KCG

COLLEGE OF TECHNOLOGY

AFFILIATED TO ANNA UNIVERSITY | AUTONOMOUS

REGULATIONS - 2023

CURRICULUM AND SYLLABI

(2026-2027)

B.E. BIOMEDICAL ENGINEERING

KCG College of Technology was founded in 1998 to fulfill the Founder-Chairman, Dr. KCG Verghese's vision of **"To Make Every Man a Success and No Man a Failure".** It is a Christian minority institution, affiliated to Anna University (Autonomous), Chennai and approved by AICTE, New Delhi.

VISION OF KCG

KCG College of Technology aspires to become a globally recognized centre of excellence for science, technology & engineering education, committed to quality teaching, learning and research while ensuring for every student a unique educational experience which will promote leadership, job creation, social commitment and service to nation building.

MISSION OF KCG

- Disseminate knowledge in a rigorous and intellectually stimulating environment.
- Facilitate socially responsive research, innovation and entrepreneurship.
- Foster holistic development and professional competency.
- Nurture the virtue of service and an ethical value system in the young minds.

PROGRAM OUTCOME (POs)

PO 01	**Engineering knowledge**: Use mathematics, science, computing and engineering knowledge to solve complex engineering problems
PO 02	**Problem analysis:** Identify and analyse complex problems and reach sound conclusions using engineering principles.
PO 03	**Design/development of solutions:** Design solutions for complex engineering problems, and design system components or processes that meet the specified needs with appropriate consideration for public health and safety and cultural, societal and environmental considerations.
PO 04	**Conduct investigations of complex problems:** Use research-based knowledge and methods, including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 05	**Engineering tool usage:** Create, select, and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, recognizing their limitations, to solve complex engineering problems.
PO 06	**The engineer and the world:** Analyse and evaluate societal and environmental aspects while solving complex engineering problems, considering their impact on sustainability with reference to economy, health, safety, legal frameworks, culture and the environment.
PO 07	**Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and the need for sustainable development.

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PO 08	**Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse and multi-disciplinary teams.

PO 09	**Communication:** Communicate effectively and inclusively within the engineering community and with society at large, such as comprehending and writing effective reports and design documentation and making effective presentations, considering cultural, language and learning differences.
PO 10	**Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team, to manage projects in multi-disciplinary environments.
PO 11	**Life-long learning:** Recognize the need for and have the preparation and ability for, independent and life-long learning, adaptability to new and emerging technologies and critical thinking in the broadest context of technological change.

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REGULATIONS 2023

B. E. BIOMEDICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM

CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

Sl. No	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1

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9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English/ Foreign language	HSMC	3	0	0	3	3
2	23MA205	Differential Equations and Transform Techniques	BSC	3	1	0	4	4
3	23AD201	C and Data Structures	ESC	3	0	0	3	3
4	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23BM201	Human Anatomy and Physiology	PCC	3	0	2	5	4
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3

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7	23BM202	Biosciences	PCC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23AD221	C and Data Structures Laboratory	ESC	0	0	4	4	2
10	23HS221	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**16**	**35**	**26**

*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

EMPOWER DREAMS ENGINEER REALITIES
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SEMESTER – III

Sl. No	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23BM301	Medical Physics	PCC	3	0	0	3	3
3	23BM302	Biomedical Instrumentation	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23BM311	Sensors and Measurements	PCC	3	0	2	5	4
6	23BM312	Electronic devices and Circuits	PCC	3	0	2	5	4
PRACTICALS								
7	23BM321	Biomedical Instrumentation Laboratory	PCC	0	0	4	4	2
8	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**10**	**29**	**23**

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SEMESTER - IV

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23MA402	Probability and Random Processes	BSC	3	1	0	4	4
2	23BM401	Biomaterials	PCC	3	0	0	3	3
3	23BM402	Bio control Systems	PCC	3	0	0	3	3
4	23BM403	AI in Healthcare	PCC	3	0	0	3	3
5	23BM404	Analog and Digital Integrated Circuits	ESC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23BM411	Microcontroller and Embedded Systems	**PCC**	**3**	**0**	2	5	4
PRACTICALS								
7	23BM421	Analog and Digital Integrated Circuits Laboratory	PCC	0	0	4	4	2
8	23ES491	Aptitude and Logical Reasoning – 1	EEC	0	0	2	2	1*
TOTAL				**18**	**2**	**12**	**32**	**22**

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SEMESTER - V

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23BM501	Diagnostic and Therapeutic Equipment	PCC	3	0	0	3	3
3		Department Elective – 1	DEC	3	0	0	3	3
4		Department Elective – 2	DEC	3	0	0	3	3
5		Open Elective – 1 (Emerging Technology)	OEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23BM512	Discrete Time Signal Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23BM521	Diagnostic and Therapeutic Equipment Laboratory	PCC	0	0	4	4	2
8	23BM522	Mini Project	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	1*
TOTAL				**17**	**1**	**10**	**28**	**22**

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SEMESTER - VI

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23BM601	Medical Ethics and Regulatory Standards	PCC	3	0	0	3	3
2		Department Elective – 3	DEC	3	0	0	3	3
3		Department Elective – 4	DEC	3	0	0	3	3
4		Open Elective – 2 (Management / Safety Courses)	OEC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE611	Environmental Science and Engineering	ESC	3	0	2	5	4
6	23BM611	Medical Image Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23BM621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23BM622	Technical Training	EEC	0	0	2	2	1
9	23BM623	Technical Seminar - 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**14**	**32**	**24**

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SEMESTER - VII

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1		Open Elective – 3 (Management Courses)	OEC	3	0	0	3	3
2		Department Elective – 5	DEC	3	0	0	3	3
3		Department Elective – 6	DEC	3	0	0	3	3
4	23BM701	Wearable Systems	PCC	3	0	0	3	3
5	23BM702	Technical Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
6	23BM711	Machine Learning for Biomedical Engineers	PCC	3	0	2	5	4
PRACTICALS								
7	23BM721	Project Work – Phase 2	EEC	0	0	6	6	3
8	23BM722	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**14**	**28**	**23**

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SEMESTER - VIII

Sl. No	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23BM821/ 23BM822	Capstone Project / Internship cum project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 172

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DEPARTMENT ELECTIVE COURSES

VERTICAL 1: BIOENGINEERING

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23BM031	Biomechanics	DEC	2	0	2	4	3
2	23BM032	Artificial Organs and Implants	DEC	2	0	2	4	3
3	23BM033	Neural Engineering	DEC	2	0	2	4	3
4	23BM034	Principles of Tissue Engineering	DEC	2	0	2	4	3
5	23BM035	Health Informatics	DEC	2	0	2	4	3
6	23BM036	BioMEMS	DEC	2	0	2	4	3

VERTICAL 2: DIGITAL HEALTH

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23BM037	Bio signal Processing	DEC	2	0	2	4	3
2	23BM038	Telehealth Technology	DEC	2	0	2	4	3
3	23BM039	Brain Computer Interface and Applications	DEC	2	0	2	4	3
4	23BM040	Biometrics	DEC	2	0	2	4	3
5	23BM041	Soft Computing and its applications	DEC	2	0	2	4	3
6	23BM042	Deep Learning	DEC	2	0	2	4	3

VERTICAL 3: Medical Device Development

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			Total Contact Periods	CREDIT
				L	T	P		
1	23BM043	Foundation Skills in Integrated Product Development	DEC	2	0	2	4	3
2	23BM044	Medical Device Design	DEC	2	0	2	4	3
3	23BM045	Advancements in Healthcare Technology	DEC	2	0	2	4	3
4	23BM046	Rapid Prototyping	DEC	2	0	2	4	3
5	23BM047	Internet of Medical Things	DEC	2	0	2	4	3
6	23BM048	Biomedical Optics and Photonics	DEC	2	0	2	4	3

VERTICAL 4: Assistive Technology

SL. NO.	COURSE CODE	COURSE TITLE	CATEG ORY	PERIODS PER WEEK			TOTAL CONTA CT PERIOD S	CRED ITS
				L	T	P		
1	23BM049	Extended Reality in Healthcare	DEC	2	0	2	4	3
2	23BM050	Rehabilitation Engineering	DEC	2	0	2	4	3
3	23BM051	Physiological Modelling	DEC	2	0	2	4	3
4	23BM052	Assistive Technology and devices	DEC	2	0	2	4	3
5	23BM053	Robotics in Medicine	DEC	2	0	2	4	3
6	23BM054	Sports Engineering and Technology	DEC	2	0	2	4	3

VERTICAL 5: Management Healthcare

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23BM056	Clinical Engineering	DEC	2	0	2	4	3
2	23BM057	Hospital Planning and Management	DEC	2	0	2	4	3
3	23BM058	Medical Waste Management	DEC	2	0	2	4	3
4	23BM059	Economics and Management for Engineers	DEC	2	0	2	4	3
5	23BM060	Forensic Science in Healthcare	DEC	2	0	2	4	3
6	23BM061	Quality Management in Hospital	DEC	2	0	2	4	3

OPEN ELECTIVE COURSES

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23OAD971	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3
2	23OCS971	Augmented Reality and Virtual Reality	OEC	3	0	0	3	3
3	23OCS972	Data Science and Fundamentals	OEC	3	0	0	3	3
4	23OEC971	IoT Concepts and Applications	OEC	3	0	0	3	3
5	23OED971	Introduction to Design Thinking	OEC	3	0	0	3	3
6	23OMT971	Foundation of Robotics	OEC	3	0	0	3	3
7	23OMA971	Resource Management Techniques	OEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	OEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	OEC	3	0	0	3	3

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3	23HS973	Engineering Management and Law	OEC	3	0	0	3	3
4	23HS974	Knowledge Management	OEC	3	0	0	3	3
5	23HS975	Industrial Management	OEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	OEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	OEC	3	0	0	3	3
8	23HS978	Essentials of Management	OEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	OEC	3	0	0	3	3
2	23HS980	Industrial Safety	OEC	3	0	0	3	3
3	23HS981	Automotive Safety	OEC	3	0	0	3	3

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SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HS MC	BSC	ESC	PCC	DEC	OEC	EEC	TOTAL
Semester I	5+1*	11	6					22
Semester II	4	4	10	8			1*	26
Semester III	3	4		16			1*	23
Semester IV		4		15			1*	22
Semester V			2	9	6	3	2+1*	22
Semester VI			5	7	6	3	3	24
Semester VII			2	7	6	3	5	23
Semester VIII							10	10
TOTAL	12	23	28	62	18	9	20	172

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SEMESTER –I

23IP101	INDUCTION PROGRAMME	L	T	P	C
		-	-	-	0

COURSE OBJECTIVES:

- This is a mandatory 2 weeks P rogramme 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 objectives
- 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 bonding in the batch as well as between faculty and students, develop awareness, sensitivity and students, develop awareness, sensitivity and understanding of the self, people around them, society large, and natureat large, and nature

- **Physical Activity**
  This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.,
- **Life skills**
  Every student would choose one skill related to daily needs such as stitching, accounting, finance management, etc.,

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 dos and don'ts, 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.

Club Activity

Students will be introduced to more than 20 Clubs available in the college-both technical and non-technical. The student can choose as to which club the student will enroll in.

Value Based Communication

This module will focus on improving the communication skills of students

Lectures by Alumni
Lectures by alumni are arranged to bring in a sense of belonging to the student towards the institution and also to inspire them to perform better

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
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
Address by different heads
Heads of Placement, Training, Student affairs, counsellor, etc would be interacting with the students to introduce them to various measures taken in the institution for the betterment of students.
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

23HS101	ESSENTIAL COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To help learners extract information from short and simple correspondence
- To familiarize learners with different text structures by engaging them in reading, writing and grammar learning activities
- To help learners write coherent, short paragraphs and essays
- To enable learners to use language efficiently while expressing their opinions via various media.

UNIT I	FORMATION OF SENTENCES	9

Reading- Read pictures-notices- short comprehension passages and recognize main ideas and specific details. Writing- framing simple and compound sentences, completing sentences, developing hints, writing text messages. Language development- Parts of Speech, Wh- Questions, yes or no questions, direct and indirect questions. Vocabulary development– prefixes- suffixes- articles – countable and uncountable nouns

UNIT II	NARRATION AND DESCRIPTION	9

Reading – Read short narratives and descriptions from newspapers, dialogues and conversations. Reading strategies and practices. Language development – Tenses- simple present, present continuous, present perfect, simple past, past continuous, past perfect, simple future, future continuous, past participle, pronouns. Vocabulary development- guessing meanings of words in context. Writing – Write short narrative paragraphs, biographies of friends/relatives - writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures.

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UNIT III	COMPARING AND CONTRASTING	9
Reading- short texts and long texts -understanding different types of text structures, -coherence-jumbled sentences. Language development- degrees of comparison, concord- Vocabulary development – single word substitutes- discourse markers- use of reference words Writing - comparative and contrast paragraphs writing- topic sentence- main idea, free writing, compare and contrast using some suggested vocabulary and structures.		
UNIT IV	**SOCIAL MEDIA COMMUNICATION**	**9**
Reading- Reading blogs, social media reviews, posts, comments, process description, Language development - relative clause, Vocabulary development- social media terms-words, abbreviations and acronyms Writing- -e-mail writing-conventions of personal email, descriptions for simple processes, critical online reviews, blog, website posts, commenting to posts.		
UNIT V	**ESSAY WRITING**	**9**
Reading- Close reading non-technical longer texts Language development - modal verbs, phrasal verbs- Vocabulary development - collocation. Writing- Writing short essays- brainstorming – developing an outline- identifying main and subordinate ideas.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Summarize simple, level-appropriate texts of around 300 words recognizing main ideas and specific details.	
CO2:	Demonstrate the understanding of more complex grammatical structures and diction while reading and writing.	

CO3:	Use appropriate expressions to describe, compare and contrast people, things, situations etc., in writing.
CO4:	Establish the ability to communicate effectively through emails.
CO5:	Determine the language use appropriate for different social media platforms.
CO6:	Use appropriate expressions for narrative descriptions and process descriptions.
TEXT BOOKS:	
1	Susan Proctor, Jack C. Richards, Jonathan Hull. Interchange Level 2. Cambridge University Press and Assessment
2	Susan Proctor, Jack C. Richards, Jonathan Hull. Interchange Level 3. Cambridge University Press and Assessment
REFERENCES:	
1	Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
2	Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning , USA: 2007

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23MA101	MATRICES AND CALCULUS	L	T	P	C
		3	0	0	3

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

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

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

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 multiplier.

UNIT IV	INTEGRAL CALCULUS	9

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.		
UNIT V	**MULTIPLE INTEGRALS**	**9**
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.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Apply the matrix algebra techniques and applications in Engineering Problems.
CO2:	Make use of the concept of limits and rules of differentiation to differentiate functions
CO3:	Find the derivative of functions of several variables
CO4:	Examine the application of partial derivatives
CO5:	Compute integrals by different techniques of Integration.
CO6:	Apply the concept of integration to compute multiple integrals.

TEXT BOOKS:	
1	Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

REFERENCES:	
1	Dr.P.Sivaramakrishnadas, Dr.C.Vijayakumari., — Matrices and Calculus‖ Pearson Publications Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 2019.
2	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016

3	Bali. N., Goyal. M. and Watkins. C., —Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2017.
4	Narayanan. S. and Manicavachagom Pillai.T. K., —Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2017.

EMPOWER DREAMS ENGINEER REALITIES
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23AD101	PROGRAMMING IN PYTHON	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the basics of Programming.
- To convert an algorithm into a Python program.
- To construct Python programs with control structures.
- To structure a Python Program as a set of functions.
- To use Python data structures-lists, tuples, dictionaries and files.

UNIT I	COMPUTATIONAL THINKING	9

Introduction to Computing and Problem Solving: Fundamentals of Computing –Computing Devices – Identification of Computational Problems – Pseudo Code and Flowcharts – Instructions – 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).

UNIT II	INTRODUCTION TO PYTHON	9

Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, type () Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: if, if…else, if…elif…else Decision Control Statements, Nested if Statement, while Loop, for Loop, continue and break Statements.

UNIT III	FUNCTIONS AND STRINGS	9

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

UNIT IV	LISTS, TUPLES, DICTIONARIES AND FILES	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. Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.		
UNIT V	**OBJECT-ORIENTED AND FUNCTIONAL PROGRAMMING**	**9**
Object-Oriented Programming: Classes and Objects, Creating Classes in Python,Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, Polymorphism. Functional Programming: Lambda. Iterators, Generators, List Comprehensions.		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Develop algorithmic solutions to simple computational problems.	
CO2:	Develop and execute simple Python programs using Control Statements	
CO3:	Develop simple Python programs for solving problems using Functions and Strings	
CO4:	Build a Python program using lists, tuples, dictionaries and files.	
CO5:	Construct a code related to Object-Oriented Programming Concept	
CO6:	Construct a code related to Functional Programming.	
TEXT BOOKS:		
1	Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/).	

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2	Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.
REFERENCES:	
1	Learning To Program with Python. Richard L. Halterman. Copyright © 2011
2	Python for Everybody, Exploring Data Using Python 3. Dr. Charles R. Severance. 2016.
3	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
4	G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
5	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data“, Third Edition, MIT Press , 2021
6	Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
7	https://www.python.org/
8	Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

23HS102	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- Explain the classical literature of Tamil and highlight notable Tamil poets.
- Explain the creation of traditional Tamil musical instruments.
- Explain the sports and games associated with Tamil heritage.
- Explore the education and literacy practices during the Sangam period.
- Explain the contributions of Tamils to the Indian freedom struggle.
- Explain the development and history of printing in Tamil Nadu.

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, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas		
UNIT V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
		TOTAL: 15 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Explain the evolution of Tamil language and literature, focusing on its cultural, ethical, and secular themes.
CO2:	Outline the making of musical instruments related to Tamil heritage.
CO3:	Discuss the sports and games of Tamils
CO4:	Explain the education and literacy during Sangam age.
CO5:	Express the importance and contribution of Tamils to Indian Freedom Struggle
CO6:	Outline the print history of books in Tamil Nadu

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TEXT BOOKS:	
1	தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). தமிழக வரலாறு-மக்களும் பண்பாடும்-கே.கேபிள்ளை (வெளியீடு:
2	கணினித்தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
REFERENCES:	
1	**கீழடி - வைவை நதிை்ைவையில் சங்ை ைால நைை நாைை்ிைம் (ததால்லியல் Fவை**
2	ப ொ ிருனை- ஆற்றங்கனை **ததால்லியல் நாவிவிிவிம் Fவை வ தளியீடு)**

23PH111	ENGINEERING PHYSICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

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

UNIT I	MECHANICS	9

Types of stress, Stress-strain diagram and its uses- factors affecting elastic modulus- tensile strength- Bending of beams, bending moment – theory and experiment: Uniform and non-uniform bending, Center of mass (CM) – CM of continuous bodies –rod, motion of the CM. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M

.I –moment of inertia of rod, disc, solid sphere – M.I of a diatomic molecule - torque -rotational energy state of a rigid diatomic molecule – M.I of disc by torsional pendulum

UNIT II	ELECTROMAGNETIC WAVES	9

Concept of field-introduction to gradient, divergence and curl of field – Stokes theorem (No proof)-Gauss divergence theorem (No proof) - The Maxwell's equations in integral form and differential form - wave equation; Plane electromagnetic waves in vacuum - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Energy and momentum in EM waves-Poynting's vector - Cell-phone reception.

UNIT III	OPTICS AND LASERS	9

Reflection and refraction of light waves - total internal reflection –

types of optical fiber, Numerical Aperture and acceptance angle - interference –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients(Qualitative) - population inversion - CO2 laser, semiconductor laser (Homo junction) - 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	ADVANCED 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

PRACTICAL EXERCISES: (Any Seven Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects
2. Simple harmonic oscillations of cantilever
3. Non-uniform bending- Determination of Young's modulus
4. Uniform bending–Determination of Young's modulus
5. Laser-Determination of the wavelength of the laser using grating
6. Airwedge- Determination of thickness of a thinsheet /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:	
After completion of the course, the students will be able to:	
CO1:	Determine the mechanical properties of materials.
CO2:	Apply the principles of electromagnetic waves to real world system.
CO3:	Determine the thickness of thin wire and the characteristic parameter of an optical fiber.
CO4:	Apply the principles of lasers to real world application.
CO5:	Organize the quantum mechanical properties of particles and waves.
CO6:	Utilize the 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	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill (Indian Edition), 2017.

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REFERENCES:	
1	R.Wolfson," Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2017.
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, 2016.

23CY111	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	2	4

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 batteries.

UNIT I	WATER AND ITS TREATMENT	9

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

UNIT II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials (Metal oxide and Metal) Synthesis and Characterization of nanomaterials: sol-gel, solvothermal, laser ablation, chemical

vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, energy, sensor , electronics and catalysis.

UNIT III	PHASE RULE AND COMPOSITES	9

Phase rule: Introduction, definition of terms with examples. One component system – water system; CO_2 system; Reduced phase rule; Two component system: lead-silver system – Pattinson process. Composites: 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: Fossil Fuels, 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 sequestration, Green Hydrogen.

UNIT V	ENERGY SOURCES AND STORAGE DEVICES	9

Nuclear fission and fusion- 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 and its advanced technology, supercapacitor.
TOTAL: 45 PERIODS
LIST OF EXPERIMENTS **TOTAL: 30 PERIODS**
1. Determination of hardness causing salts in water sample by EDTA method. 2. Determination of alkalinity in water sample. 3. Determination of chloride content of water sample by argentometric method. 4. Determination of strength of given Barium chloride using conductivity meter. 5. Determination of strength of Acid using pH meter. 6. Determination of strength of FAS by potentiometer 7. Determination of strength of acids in a mixture using conductivity meter. 8. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method. **9.** Estimation of Nickel in steel
COURSE OUTCOMES:
After completion of the course, the students will be able to:

CO1:	Interpret the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2:	Illustrate the basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3:	Estimate the knowledge of phase rule and composites for material selection requirements
CO4:	Choose a suitable fuel for engineering processes and applications
CO5:	Relate the different forms of energy resources and apply them for suitable applications in energy sectors.

CO6:	Explain the different types of batteries, fuel cells and working principles of Electric vehicles

TEXT BOOKS:	
1	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3	S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th 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, 2014New Delhi, 2018.
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

23AD121	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objective of this laboratory is to put into practice computational thinking. The students will be expected to write, compile, run and debug Python programs to demonstrate the usage of:

- Operators and Conditional Statements
- Control Structures and Functions (both recursive and iterative) and Recursion.
- String functions
- Lists, Sets, Dictionaries, Tuples and Files.
- Object-Oriented Programming

Exercise 1	**Programs to demonstrate the usage of operators and conditional statements.**

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information:
   Your name, Full Address, Mobile Number,
   College Name, Course Subjects
3. Program that reads the URL of a website as input and displays contents of a webpage.

Exercise 2	**Programstodemonstrate usage ofcontrol structures.**

4. Program to find the sum of all prime numbers between 1 and 1000.
5. Program to find the product of two matrices.
6. Program to find the roots of a quadratic equation.

Exercise 3	**Programs to demonstrate the usage of Functions and Recursion**

7.	Write both recursive and non-recursive functions for the following: a. To find GCD of two integers b. To find the factorial of positive integer c. To print Fibonacci Sequence up to given number n

	d. To convert decimal number to Binary equivalent
8.	Program with a function that accepts two arguments: a list and a number n. It should display all the numbers in the list that are greater than the given number n.
9.	Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000.
Exercise 4	**Programsto demonstratethe usage of String functions.**
10.	Program that accepts two strings S1, S2, and finds whether they are equal are not.
11.	Program to count the number of occurrences of characters in each string.
12.	Program to find whether a given string is palindrome or not.
Exercise 5	**Programs to demonstrate the usage of lists, sets, dictionaries, tuples and files.**
13.	Simple sorting, Histogram, Students marks statement, Retail bill preparation
14.	Write a program that combines lists L1 and L2 into a dictionary.
15.	Program to display a list of all unique words in a text file and word count, copy file, Voter‘s age validation, Marks range validation (0-100).
Exercise 6	**Programsto demonstrate the usage of Object-Oriented Programming**
16.	Program to implement the inheritance.
17.	Program to implement polymorphism
	TOTAL: 60 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Develop algorithmic solutions to simple computational problems.
CO2:	Develop and execute simple Python programs.

CO3:	Construct programs in Python using conditionals and loops for solving problems.
CO4:	Utilize functions to decompose a Python program.
CO5:	Analyse compound data using Python data structures.
CO6:	Interpret data from/to files in Python Programs

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23HS121	COMMUNICATION SKILLS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enable the students to comprehend the main idea and specific information of the listening passage
- To help students express themselves clearly, and communicate effectively with others.
- To introduce authentic language use and context-specific vocabulary that might not be encountered in textbooks.

Exercise: 1	Listening to conversations set in everyday social context and complete gap-filling exercise
Exercise: 2	Listening to a monologue in everyday social context. Diagram labelling and MCQ
Exercise: 3	Listening to a group conversation in academic setting and answer MCQ
Exercise: 4	Listening to a lecture and answer MCQ or gap filling
Exercise: 5	Listening to Ted Talks, podcasts, documentaries - discussion
Exercise: 6	Listening to a lecture and reading a text on the same subject- compare and contrast
Exercise: 7	Speaking Introducing oneself
Exercise: 8	Answering questions based on the introduction
Exercise: 9	Speaking on a given prompt for 2 mins.
Exercise :10	Answering questions based on the topic spoken
Exercise :11	Role play- Engaging in conversation
Exercise :12	Engaging in Podcast Discussion

TOTAL: 25 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Demonstrate fluency in speaking in variety of situations
CO2:	Express their knowledge by talking continuously for more than two minutes on a topic

CO3:	Develop active listening for more meaningful interactions and conversations
CO4:	Use a full range of structures naturally and appropriately
CO5:	Identify the specific information in conversations, interviews, talks and lectures
CO6:	Develop the ability to compare and analyse different forms of information, identifying key similarities and differences.

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SEMESTER - II

23HS201	PROFESSIONAL ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To help learners extract information from longer, technical and scientific texts
- To familiarize learners with different text structures by engaging them in reading, writing and grammar learning activities
- To help learners write coherent, extensive reports and essays.
- To enable learners to use language efficiently while expressing their opinions in professional and business situations

UNIT I	WORKPLACE COMMUNICATION	9

Reading – Reading brochures (technical context), advertisements, telephone messages, gadget reviews social media messages, digital communication relevant to technical contexts and business. Writing – Writing emails -emails on professional contexts including introducing oneself, writing checklist, writing single sentence definition, product description- advertising or marketing slogans, Language Development– Tenses, Concord, Question types: Wh/ Yes or No/ and Tags, imperative sentences, complex sentences. Vocabulary - One-word substitutes; Abbreviations & Acronyms as used in technical contexts and social media.

UNIT II	EXPRESSING CAUSE AND EFFECT	9
Reading - Reading longer technical texts– Cause and Effect Essays, and emails of complaint. Writing - writing complaint emails (raising tickets) and responses to complaints, writing Cause and effect paragraphs and essays. Language Development– Active, Passive and Impersonal Passive Voice transformations, Infinitive and Gerunds Vocabulary – Synonyms- contextual meaning of words, Same word acting as different parts of speech, causal expressions.		
UNIT III	**PROVIDING SOLUTIONS TO PROBLEMS**	**9**
Reading - Case Studies, editorials, news reports etc. Writing – Letter to the Editor, Writing instructions and recommendations, Problem solution essay / Argumentative Essay, Language Development – Error correction; If conditional sentences Vocabulary - Compound Words, discourse markers.		
UNIT IV	**INTERPRETATION OF GRAPHICS**	**9**
Reading - Reading newspaper articles, nonverbal communication (charts and graphs) Writing –Transferring information from nonverbal (chart, graph etc, to verbal mode) Process– description. Language development–Possessive & Relative pronouns, numerical adjectives Vocabulary Homonyms and Homophones, sequence words.		
UNIT V	**REPORT WRITING AND RESUME WRITING**	**9**
Reading – Company profiles, journal reports. Language Development– Reported Speech Vocabulary-reporting words and phrases. Writing - Writing accident report, survey report and progress report, project proposal, minutes of the meeting, writing statement of purpose, internship application and resume		
TOTAL: 45 PERIODS		

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Summarize long technical and scientific text of not less than 500 words recognizing main ideas and specific details
CO2:	Demonstrate the understanding of more complex grammatical structures and diction while reading and writing
CO3:	Use appropriate expressions to describe process and product, compare and contrast data, analyze problems, provide solutions and prove an argument in writing

CO4	Establish the ability to communicate effectively in professional environment through emails and reports
CO5	Determine the language use appropriate for different social media platforms used for digital marketing
CO6	Convert skills to assets and position themselves in job market through their own professional narratives
TEXT BOOKS:	
1	V. Chellammal, Deepa Mary Francis, K N Shoba, P R Sujatha Priyadharshini, Veena Selvam, English for Science & Technology I, Cambridge University Press and Assessment
2	V. Chellammal, Deepa Mary Francis, K N Shoba, P R Sujatha Priyadharshini, Veena Selvam, English for Science & Technology II, Cambridge University Press and Assessment
REFERENCES:	
1	Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
2	Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

23MA205	DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

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

UNIT I	DIFFERENTIAL EQUATIONS	9+3

Homogeneous linear ordinary differential equations of second order - general solution- Particular integral - Solution by variation of parameters - Homogeneous equations of Euler–Cauchy and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II	LAPLACE TRANSFORMS	9+3

Existence theorem - Transform of standard functions – Transform of Unit step function and Dirac delta function – Basic properties - Shifting theorems - Transforms of derivatives and integrals – Transform of periodic functions - Initial and Final value theorem - Inverse Laplace transforms- Convolution theorem (without proof) – Solving Initial value problems by using Laplace Transform techniques.

UNIT III	FOURIER SERIES	9+3

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

UNIT IV	FOURIER TRANSFORMS	9+3
Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transforms – Properties – Transform of elementary functions – Inverse Fourier Transforms - Convolution theorem (without proof) – Parsevals's identity.		

UNIT V	Z – TRANSFORM AND DIFFERENCE EQUATIONS	9+3
Z-transform – Properties of Z-transform – Inverse Z-transform – Convolution theorem – Evaluation of Inverse Z transform using partial fraction method and convolution theorem - Initial and final value theorems – Formation of difference equations – Solution of difference equations using Z - transform.		
TOTAL: 60 PERIODS		

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Solve linear ordinary differential equations.
CO2:	Apply Laplace transform properties to standard functions.
CO3:	Represent periodic functions using Fourier series.
CO4:	Compute Fourier transforms and inverse transforms
CO5:	Solve difference equations using Z-transforms.

TEXT BOOKS:

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

REFERENCES:

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



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23AD201	C AND DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To learn the concepts of linear data structure.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT I	C PROGRAMMING FUNDAMENTALS	9

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi- Dimensional Arrays.

UNIT II	C PROGRAMMING - ADVANCED FEATURES	9

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives.

UNIT III	LINEAR DATA STRUCTURES	9

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

UNIT IV	NON-LINEAR DATA STRUCTURES	9

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

UNIT V	SORTING AND SEARCHING TECHNIQUES	9
Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Develop C programs for any real world/technical application.	
CO2:	Apply advanced features of C in solving problems.	
CO3:	Utilize functions to implement linear data structure operations.	
CO4:	Make use of appropriate non–linear data structure operations.	
CO5:	Apply sort algorithms for a given application.	
CO6:	Utilize search algorithms for a given application	
TEXT BOOKS:		
1	Reema Thareja, —Programming in C‖, Second Edition, Oxford University Press, 2016.	
2	Mark Allen Weiss, —Data Structures and Algorithm Analysis in C‖, Second Edition, Pearson Education, 1997.	
3	Gilberg and Forouzan: —Data Structure- A Pseudo code approach with C‖ by Thomson publication	
4	Data structure in C‖ by Tanenbaum, PHI publication / Pearson publication	
REFERENCES:		
1	Brian W. Kernighan, Rob Pike, —The Practice of Programming‖, Pearson Education, 2019.	
2	Paul J. Deitel, Harvey Deitel, —C How to Program‖, Seventh Edition, Pearson Education, 2013.	
3	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, —Data Structures and Algorithms‖, Pearson Education,1983.	
4	Ellis Horowitz, SartajSahni and Susan Anderson, —Fundamentals of Data Structures‖, Galgotia, 2008.	

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23HS203	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To summarize the weaving industry and ceramic technology during Sangam Age
- To explain the design and construction of houses during Sangam Age and the sculptures and temples of Chola,Pallava and Pandya period
- To Explain about the water bodies of Sangam age and relate it to the agricultural usage
- To Outline to students the agriculture and irrigation technology during the Chola Period
- To help students Interpret and explain the digitalization of Tamil books and development of Tamil software

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

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

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

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

UNIT III	MANUFACTURING TECHNOLOGY	3

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

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
UNIT V	**SCIENTIFIC TAMIL & TAMIL COMPUTING**	**3**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books –Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Summarize the weaving industry and ceramic technology during Sangam Age	
CO2:	Explain the design and construction of houses during Sangam Age	
CO3:	Explain the sculptures and temples of Chola,Pallava and Pandya period.	
CO4:	Explain about the water bodies of Sangam age and relate it to the agricultural usage	
CO5:	Outline the agriculture and irrigation technology during the Chola Period.	
CO6:	Interpret and explain the digitalization of tamil books and development of Tamil software	
TEXT BOOKS:		
1	Dr.K.K.Pillay ,"Social Life of Tamils", A joint publication of TNTB & ESC and RMRL	

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REFERENCES:	
1	Dr.S.Singaravelu ,"Social Life of the Tamils - The Classical Period", Published by: International Institute of Tamil Studies.
2	Dr.S.V.Subatamanian , Dr.K.D. Thirunavukkarasu, "Historical Heritage of the Tamils", Published by: International Institute of Tamil Studies

23BM201	HUMAN ANATOMY AND PHYSIOLOGY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the basic structure and functions of the human body.
- To study the physiology of respiratory and urinary systems.
- To learn the composition and functions of blood, heart, and lymphatic system.
- To understand the skeletal system and special sensory organs.
- To comprehend structure and functions of nervous system.

UNIT I	INTRODUCTION TO HUMAN BODY	9

Cell: Structure and organelles - membrane – transport across membrane – Origin of cell membrane potential – Action potential - Recording of Membrane Potential. Homeostasis - Body Cavities - Tissue: Epithelial, Connective, Muscular and Nervous tissue. Physiology of GI tract and Endocrine system.

UNIT II	RESPIRATORY SYSTEM AND URINARY SYSTEM	9

Respiratory System: Organization of respiratory system – Respiratory organs - Respiratory Mechanism. Types of respiration - Respiratory volumes and Recording of respiratory volume. Oxygen and carbon dioxide transport and acid base regulation. Urinary system: Basic Structure of Kidney and Nephron. Mechanism of Urine formation – JXT apparatus - Urinary reflex – Water and blood pressure regulation by urinary system.

UNIT III	CARDIOVASCULAR, BLOOD AND LYMPHATIC SYSTEM	9

Composition of Blood - functions of blood – Blood Cells: RBC - Functions - WBC - Types and functions - Platelet. Blood groups – importance of identification. Blood vessels: Vein, Artery and Capillaries - Structure of heart – Properties of Cardiac muscle – Conducting system of heart – Cardiac cycle – Heart sound -Volume and pressure changes and regulation of heart rate – Coronary Circulation. Lymph - Lymphatic vessels – Lymph nodes and Lymphatic Channel.

UNIT IV	SKELETAL AND SPECIAL SENSORY SYSTEM	9
Skeletal system: Bone types and functions – Axial Skeleton and Appendicular Skeleton. Joint - Types of Joint – Cartilage structure, types and functions. Special Sensory system- Eye: Layers of Eye- Mechanism of Vision - Errors of Refraction. Ear: Ear Divisions - Mechanism of Hearing - Hearing Conditions – Skin: Layers of Skin - Functions of Skin.		
UNIT V	**NERVOUS SYSTEM**	**9**
Structure of a Neuron – Types of Neuron. Neuroglial Cells - Synapses and types. Brain – Divisions of brain lobes – Cross Sectional Anatomy of Brain - Cortical localizations and functions - Methods to Record Cortical Functions. Spinal cord – Tracts of spinal cord – Spinal Nerve - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.		
TOTAL: 45 PERIODS		
LIST OF EXPERIMENTS	**TOTAL: 30 PERIODS**	
1. Separation of serum and plasma from whole blood. 2. Blood Grouping Test 3. Eye Function study - Snellen's Chart & Ishihara's Chart 4. Ear Function study - Weber's and Rinne's Test 5. Estimation of Hemoglobin 6. RBC and WBC differential count		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Understand the basic structural and functional elements of the human body.	
CO2:	Understand the gaseous exchange and fluid maintenance in the human body.	
CO3:	Analyze the physiological mechanisms governing cardiac cycle, blood pressure regulation, and electrical conduction pathways.	

CO4:	Evaluate the mechanisms of bone growth, remodeling, mineral homeostasis, and articular joint articulation.
CO5:	Explain the cellular mechanisms of action potential generation, synaptic transmission, and signal integration across neural pathways.
CO6:	Differentiate the structural and functional divisions of the central, peripheral, and autonomic nervous systems.
TEXT BOOKS:	
1	Elaine N. Marieb and Suzanne M. Keller, "Essentials of Human Anatomy and Physiology," Pearson Education, 13th Edition, 2021.
2	Gillian Pocock, Christopher D. Richards, and David A. Richards, "Human Physiology," Oxford University Press, 5th Edition, 2018.

REFERENCES:	
1	William F. Ganong, "Review of Medical Physiology", Mc Graw Hill, New Delhi, 25th Edition, 2015.
2	Eldra Pearl Solomon, "Introduction to Human Anatomy and Physiology," Saunders (Elsevier), 4th Edition, 2016.
3	John E. Hall and Michael E. Hall, "Guyton and Hall Textbook of Medical Physiology," Elsevier, 15th Edition, 2025.

23EE281	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics, functional elements and working of measuring instruments
- To demonstrate the load test on DC machines, working of PN Junction diodes, Zener diodes and rectifiers.

UNIT I	ELECTRICAL CIRCUITS	6

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor– Ohm 's Law-Kirchhoff's Laws -Nodal Analysis, Mesh analysis with independent sources only (Steady State)- Introduction to AC Circuits –Steady state analysis of RL, RC, and RLC circuits (Simple problems only).

UNIT II	ELECTRICAL MACHINES	6

Construction and Working principle of DC Generators, EMF equation, Types and Applications- Working Principle of DC motors, Torque Equation, Types and Applications. - Construction, Working principle and Applications of Single- Phase Transformer.

UNIT III	ANALOG ELECTRONICS	6

PN Junction Diodes, Zener Diode–Characteristics & Applications– Bipolar Junction Transistor, JFET, SCR, MOSFET, – Types, I-V Characteristics and Applications – Rectifier.

UNIT IV	DIGITAL ELECTRONICS	6

Review of number systems, Combinational logic (adder and subtractor) – representation of logic functions-SOP and POS forms, K-map representations and minimization using K-maps (up to 3 variables).

UNIT V	MEASUREMENTS AND INSTRUMENTATION	6
Functional elements of an instrument, Standards and calibration, Operating Principle, types- Moving Coil and Moving Iron meters, Instrument Transformers- CT and PT, DSO-Block Diagram		
Total : 30 PERIODS		

LAB COMPONENT

1. Verification of Ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Characteristics of PN and Zener Diodes
4. Design and analysis of Half wave and Full Wave rectifiers
5. Implementation of Binary Adder and Subtractor
6. Study of DSO

Total: 30 + 30 = 60 Periods

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Apply fundamental laws to DC electric circuits and demonstrate it experimentally.
CO2:	Explain the steady state AC circuits with RL, RC, and RLC circuits
CO3:	Identify the working principle and applications of electrical machines with experimental results
CO4:	Demonstrate the characteristics of various analog electronic devices
CO5:	Experiment with the basic concepts of digital electronics and demonstrate the implementation of Binary Adder and Subtractor
CO6:	Illustrate the operating principles of measuring instruments and demonstrate DSO for the basic measurements.

TEXT BOOKS:

1	Kothari D P and I.J Nagrath,—Basic Electrical and Electronics Engineering‖ , Second Edition, McGraw Hill Education,2020
2	Sedha R. S.,—A textbook book of Applied Electronics‖, S. Chand & Co.,2008

3	A.K. Sawhney, Puneet Sawhney ‗A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.
REFERENCES:	
1	Kothari D P and I.J Nagrath, —Basic Electrical Engineering‖, Fourth Edition, Mc Graw Hill Education, 2019.
2	S.K. Bhattacharya —Basic Electrical and Electronics Engineering‖, Pearson Education, Second Edition, 2017.
3	Thomas L. Floyd,‗ Digital Fundamentals', 11thEdition,Pearson Education,2017.
4	Albert Malvino, David Bates, ‗Electronic Principles, McGraw Hill Education; 7th edition, 2017.
5	Mahmood Nahvi and Joseph A. Edminister, —Electric Circuits‖, 86 Schaum 'Outline Series, McGraw Hill, 2002.
6	H.S. Kalsi, ‗Electronic Instrumentation' , Tata McGraw-Hill, New Delhi, 2010
7	James A. Svoboda, Richard C. Dorf,— Dorf's Introduction to Electric Circuits‖, Wiley, 2018.

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23BM202	BIOSCIENCES	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the fundamental concepts of biomolecules, including acids, bases, biomolecules and nucleic acids.
- To analyze the structure, function and metabolic pathways of carbohydrates, lipids and proteins
- To explore the components and mechanisms of innate and adaptive immune responses, including antibody structures and therapeutic applications of modern Immunotherapeutics
- To master advanced microscopy techniques, microbial culturing, growth dynamics and specialized staining methods
- To comprehend the cellular responses to injury, mechanisms of cell death, structural adaptations, and the pathophysiological processes underlying vascular and hematological disorders.

UNIT I	Introduction to Biochemistry	9

Structure of water and its significance, importance of covalent and noncovalent bonds. Acid- base maintenance and the role of biological buffers in pH maintenance. Henderson- Hasselbalch equation. Disorders associated with acid- base imbalance. Principles of viscosity, surface tension, adsorption, diffusion, osmosis and their contribution in biological systems.

UNIT II	Complex Organic Molecule	9

Carbohydrates-General classification, structure and functions. Carbohydrate metabolism -glycolysis and hormonal regulation. Lipid-structure and functions. Lipid metabolism- triglyceride formation and degradation. Lipoproteins- chemistry and types. Protein- structure and functions. Abnormalities- Diabetes mellitus, hypercholesterolemia and phenylketonuria.

UNIT III	Immunology	9

Cells and organs of Immune system, innate and adaptive Immunity. Antigenicity, epitopes, antigen presenting cells. Antibody- structure, function and its isotypes. Recombinant antibodies, monoclonal antibodies in cancer treatment and autoimmune disorders. Cell and humoral mediated immunity. Hypersensitivity and its types. Immunotherapeutics and its applications.

UNIT IV	Microbiology	9
Microscopy- Principles and working of fluorescence microscope, confocal microscope, Electron Microscopes - TEM and SEM. Microbial culturing, inoculation and culture media, growth curve of microbes, identification of microbes. Staining methods- simple staining, differential staining, acid fast staining, negative staining and hematoxylin and eosin staining.		

UNIT V	Pathology	9
Cell injury-reversible and irreversible, necrosis, apoptosis, intracellular accumulations, cellular adaptations of growth and differentiation-atrophy, hypertrophy, hyperplasia, dysplasia, metaplasia. Edema, thrombosis, embolism, Hematological disorders-bleeding disorders, leukemias, lymphomas.		
		TOTAL: 45 PERIODS

LIST OF EXPERIMENTS **TOTAL: 30 PERIODS**

1. Preparation of solutions- normality and molar solutions.
2. Measurement of pH using pH meter.
3. Estimation of glucose by Orthotolidine method.
4. Estimation of protein by Biuret method.
5. Estimation of cholesterol by Zak's method.
6. Hematoxylin and eosin staining.
7. Estimation of bleeding and clotting time.

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Evaluate acid-base equilibria using mathematical models to assess clinical disorders of pH imbalance.
CO2	Analyze metabolic dysregulations and hormonal controls involved in conditions like diabetes, hypercholesterolemia, and phenylketonuria.
CO3	Differentiate the anatomical components and cellular mechanisms governing innate and adaptive immune responses.

CO4	Apply principles of high-resolution microscopy and differential staining methods to isolate and identify micro-organisms.
CO5	Distinguish cellular responses to injury, adaptive growth alterations, and pathways leading to reversible or irreversible cell death.
CO6	Evaluate the clinical etiology and pathophysiology and immunotherapeutic strategies and to interpret microbial growth kinetics.
TEXT BOOKS:	
1	Rafi MD, Text book of Biochemistry for Medical student, 4th edition, University of Press, 2021.
2	Prescott, Harley and Klein, Microbiology, 9th edition, McGraw Hill, 2017.
3	Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen, Kuby Immunology, 8th edition, WH Freeman, 2018.
4	Ramzi S Cotran, Vinay Kumar & Stanley L Robbins, "Pathologic Basis of diseases," WB Saunders Co. 7th Edition, 2005.
REFERENCES:	
1	David W Martin, Peter A, Mayes, Victor. W, Rodwell, Harpers review of biochemistry, Lange Medical Publications, 2021.
2	Ananthanarayan and Paniker, Textbook of Microbiology, 11th edition, Universities Press, 2020.
3	Vinay Kumar, Abul K Abbas, Jon C Aster, Robbins & Cotran Pathologic Basis of Disease, Elsevier, 2020.
4	Ivan Roitt, Jonathan Brostoff, David Male, Immunology, 8th edition, Elsevier, 2013.

23ME221	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- Familiarize students with basic engineering tools and equipment.
- Educate students on the importance of safety practices, including proper handling of equipment, adherence to safety protocols, and understanding potential hazards in the laboratory environment. Develop basic manufacturing and fabrication skills.
- Provide hands on training to the students in plumbing and woodworking.
- Provide hands on training to the students in welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.
- Demonstrate the wiring and measurement methods in common household electrical applications.
- Study the basic electronic components, gates and provide hands on training in soldering.

GROUP A (CIVIL and MECHANICAL)

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 households.
b) Preparation of plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

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

WOOD WORK STUDY

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

PART II	**MECHANICAL ENGINEERING PRACTICES**	**15**

WELDING WORK

a) Study of Welding and its tools.
b) Welding of Butt Joints, Lap Joints and Tee Joints by metal arc welding.
c) Study of Gas Welding.

BASIC MACHINING PRACTICE

a) Facing and Plain Turning
b) Taper Turning
c) Drilling and Tapping

SHEET METAL WORK

a) Forming and Bending
b) Making of a square Tray

MACHINE ASSEMBLY WORK

a) Study of Centrifugal Pump
b) Study of Air Conditioner

FOUNDRY PRACTICE

Demonstration on Foundry operations like mould preparation.

TOTAL: 30 PERIODS

GROUP B (ELECTRICAL & ELECTRONICS)

PART III	**ELECTRICAL ENGINEERING PRACTICES**	**15**

1. Residential House wiring using Switches, Fuse, Indicators, Lamp and Energy Meter.
2. Staircase Wiring.

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3. Fluorescent Lamp Wiring with Introduction to CFL and LED Types. 4. Measurement of Energy using Single Phase Energy Meter. 5. Study of Iron Box Wiring and Assembly **6.** Study of Fan Regulator – Electronic Type		
PART IV	**ELECTRONICS ENGINEERING PRACTICES**	**15**
1. Study of Electronic components and equipment – Resistors, Colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO. 2. Study of logic gates AND, OR, EX-OR and NOT. 3. Generation of Clock Signal. 4. Soldering simple electronic circuits and checking continuity. 5. Study the elements of smart phone 6. Study of LED TV (Block diagram		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Plan the pipeline layout for common household plumbing work.	
CO2:	Make use of welding equipment and carpentry tool for making joints.	
CO3:	Demonstrate on centrifugal pump, air conditioner and foundry operations.	
CO4:	Demonstrate the electrical wiring connections for household applications and study the working of iron box and fan regulator.	
CO5:	Identify the basic electronic components and explain the gates and soldering methods.	
CO6:	Examine the performance and operation of CRO, LED TV and Smart phone.	

23AD221	C AND DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To write basic level programming in C
- Developing applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized with sorting and searching algorithms

PRACTICALS:

1. Practice of C programming using statements, expressions, decision making and iterative statements.
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Pointers and Structures
4. Implement C programs using Files
5. Development of real-time applications
6. Array implementation of List ADT
7. Array implementation of Stack and Queue ADTs
8. Linked list implementation of List, Stack and Queue ADTs
9. Applications for List, Stack and Queue ADTs
10. Implementation of Binary Trees and operations of Binary Trees
11. Implementation of Binary Search Trees
12. Implementation of searching techniques
13. Implementation of Sorting algorithms: Insertion Sort, Quick Sort, Merge Sort
14. Implementation of Hashing – any two collision techniques

TOTAL : 60 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Make Use of different constructs of C and develop applications.
CO2:	Build functions to implement linear data structure operations.
CO3:	Construct appropriate non-linear data structure operations.
CO4:	Choose appropriate Sorting and searching algorithms for a given application.
CO5:	Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.
CO6:	Choose appropriate searching algorithms for a given application.

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23HS221	SOFT SKILLS	L	T	P	C
		0	0	2	1*

COURSE OBJECTIVES:

- To help learners improve their interpersonal skills and critical thinking
- To familiarize learners with the attributes of a leader to enhance team performance
- To prepare students to face job interviews
- To help learners to know the importance of ethics in work place

UNIT I	INTERPERSONAL COMMUNICATION	

Basic communication- verbal and non-verbal communication; passive, assertive and aggressive communication; presentation skills; giving feedback and responding to feedback.

UNIT II	TEAM WORK AND LEADERSHIP	

Vision- setting realistic goals and objectives, collaboration, cooperation, dependability, empathy, sympathy, motivation, delegation of responsibilities, open mindedness, creativity, flexibility, adaptability, cross cultural communication and group dynamics.

UNIT III	TIME MANAGEMENT AND STRESS MANAGEMENT	

Effective Planning, Planning activities at macro and micro levels, setting practical deadlines and realistic limits/targets, punctuality, prioritizing activities, spending the right time on the right activity, positive attitude, emotional intelligence, self- awareness and regulation.

UNIT IV	CRITICAL THINKING AND WORK ETHICS	

Questioning, analysing, inferencing, interpreting, evaluating, solving problems, explaining, self-regulation, open-mindedness, conflict management- ethical dilemmas, appearance, attendance, attitude, character, organizational skills, productivity, respect.

UNIT V	INTERVIEW SKILLSAND RESUME BUILDING TECHNIQUES	
Telephonic interview, online interviews, f2f interviews, FAQ soft skills interview questions, drafting error-free CVs/ Resumes and Cover Letters, selecting the ideal format for resume, content drafting along with sequencing, art of representing one's qualifications and most relevant work history, video resume, website resume.		
TOTAL: PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Express their thoughts, opinions and ideas confidently to one or more people in spoken form	
CO2:	Develop evolving competences required for professional success	
CO3:	Demonstrate knowledge and skills in a group as team player and leader	
CO4:	Compose a comprehensive resume reflecting qualifications, exposure and achievements	
CO5:	Exhibit knowledge and skills confidently during job interviews	
CO6:	Demonstrate ethical and professional behaviour at workplace in all situations	
TEXT BOOKS:		
1	Soft Skills: Key to Success in Workplace and Life by Meenakshi Raman & Shalini Upadhyay. Cengage	
REFERENCES:		
1	English for Job Seekers (Language and Soft Skills for the Aspiring) by Geetha Rajeevan, C.L.N. Prakash) Cambridge University Press pvt, Ltd.	
2	Business Benchmark by Norman Whitby. Cambridge University Press pvt, Ltd	