUMMARY

SL. NO.	SUBJECT AREA	CREDITS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII/VIII	VIII/VII	
1.	HSMC	4	3	-	-	-	-	5	-	12
2.	BSC	12	4	4	5	-	-	-	-	25
3.	ESC	5	13.5	-	-	-	-	-	-	18.5
4.	PCC	-	4	19	17.5	18	11	7	-	76.5
5.	PEC	-	-	-	-	6	9	3	-	18
6.	OEC	-	-	-	-	-	3	3	-	6
7.	EEC	1	2	1	-	-	-	2	10	16
	Total	22	**26.5**	24	22.5	24	23	20	10	172
8.	Mandatory Course (Non credit)	-	**-**	-	Yes	Yes	Yes	-	-	-

IP3151   **INDUCTION PROGRAMME**

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 everyday 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

PROFESSIONAL ENGLISH I **L T P C**
3 0 0 3

COURSE 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 1
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 8
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 Communcation (tables, pie charts etc,.). 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

LEARNING OUTCOMES :
At the end of the course, learners will be able
CO1: To use appropriate words in a professional context
CO2: To gain understanding of basic grammatic structures and use them in right context.
CO3: To read and infer the denotative and connotative meanings of technical texts
CO4: To 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. English for Science & Technology Cambridge University Press, 2021.
   Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis,
   3. Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:

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

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-
Avg.	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	-

MA3151   **MATRICES AND CALCULUS**   **L   T   P   C**
                                                                       3   1   0   4

COURSE OBJECTIVES :
- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To 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].

REFERENCES :

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.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
2	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
3	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
4	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
5	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
Avg.	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-

PH3151   **ENGINEERING PHYSICS**   **L T P C**
                                                                            3 0 0 3

COURSE 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.
- Equipping 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, CO_2 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:
After completion of this course, the students should 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.

REFERENCES:
1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – 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.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-	-	-	-	-	-	-
Avg.	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-	-	-

CY3151   **ENGINEERING CHEMISTRY**   **L T P C**
                                                                          3 0 0 3

COURSE 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 demineralisation 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, nanorod, 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:

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

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

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

CO4: To recommend suitable fuels for engineering processes and applications.

CO5: To 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, DhanpatRai 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.

REFERENCES:

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. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-
Avg.	2.8	1.3	1.6	1	-	1.5	1.8	-	-	-	-	1.5	-	-	-

CS3251   **PROGRAMMING IN C**   **L T P C**
                                                                                        3 0 0 3
COURSE OBJECTIVES:
- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT I   BASICS OF C PROGRAMMING   9
Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT II   ARRAYS AND STRINGS   9
Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III   FUNCTIONS AND POINTERS   9
Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV   STRUCTURES AND UNION   9
Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

UNIT V   FILE PROCESSING   9
Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

COURSE OUTCOMES:
Upon completion of the course, the students will be able to

CO1: Demonstrate knowledge on C Programming constructs

CO2: Develop simple applications in C using basic constructs

CO3: Design and implement applications using arrays and strings

CO4: Develop and implement modular applications in C using functions.

CO5: Develop applications in C using structures and pointers.

CO6: Design applications using sequential and random access file processing.

TEXT BOOKS:

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

TOTAL : 45 PERIODS

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw- Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second
5. Edition, Oxford University Press, 2013.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	2	1	1	1	2	-	3	2	1	2	-
2	2	2	2	1	2	1	1	1	2	-	3	3	2	2	-
3	2	3	2	1	2	1	1	1	2	-	3	2	2	2	-
4	3	2	2	1	3	1	1	1	2	-	3	3	2	2	-
5	2	3	3	1	2	1	2	1	2	-	3	2	2	3	-
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	
CO	2	2	2	1	2	1	1	1	2	-	3	2	2	2	-

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

HERITAGE OF TAMILS   **LT 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.   பொருநை – 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) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3152   **தமிழர் மரபு**   **L T P C**
                                                                  1 0 0 1

அலகு I   மொழி மற்றும் இலக்கியம்:   **3**
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – 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 II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:   **3**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:
                                                                  3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV 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 V   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. பொருநை – 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) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

CS3271   **PROGRAMMING IN C LABORATORY**   **L T P C**
                                                                          0 0 4 2

COURSE OBJECTIVES:
- To familiarise with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:
Note: **The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.**
1. I/O statements, operators, expressions
2. decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays,Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

                                                                    TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students will be able to

CO1: Demonstrate knowledge on C programming constructs.

CO2: Develop programs in C using basic constructs.

CO3: Develop programs in C using arrays.

CO4: Develop applications in C using strings, pointers, functions.

CO5: Develop applications in C using structures.

CO6: Develop applications in C using file processing.

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

REFERENCES:
1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
   4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
   5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	3	3	1	1	1	-	-	2	1	2	2	2	2	
2	2	3	3	2	1	1	-	-	2	1	2	2	2	3	
3	2	2	2	1	1	2	-	-	2	-	2	2	2	2	
4	2	2	2	2	1	2	-	-	3	-	3	3	3	2	
5	2	2	3	2	3	2	-	-	3	-	3	3	3	3	
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	
Avg	2	2	3	2	1	2	-	-	2	1	2	2	2	2	

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

BS3171   **PHYSICS AND CHEMISTRY LABORATORY**   **L T P C**
                                                                     0 0 4 2

PHYSICS LABORATORY : (Any Seven Experiments)

COURSE 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.

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:
Upon completion of the course, the students should 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.

MAPPING OF COs WITH POs AND PSOs

CO's	PO's												PSO's		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-	-	-	-	-	-	-	-
Avg.	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

COURSE 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 nanoparticles

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 types and amount of alkalinity in water sample.
- Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL : 30 PERIODS

COURSE OUTCOMES :
CO1: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO2: To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3: To analyse and determine the composition of alloys.
CO4: To learn simple method of synthesis of nanoparticles
CO5: To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOKS :
1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-
Avg.	2.6	1.3	1.6	1	1	1.4	1.8	-	-	-	-	1.3	-	-	-

GE3172   **ENGLISH LABORATORY**   **L T P C**
                                                                     0 0 2 1

COURSE 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-

UNITV   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

LEARNING OUTCOMES:
At the end of the course, learners will be able
CO1: To listen to and comprehend general as well as complex academic information
CO2: To listen to and understand different points of view in a discussion
CO3: To speak fluently and accurately in formal and informal communicative contexts
CO4: To describe products and processes and explain their uses and purposes clearly and accurately
CO5: To express their opinions effectively in both formal and informal discussions

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

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-	-	-
Avg.	3	3	3	3	1	3	3	3	3	3	3	3	-	-	-

HS3252 **PROFESSIONAL ENGLISH - II** **L T P C**
2 0 0 2

COURSE 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, learners will be able
CO1: To compare and contrast products and ideas in technical texts.
CO2: To identify and report cause and effects in events, industrial processes through technical texts
CO3: To analyse problems in order to arrive at feasible solutions and communicate them in the written format.
CO4: To present their ideas and opinions in a planned and logical manner
CO5: To draft effective resumes in the context of job search.

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

REFERENCE BOOKS:
1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.

2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

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

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	2	3	3	3	-	-	-
5	-	-	-	-	-	-	-	-	3	3	3	3	-	-	-
Avg.	3	3	3	3	2.75	3	3	3	2.2	3	3	3	-	-	-

MA3202　　　**LINEAR ALGEBRA AND NUMERICAL METHODS**　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 1 0 4

OBJECTIVES:
The basic concepts and tools of the subject covered are:
- Vector spaces and subspaces; linear independence and span of a set of vectors, basis and dimension; the standard bases for common vector spaces;
- Linear maps between vector spaces, their matrix representations, null-space and Range spaces, the Rank- Nullity Theorem;
- Inner product spaces: Cauchy-Schwarz inequality, orthonormal bases, the Gramm-Schmidt procedure, orthogonal complement of a subspace, orthogonal projection;
- Eigenvalues and eigenvectors, diagonalizability of a real symmetric matrix, canonical forms;
- Mathematical foundations of numerical techniques for solving linear systems, eigenvalue problems and generalized inverses.

UNIT I　　VECTOR SPACES　　　　　　　　　　　　　　　　　　　　12
Vector spaces – Subspaces – Linear combinations - Linear Span – Linear dependence - Linear independence – Bases and Dimensions

UNIT II　　LINEAR TRANSFORMATIONS　　　　　　　　　　　　　12
Linear Transformation – Null space, Range space - dimension theorem - Matrix and representation of Linear Transformation – Eigenvalues Eigenvectors of linear transformation – Diagonalization of linear transformation – Application of diagonalization in linear system of differential equations.

UNIT III　　INNER PRODUCT SPACES　　　　　　　　　　　　　　12
Inner Products and norms - Inner Product Spaces - Orthogonal vectors – Gram Schmidt orthogonalization process – Orthogonal complement – Least square Approximations

UNIT IV　　NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS　　12
Solution of linear system of equations – Direct methods: Gauss elimination method – Pivoting, Gauss Jordan method, LU decomposition method and Cholesky decomposition method - Iterative methods: Gauss-Jacobi Method, Gauss-Seidel Method and SOR Method

UNIT V　　NUMERICAL SOLUTION OF EIGENVALUE PROBLEMS AND GENERALISED INVERSES　　　　　　　　　　　　　　　　　　　　　　　　12
Eigen value Problems: Power method – Jacobi's rotation method – Conjugate gradient method – QR decomposition - Singular value decomposition method.

　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL:60 PERIODS
OUTCOMES:
- The students will be able to solve system of linear equations, to use matrix operations and vector spaces using algebraic methods.
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyze and evaluate the accuracy of common numerical methods.

TEXT BOOKS:
1. Faires, J.D. and Burden, R., "Numerical Methods", Brooks/Cole (Thomson Publications), 4th Edition, New Delhi, 2012.
2. Friedberg, S.H., Insel, A.J. and Spence, E., "Linear Algebra", Pearson Education, 5th Edition, New Delhi, 2008.
3. Williams, G, "Linear Algebra with Applications", Jones & Bartlett Learning, First Indian Edition, New

Delhi, 2019.

REFERENCES:
1. Bernard Kolman, David R. Hill, "Introductory Linear Algebra", Pearson Education, First Reprint, New Delhi, 2010.
2. Gerald, C.F, and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education, 7th Edition, New Delhi, 2004.
3. Kumaresan, S., "Linear Algebra – A geometric approach", Prentice – Hall of India, Reprint, New Delhi, 2010.
4. Richard Branson, "Matrix Operations", Schaum's outline series, McGraw Hill, New York, 1989.
5. Strang, G., "Linear Algebra and its Applications", Cengage Learning, New Delhi, 2005.
6. Sundarapandian. V, "Numerical Linear Algebra", Prentice – Hall of India, New Delhi, 2008.

CP3201   **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**
                                                                        3 0 3 4.5

COURSE OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, 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, a nd 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 exceptions: 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 : 90 PERIODS

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 : 90 PERIODS

COURSE OUTCOMES:
Upon completion of the course, students will be able to
   CO1: Develop algorithmic solutions to simple computational problems.
   CO2: Develop and execute simple Python programs.
   CO3: Write simple Python programs using conditionals and loops for solving problems.
   CO4: Decompose a Python program into functions.
   CO5: Represent compound data using Python lists, tuples, dictionaries etc.
   CO6: 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 Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

   REFERENCES:
   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. https://www.python.org/

6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
Avg.	2	3	3	3	2	-	-	-	-	-	2	2	3	3	-

BE3255　　**BASIC CIVIL AND MECHANICAL ENGINEERING**　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 0 0 3

COURSE OBJECTIVES:
- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I　　PART A:　OVERVIEW OF CIVIL ENGINEERING　　5
Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

UNIT I　　PART B: OVERVIEW OF MECHANICAL ENGINEERING　　4
Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

UNIT II　　SURVEYING AND CIVIL ENGINEERING MATERIALS　　9
Surveying: Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours.
Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber - Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only)

UNIT III　　BUILDING COMPONENTS AND INFRASTRUCTURE　　9
Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering.
Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

UNIT IV　　INTERNAL COMBUSTION ENGINES AND POWER PLANTS　　9
Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices

UNIT V   REFRIGERATION AND AIR CONDITIONING SYSTEM   9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometric and its process.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
   CO1: Understanding profession of Civil and Mechanical engineering.
   CO2: Summarise the planning of building, infrastructure and working of Machineries.
   CO3: Apply the knowledge gained in respective discipline
   CO4: Illustrate the ideas of Civil and Mechanical Engineering applications.
   CO5: Appraise the material, Structures, machines and energy.

TEXT BOOKS:
   1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018

REFERENCES:
   1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
   2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
   3. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
   4. Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	2	-	-	1	-	-	1	2	1	2	-	1	-	-	-
2	2	-	-	-	-	-	1	2	1	2	-	2	-	-	-
3	2	-	-	-	-	-	1	2	2	2	-	2	-	-	-
4	2	-	-	-	-	-	1	2	1	2	-	2	-	-	-
5	2	-	-	-	-	-	1	2	1	2	-	2	-	-	-
Avg.	2	-	-	0.2	-	-	1	2	1.2	2	-	1.8	-	-	-

GE3251   **ENGINEERING GRAPHICS**   **L   T   P   C**
                                                                2   0   4   4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing engineering curves.
2. Drawing freehand sketch of simple objects.
3. Drawing orthographic projection of solids and section of solids.
4. Drawing development of solids
5. Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I   PLANE CURVES   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.

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACE   6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III   PROJECTION OF SOLIDS AND FREEHAND SKETCHING   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.
Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

** 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.
Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

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.
Practicing three dimensional modeling of isometric projection of simple objects by CAD Software(Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

COURSE OUTCOMES:
On successful completion of this course, the student 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 BOOK:
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

REFERENCES:
1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 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.

Publication of Bureau of Indian Standards:
1. IS 10711 — 2001: Technical products Documentation — Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-
Avg.	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-

CP3202   **ELECTRIC CIRCUIT ANALYSIS**   **L   T   P   C**
                                                                     3   0   2   4

COURSE OBJECTIVES:
- To introduce electric circuits and its analysis
- To provide key concepts to analyze and understand electrical circuits
- To impart knowledge on solving circuit equations using network theorems
- To educate on obtaining the transient response of circuits.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of single &three phase circuits

UNIT I   BASIC CIRCUITS ANALYSIS   9
Fundamentals concepts of R, L and C elements-Energy Sources- Ohm's Law -Kirchhoff 's Laws – DC Circuits – Resistors in series and parallel circuits - A.C Circuits – Average and RMS Value – Complex Impedance – Phasor diagram - Real and Reactive Power, Power Factor, Energy -Mesh current and node voltage methods of analysis D.C and A.C Circuits.

UNIT II   NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 9
Network reduction: voltage and current division, source transformation – star delta conversion. Theorems – Superposition, Thevenin's and Norton's Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem- Tellegen's Theorem-Statement, application to DC and AC Circuits.

UNIT III   TRANSIENT RESPONSE ANALYSIS   9
Introduction – Laplace transforms and inverse Laplace transforms- standard test signals - Transient response of RL, RC and RLC circuits using Laplace transform for Source free, Step input and Sinusoidal input.

UNIT IV   RESONANCE AND COUPLED CIRCUITS   9
Series and parallel resonance –frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Dot rule-Analysis of coupled circuits– Single Tuned circuits.

UNIT V   THREE PHASE CIRCUITS   9
Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced – phasor diagram of voltages and currents – power measurement in three phase circuits– Power Factor Calculations.

                                        TOTAL: 60 PERIODS
LIST OF EXPERIMENTS   30 PERIODS
Familiarization of various electrical components, sources and measuring instruments
1. Simulation and experimental verification of series and parallel electrical circuit using fundamental laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer theorem.
6. Simulation and Experimental validation of R-C,R-L and RLC electric circuit transients
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and implementation of series and parallel resonance circuit.

9. Simulation and experimental verification of three phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).

COURSE OUTCOMES:
After completing this course, the students will be able to:
CO1: Explain circuit's behavior using circuit laws.
CO2: Apply mesh analysis/ nodal analysis / network theorems to determine behavior of the given DC and AC circuit
CO3: Compute the transient response of first order and second order systems to step and sinusoidal input
CO4: Compute power, line/ phase voltage and currents of the given three phase circuit
CO5: Explain the frequency response of series and parallel RLC circuits
CO6: Explain the behavior of magnetically coupled circuits.

TEXT BOOKS:
1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9thedition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES
1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
2 Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc. 2018.
6. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraHill, 2015.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	2	2	-	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
CO6	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	-	2	1	-	-	-	3	3	3	3

NCC Credit Course Level 1*

NX3251	(ARMY WING) NCC Credit Course Level - I	L	T	P	C
		2	0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

NX3252	(NAVAL WING) NCC Credit Course Level - I	L	T	P	C
		2	0	0	2

NCC GENERAL   6

NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS   4

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT   7

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP   5

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT   8

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

NX3253	(AIR FORCE WING) NCC Credit Course Level - I	L	T	P	C
		2	0	0	2

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL : 30 PERIODS

GE3252   **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
Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage
Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great
Temples of Cholas and other worship places - Temples of Nayaka Period - Type study
(Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo -
Saracenic architecture at Madras during British Period.

UNIT III   MANUFACTURING TECHNOLOGY   3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and
gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads
-Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem
stone types described in Silappathikaram.

UNIT IV   AGRICULTURE AND IRRIGATION TECHNOLOGY   3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal
Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge
of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge
Specific Society.

UNIT V   SCIENTIFIC TAMIL & TAMIL COMPUTING   3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books –
Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online
Tamil Dictionaries – Sorkuvai Project.

                                                        TOTAL : 15 PERIODS

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. பொருநை – 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)
    (Publishedby: The Author)
                                        52

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3252   <u>தமிழரும் தொழில்நுட்பமும்</u>   **L T P C**
1 0 0 1

அலகு I   <u>நெசவு மற்றும் பானைத் தொழில்நுட்பம்</u>:   3
சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II   <u>வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்</u>:   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 III <u>உற்பத்தித் தொழில் நுட்பம்</u>:   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 IV   <u>வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்</u>:   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 V   <u>அறிவியல் தமிழ் மற்றும் கணித்தமிழ்</u>:   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 53 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. பொருநை – 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3271   **ENGINEERING PRACTICES LABORATORY**   **L T P C**
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COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. 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.
4. 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) Planing and
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 airconditioner.

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:
Upon completion of this 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 equipments; 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.

MAPPING OF COs WITH POs AND PSOs

CO s	POs												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	P0 6	P0 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS01	PS02	PS03
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
Avg.	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

COURSE OBJECTIVES
- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse 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   **12**
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   **12**
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   **12**
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   **12**
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   **12**
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: 60 PERIODS
LEARNING OUTCOMES
At the end of the course, learners will be able
- Speak effectively in group discussions held in formal/semi formal contexts.
- Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
- Write emails, letters and effective job applications.
- Write critical reports to convey data and information with clarity and precision
- Give appropriate instructions and recommendations for safe execution of tasks

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
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	-	-	-
Avg.	2.4	2.8	3	3	1.8	3	3	3	3	3	3	3	-	-	-

Assessment Pattern
- One online / app based assessment to test speaking and writing skills

- Proficiency certification is given on successful completion of speaking and writing.