CK COLLEGE OF ENGINEERING AND TECHNOLOGY
AN AUTONOMOUS INSTITUTION
CAVINKARE PATRONIZED INSTITUTION

C.K. COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, Affiliated to Anna University & Recognized under UGC section 2(f) & 12(B)
Accredited by NAAC with 'A' grade and ISO 9001:2015 Certified Institution

Jayaram Nagar, Chellangkuppam, Cuddalore-607 003, Tamil Nadu, India.

DEPARTMENT OF
BIOMEDICAL ENGINEERING (BME)

CURRICULUM AND SYLLABI

I & II SEMESTER

(UNDER CKCET AUTONOMOUS REGULATION)

REGULATION 2026

Academic Year 2026-27 onwards

C. K. COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

UNDERGRADUATE CURRICULUM

Department : Biomedical Engineering

Programme : B.E. Biomedical Engineering

Regulations : 2026, with effect from the AY 2026 – 27 to all the students of Under Graduate Programme

OVERVIEW OF CREDITS

Semester / Category	BS	ES (G)	HUM	SD	ES (PC)	ES (PE)	ES (ET)	OE	Total
Semester – I	07	06	03	–	06	–	–	–	22
Semester – II	10	–	04	02	06	–	–	–	22
Semester – III	04	07	–	02	09	–	–	–	22
Semester – IV	04	–	02	02	16	–	–	–	24
Semester – V	–	–	–	02	19	03	–	–	24
Semester – VI	–	–	03	02	12	03	–	03	23
Semester – VII	–	–	02	03	06	06	03	–	20
Semester – VIII	–	–	–	08	–	–	–	–	08
Total Credits	**25**	**13**	**14**	**21**	**74**	**12**	**03**	**03**	**165**
Percentage (%)	**15.15**	**7.88**	**8.48**	**12.73**	**44.84**	**7.27**	**1.82**	**1.82**	**100.00**

CATEGORY OF COURSES

HUM	Humanities (Languages, Management, Heritage and others)	BS	Basic Science (Mathematics, Physics, Chemistry)
P	Laboratory Course	T	Theory Course
SD	Skill Development	MC	Mandatory Course
OE	Open Elective	SLC	Self-Learning Course
ES (G)	Engineering Science (General)	LIT	Laboratory Integrated Theory
ES (PC)	Engineering Science (Programme Core)	ES (PE)	Engineering Science (Programme Elective)
ES (ET)	Engineering Science (Emerging Technology)		

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of BMG Dept.
Meeting No.: 01 Dated: 28.3.26

Knowledge and Attitude Profile (WK)

The Knowledge and Attitude Profile (WK) is intended to define the essential knowledge base and professional attitudes expected of program graduates. It ensures alignment with OBE principles and equips graduates with the capability to effectively analyze and address complex engineering problem.

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Educational Objectives (PEOs):

PEO1: To enable the graduates to demonstrate their skills in design and develop medical devices for health care system through the core foundation and knowledge acquired in engineering and biology.

PEO2: To develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.

PEO3: To Carryout multidisciplinary research, addressing human healthcare problems and sustain technical competence with ethics, safety and standards.

PEO4: To ensure that graduates will recognize the need for sustaining and expanding their technical competence and engage in learning opportunities throughout their careers.

Program Specific Outcomes (PSOs):

PSO1: Design, develop, and analyze biomedical devices and systems for real time Applications.

PSO2: Utilize modern computational tools, instrumentation, and biomedical imaging Techniques in the health sectors.

PSO3: keep pace with advancements in biomedical technology and demonstrate Research aptitude, collaborate effectively in teams and uphold ethical practices.

Semester – I							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26MAC01T	Applied Calculus	T	3-1-0	4	4	BS
2.	26ENC01T	English Essentials – I	T	2-0-0	2	2	HUM
3.	26TLC01T	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.	26BM101T	Human Anatomy and Physiology – I	T	3-0-0	3	3	ES (PC)
5.	26PHC02L	Physics of Electronic Materials and Devices	LIT	2-0-2	4	3	BS
6.	26CSC01L	Problem Solving using C Programming	LIT	2-0-2	4	3	ES (G)
7.	26ECC01L	Basic Electrical and Instrumentation Engineering	LIT	2-0-2	4	3	ES (PC)
8.	26MEC01L	Engineering Drawing	LIT	2-0-2	4	3	ES (G)
9.	---	Physical Education – I	P	0-0-1	1	NC	MC
10.	---	Induction Program	---	---	---	NC	MC
Total Credits					**27**	**22**	

Semester – II							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26MAC03T	Complex Functions and Transforms	T	3-1-0	4	4	BS
2.	26TLC02T	தமிழர்களும் தொழில்நுட்பமும் / Tamils & Technology	T	1-0-0	1	1	HUM
3.	26BM201T	Human Anatomy and Physiology – II	T	3-0-0	3	3	ES (PC)
4.	26PH201L	Medical Physics	LIT	2-0-2	4	3	BS
5.	26BM202L	Electronic Devices and Circuits	LIT	2-0-2	4	3	ES (PC)
6.	26CY202L	Biochemistry and Microbiology	LIT	2-0-2	4	3	BS
7.	26ENC02L	English Essentials – II	LIT	1-0-2	3	2	HUM
8.	26MEC01P	Engineering Practices and Re-Engineering Laboratory	P	0-0-4	4	2	SD
9.		Foreign Language	P	0-0-2	2	1	HUM
10.	---	Foundations of Problem Solving	T	3-0-0	3	NC	MC

11.	---	Physical Education – II	P	0-0-1	1	NC	MC
12.	---	Self – Learning Course – I	---	---	---	NC	SLC
13.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
14.	---	NSS/NCC/NSO	---	---	---	NC	MC
Total Credits					**33**	**22**	

Semester – III							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	26MAC05T	Advanced Engineering Mathematics	T	3-1-0	4	4	BS
2.	26ECC01T	Circuits and Network Analysis	T	3-1-0	4	4	ES (G)
3.	26BM301L	Analog and Digital Integrated Circuits	LIT	2-0-2	4	3	ES (PC)
4.	26CSC02L	Python Programming	LIT	2-0-2	4	3	ES (G)
5.	26BM302L	Sensors and Measurements	LIT	2-0-2	4	3	ES (PC)
6.	26BM303L	Industry oriented Course – I	LIT	2-0-2	4	3	ES (PC)
7.	26BM304P	Career Readiness & Professional Skills – Foundation Level	P	0-0-2	2	1	SD
8.	26BM305P	Project Work – I	P	0-0-2	2	1	SD
9.	---	Indian Constitution	T	3-0-0	3	NC	MC
10.	---	Self – Learning Course – II	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**31**	**22**	

Semester – IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26MAC08T	Probability and Statistics	T	3-1-0	4	4	BS
2.	26BM401T	Biomaterials and Implants	T	3-0-0	3	3	ES (PC)
3.	26CYC01T	Climate Change and Sustainability	T	2-0-0	2	2	HUM
4.	26BM402T	Biomedical Instrumentation	T	3-0-0	3	3	ES (PC)

5.	26BM403L	Bio Control Systems	LIT	2-0-2	4	3	ES (PC)
6.	26ECC03L	Signals and Systems	LIT	2-1-2	5	4	ES (PC)
7.	26BM404L	Industry oriented Course – II	LIT	2-0-2	4	3	ES (PC)
8.	26BM405P	Career Readiness & Professional Skills – Intermediate Level	P	0-0-2	2	1	SD
9.	26BM406P	Project Work – II	P	0-0-2	2	1	SD
10.	---	Self-Learning Course – III	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**29**	**24**	

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26BM501T	Diagnostic Equipment	T	3-0-0	3	3	ES (PC)
2.	26BM0XXX	Programme Elective – I	T	3-0-0	3	3	ES (PE)
3.	26BM502T	Biomechanics	T	3-0-0	3	3	ES (PC)
4.	26BM503L	Radiological Equipment	LIT	2-0-2	4	3	ES (PC)
5.	26BM504L	Artificial Intelligence and Machine Learning in Healthcare	LIT	2-0-2	4	3	ES (PC)
6.	26BM505L	Biomedical Signal Processing	LIT	2-1-2	5	4	ES (PC)
7.	26BM506L	Industry oriented Course – III	LIT	2-0-2	4	3	ES (PC)
8.	26BM507P	Career Readiness & Professional Skills – Advance Level	P	0-0-2	2	1	SD
9.	26BM508P	Project Work – III	P	0-0-2	2	1	SD
10.	---	Self-Learning Course – IV	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**30**	**24**	

For Honours Degree							
1.		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – I	T	3-0-0	3	3	

2.		Honours Elective – II	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – I	T	3-0-0	3	3	
2.		Minor Elective – II	T	3-0-0	3	3	

Semester – VI							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26MG601T	Biomedical Ethics, Regulations and IPR	T	3-0-0	3	3	HUM
2.	26BM0XXX	Programme Elective – II	T	3-0-0	3	3	ES (PE)
3.	26BM9XXX	Open Elective – I	T	3-0-0	3	3	OE
4.	26BM601L	Therapeutic Equipment	LIT	2-0-2	4	3	ES (PC)
5.	26BM602L	Healthcare in Data Analytics	LIT	2-0-2	4	3	ES (PC)
6.	26BM603L	Brain Computer Interfacing	LIT	2-0-2	4	3	ES (PC)
7.	26BM604L	Industry oriented Course – IV	LIT	2-0-2	4	3	ES (PC)
8.	26BM605P	Career Readiness & Professional Skills – Placement Level	P	0-0-2	2	1	SD
9.	26BM606P	Project Work – IV	P	0-0-2	2	1	SD
10.	---	Self – Learning Course – V (NPTEL/Microsoft/IBM/AWS)	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**29**	**23**	

For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – III	T	3-0-0	3	3	
2.		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	
2.		Minor Elective – IV	T	3-0-0	3	3	

Semester – VII							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26MGC01T	Engineering Entrepreneurship Development	T	2-0-0	2	2	HUM
2.	26BM0XXX	Programme Elective – III	T	3-0-0	3	3	ES (PE)
3.	26BM0XXX	Programme Elective – IV	T	3-0-0	3	3	ES (PE)
4.	26BM701L	Industry oriented Course – V	LIT	2-0-2	4	3	ES (PC)
5.	26BM702L	Wearable Systems in Healthcare	LIT	2-0-2	4	3	ES (PC)
6.	26BM703L	Industry oriented Course – VI	LIT	2-0-2	4	3	ES (ET)
7.	26BM704P	Major Project – Phase I	P	0-0-4	4	2	SD
8.	26BM705P	Summer Internship	P	--	--	1	SD
Total Credits					**24**	**20**	

For Honours Degree							
1.		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – V	T	3-0-0	3	3	
2.		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	
2.		Minor Elective – VI	T	3-0-0	3	3	

Semester – VIII							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26BM801P	Major Project – Phase II	P	0-0-16	16	8	SD
Total Credits					**16**	**8**	

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

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Board of Studies of BMG Dept.
Meeting No.: 01 Dated: 28.3.26

PROGRAMME ELECTIVE COURSES – STREAMS

Vertical – I	Vertical – II	Vertical – III	Vertical – IV	Vertical – V	Vertical – VI	Vertical – VII
Bio – Engineering	**Digital Health**	**Medical Device Development**	**Assistive Technology Management**	**Healthcare Biomaterials**	**Computational Biomedical Engineering**	**Surgical & Rehabilitative Technology**
Physiological Modelling	Telehealth Technology	Foundation Skills in Integrated Product Development	Assistive Technology and Devices	Nano biomaterials and Drug Delivery	Soft Computing and its Applications	Prosthetics and Orthotics
Bio Electromagnetics	Digital Therapeutics	Medical Device Design	Hospital Planning and Management	Artificial Organs and Implants	Explainable AI in Medicine	Rehabilitation Engineering
Computational Genomics	Health Informatics	Rapid Prototyping	Medical Equipment Maintenance and Quality Assurance	Biomedical Optics and Photonics	Biometrics	Human Movement Analysis
BIOMEMS	Cloud Computing and Edge AI for Remote Patient Monitoring	Embedded AI for Healthcare	Clinical Engineering	Tissue Engineering	Biomedical Data Analytics	Minimally Invasive Surgical Technology

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Semester – I

26MAC01T	Applied Calculus (Common to all Branches)	Category	L	T	P	C
		BS	3	1	0	4

Prerequisites:

- Fundamental knowledge of Algebra, Functions, Trigonometry, Differentiation and basic Integration.

Course Objectives:

- To provide a strong foundation in differential and integral calculus for Engineering applications.
- To develop analytical skills in solving functions of several variables and optimization problems.
- To enable students to apply integral calculus concepts in computing arc length, area and surface area.
- To introduce multiple integrals and their evaluation in Cartesian, polar, cylindrical and spherical coordinate systems.

Differential Calculus

Functions and graphs - New functions from old functions - Limit of a function - Continuity - Limits at infinity - Derivative as a function - Differentiation rules - Maxima and minima of functions of a single variable - Mean value theorem - Effect of derivatives on the shape of a graph- Applications.

Activities: Open-source Software: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Functions of several variables

Partial derivatives - Higher-order partial derivatives - Total derivative - Chain rule - Taylor's formula for functions of two variables - Maxima and minima of functions of two variables - Method of Lagrange multipliers - Engineering applications.

Activities: Open-source Software: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Integral Calculus

Fundamental theorem of calculus - Indefinite integrals and the net change theorem - Techniques of integration - Improper integrals - Arc length - Area of a plane region - Area of a surface of revolution - Applications.

Activities: Open-source Software: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).

Multiple Integrals

Double integrals - Iterated integrals and Fubini's theorem - Change of order of integration - Change of variables: Cartesian to polar coordinates - Triple integrals - Change of variables: Cartesian to cylindrical and spherical coordinates - Engineering applications.

Activities: Open-source Software: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Total periods (L: 45; T: 15): 60

Text Books:

1. Grewal, B. S. (2017). Higher Engineering Mathematics. Khanna Publishers. 44th Edition.
2. Kreyszig, E. (2016). Advanced Engineering Mathematics. John Wiley & Sons. 10th Edition.

Reference Books:

1. K Kandasamy, K Thilagavathy and K Gunavathy K (2026). Engineering Mathematics. S. Chand Publishing.
2. Anton, H., Bivens, I. C., & Davis, S. (2012). Calculus: Early Transcendentals. John Wiley & Sons. 10th Edition.
3. Larson, R., & Falvo, D. C. (2013). Calculus: An Applied Approach. Cengage Learning. 9th Edition.
4. Stewart, J., Clegg, D., & Watson, S. (2021). Calculus: Early Transcendentals. Cengage Learning. 9th Edition.
5. Thomas, G. B., Weir, M. D., Hass, J., & Heil, C. (2018). Thomas' Calculus: Early Transcendentals. Pearson Education. 14th Edition.
6. Singh, K. (2019). Engineering Mathematics through Applications. Bloomsbury Publishing. 2nd Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply the concepts of limits, continuity and differentiation to analyze the behaviour of single-variable functions and solve optimization problems.
CO2	Apply partial differentiation, Taylor's expansion and the method of Lagrange multipliers to solve optimization problems involving functions of several variables.
CO3	Evaluate definite and improper integrals and apply them to compute arc length, plane area and surface area of revolution.
CO4	Evaluate double and triple integrals using appropriate coordinate systems and apply them to Engineering problems.

26ENC01T	English Essentials – I (Common to all Branches)	Category	L	T	P	C
		HUM	2	0	0	2

Prerequisites:

- Basic knowledge on English communication skills (writing, speaking, reading and listening).

Course Objectives:

- To improve Listening and Pronunciation Skills.
- To develop effective verbal and non-verbal skills.
- To enhance Reading and Comprehension abilities.
- To develop Professional Writing Skills.

Listening & Pronunciation Skills

Listening to academic and workplace conversations - Recorded interview - Pronunciation drills: Stress, Intonation, Phonetics basics - Accent neutralization - Listening comprehension tasks.

Grammar: Introduction to Parts of Speech, Word Syllable, Synonyms & Antonyms.

Activities: Audio Exercises, Minimal Pair Practice, Listening Tests.

Basic Grammar and Communication

Self-introduction: Formal, Informal - Making requests and giving instructions - Expressing opinions and ideas - Conversation.

Grammar: Articles, Tenses, Subject Verb & Agreement, Phrasal Verbs, Collocations, Word Formation, One Word Substitution.

Activities: Self-Introduction, Listen Short Podcasts, Just A Minute (JAM) Video Recording, Situational Role Plays, Spell Bee, Group Discussion.

Reading and Language Skills

Reading strategies: Skimming, Scanning, Predicting - Intensive reading: Short passages, Long passages on suggested theme - Reading comprehension passages.

Grammar: Sentence Patterns, Prefixes and Suffixes, Idioms and Phrases, Prepositions - Gerunds - Conjunctions.

Activities: Reading - Newspaper and Digital Articles, Cloze, Reading Comprehension, Note Making and Summarising.

Written Communication

Discourse markers - Completing sentences - Jumbled sentences - Paragraph writing - Essay writing - Report writing.

Grammar: Active and Passive Voice - Direct and Indirect Questions - Wh-Questions - Yes/No Questions.

Activities: Describe a Product, Apply/Request for Internship Program, Listening and Repeating, Gap Filling Exercises, Note-Taking.

Total periods: 30

Reference Books:

1. Tiwari, A. (2022). Communication Skills in English.
2. Murphy, R. (2019). English Grammar in Use. Cambridge University Press. 5th Edition.
3. English Edge (2025). Speaking. Orient BlackSwan.
4. Sharma, S., & Mishra, B. (2024). Communication Skills for Engineers and Scientists. PHI Learning. 2nd Edition.

E - Resources:

1. Cambridge English - https://www.cambridgeenglish.org/learningenglish/grammar-and-vocabulary/
2. Perfect English Grammar - https://www.perfect-english-grammar.com/
3. British Council - Learn English - https://learnenglish.britishcouncil.org/grammar
4. SpSDhling - https://spSDhling.com/
5. mePro by Pearson - https://mepro.pearson.com/
6. TED Talks - https://www.ted.com/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Demonstrate improved listening skills in academic and real-life contexts.
CO2	Use basic grammatical structures accurately in spoken communication.
CO3	Apply reading strategies to understand and interpret technical and professional texts.
CO4	Develop clear, coherent and professional writing skills.

26TLC01T	தமிழர் மரபு (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

மொழி மற்றும் இலக்கியம்

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செம்மொழி இலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மை கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழர்களின் சமண, பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம்: ஆழ்வார்கள், நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார், பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் - பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத்தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள்: மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

தெருக்கூத்து - கரகாட்டம் - வில்லுப்பாட்டு - கணியான் கூத்து - ஒயிலாட்டம் - தோற்பாவைக் கூத்து - தமிழர்களின் வீர விளையாட்டுகள்: சிலம்பாட்டம், வளரி, புலியாட்டம், ஜல்லிக்கட்டு, கபடி, வழுக்குமரம்.

தமிழர்களின் திணைக் கோட்பாடுகள்

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம், புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும், துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி, இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள் – கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Total periods: 15

References:

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல்மற்றும் 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) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.

26TLC01T	Heritage of Tamils (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

Language and Literature

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 Thirukkural - Tamil epics - Impact of Buddhism, Jainism in Tamil land - Bhakti literature: Azhwars, Nayanmars - Forms of minor poetry - Development of modern literature in Tamil - Contribution of Bharathiyar, Bharathidhasan.

Heritage - Rock Art Paintings to Modern Art - Sculpture

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 - Musical instruments: Mridangam, Parai, Veena, Yazh, Nadaswaram - Role of temples in social and economic life of Tamils.

Folk and Martial Arts

Therukoothu - Karagattam - Villu pattu - Kaniyan koothu - Oyilattam - Leather puppetry - Sports and games of Tamils: Silambattam, Valari, Tiger dance.

Thinai Concept of Tamils

Flora and fauna of Tamils - Aham, Puram concepts from Tholkappiyam and Sangam literature - Aram concept of Tamils - Education and literacy during Sangam age - Ancient cities, ports of Sangam age - Export, import during Sangam age - Overseas conquest of Cholas.

Contribution of Tamils to Indian National Movement and Indian Culture

Contribution of Tamils to Indian freedom struggle - Cultural influence of Tamils over other parts of India - Self-respect movement - Role of Siddha medicine in indigenous systems of medicine - Inscriptions, manuscripts - Print history of Tamil books.

Total periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணியன் பூங்குன்றன் - முதன்மை நூல் - இல. சுந்தரம் (விடியல் பதிப்பகம்).
3. தமிழ் - 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) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26BM101T	Human Anatomy and Physiology – I	Category	L	T	P	C
		ES (PC)	3	0	0	3

Prerequisites:

- Basic knowledge of human anatomy, cell biology, biological terminology and nervous system.

Course Objectives:

- To understand the structural organization of the human body from cellular to system level.
- To correlate anatomical structures with physiological functions.
- To study tissues, integumentary, skeletal and muscular systems.
- To understand basic neural and endocrine regulation mechanisms.

Introduction and Cell Physiology

Levels of organization – anatomical terminology – body planes and cavities – Cell structure – organelles and their functions – Plasma membrane – Transport across cell membrane: diffusion, osmosis, active transport – Cell cycle – Homeostasis – Feedback mechanisms.

Tissues

Classification of tissues – epithelial tissue: types and functions – connective tissue: types and properties – muscle tissue: skeletal, cardiac and smooth muscle – nervous tissue: neurons and neuroglia – Tissue repair and regeneration.

Integumentary and Skeletal System

Integumentary System: Structure of skin – functions of skin – glands and appendages. **Skeletal system:** Structure of bone – Classification of bones – bone formation and growth – Axial and Appendicular Skeleton – Joints: types and movements – calcium homeostasis – Diseases of Bones and Muscles.

Muscular System

Types of muscles: Structure of skeletal muscle – Sliding filament theory – neuromuscular junction – muscle contraction mechanism – types of muscle contraction – muscle fatigue – energy sources for muscle activity.

Nervous and Endocrine System

Nervous System: Organization of nervous system – Structure of neuron – nerve impulse transmission – synapse – central and peripheral nervous system – reflex action.

Endocrine System: Endocrine glands: Pituitary Glands and Hypothalamus, Thyroid Gland, Pancreas, Adrenal Gland – Hormones and their functions – Feedback regulation.

Total periods: 45

Text Books:

1. Gerard J. Tortora and Bryan H. Derrickson, Principles of Anatomy and Physiology, 16th Edition, Wiley India, 2023.
2. Lauralee Sherwood, Human Physiology: From Cells to Systems, 10th Edition, Cengage Learning, 2021.

Reference Books:

1. Cinnamon VanPutte, Jennifer Regan and Andrew Russo, Seeley's Anatomy and Physiology, 13th Edition, McGraw Hill, 2022.
2. John E. Hall, Guyton and Hall Textbook of Medical Physiology, 14th Edition, Elsevier, 2021.
3. Richard L. Drake, A.W. Vogl and A.W.M. Mitchell, Gray's Anatomy for Students, 5th Edition, Elsevier, 2023.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Explain the structure and functional organization of cells and tissues in the human body.
CO2	Describe the anatomy and physiology of integumentary and skeletal systems.
CO3	Apply the principles of muscle physiology to explain mechanisms of contraction and movement.
CO4	Apply concepts of neural and endocrine systems in maintaining body homeostasis.
CO5	Analyze the relationship between anatomical structures and physiological functions in different body systems.

26PHC02L	Physics of Electronic Materials and Devices (Common to BME, ECE and EEE)	Category	L	T	P	C
		BS	2	0	2	3

Prerequisites:

- Basic knowledge of Physics fundamentals, including wave optics and electricity.
- Fundamental knowledge of algebra and logarithms.

Course Objectives:

- To study optics, laser physics and fiber optic technologies and their applications in communication and sensing.
- To introduce the fundamental principles of quantum mechanics as the foundation for understanding material properties.
- To understand the electrical properties of materials through classical and quantum free electron theories.
- To study the electrical properties of semiconductors and their applications in electronic devices.
- To understand the dielectric, magnetic and superconducting properties of materials and their engineering applications

Optics and Laser Physics

Interference: Air wedge - Michelson Interferometer. Lasers: Einstein coefficients - population inversion - Laser Types: Nd: YAG laser, CO_2 laser and dye laser: construction, working principle and applications-Classification of lasers based on safety- Fiber optics: structure of an optical fiber - acceptance angle and numerical aperture (qualitative) - types of optical fibers - fiber optic communication system - fiber sensors: displacement sensor, temperature sensor - applications: Endoscopy.

Practical:

1. Air wedge - Determination of thickness of a thin sheet/wire.
2. Michelson Interferometer - Determination of Wavelength of the light source.
3. Determination of wavelength and divergence angle of laser using diffraction grating.

Quantum Mechanics

Inadequacy of classical mechanics - Blackbody radiation - photoelectric effect - wave- particle duality - de Broglie hypothesis- Wave function - physical significance and normalization - Schrödinger wave equation: time-independent form - particle in a one- dimensional box. quantum tunneling - Scanning Tunnelling Microscope: STM - Resonant Tunnelling Diode.

Practical:

4. Photo-electric effect – Determination of Planck's constant.

Electrical Properties of Materials

Ohm's law - electrical resistivity and conductivity - electron theory of metals - Classical free electron theory: electrical conductivity derivation - limitations of classical theory. Quantum free electron theory - Fermi-Dirac statistics - Fermi energy - effect of temperature on Fermi function - Band theory of solids- classification of solids - density of energy states.

Practical:

5. Determination of electrical resistivity of a given material using four probe setup.

Physics of Semiconductors

Types of semiconductors - energy band diagram - direct and indirect band gap semiconductors - carrier concentration in intrinsic semiconductors. Extrinsic semiconductors - carrier concentration in n-type and p-type semiconductors - variation of carrier concentration with temperature. Carrier transport in semiconductors: drift, mobility and diffusion current. Hall effect- determination of carrier concentration and mobility. Photo detectors and solar cells.

Practical:

6. Measurement of hall coefficient of a semiconductor using Hall Effect setup.
7. Determination of bandgap of semiconductor (thermistor) using meter bridge.
8. Study of I-V characteristics of LED and Solar cell.

Dielectric and Magnetic Properties of Materials

Dielectric materials: Properties of dielectric materials - dielectric constant - polar and non-polar dielectrics - types of polarisation - local field derivation - Clausius - Mossotti equation - ferro-electricity and piezo-electricity (qualitative) - frequency dependence of dielectric constant - applications of dielectric materials.

Magnetic materials: Classification of magnetic materials - domain theory - hard and soft magnetic materials and applications. Superconductors: Introduction - type I, type II superconductors-applications: SQUID, Cryotron.

Practical:

9. Hysteresis curve - Determination of energy loss of a coil.

Total periods (L + P): 60

Text Books:

1. Avadhanulu, M. N., & Kshirsagar, P. G. (2012). Engineering Physics. S. Chand Publishing.
2. Aruldhas, G. (2015). Engineering Physics. PHI Learning Pvt. Ltd. 2nd Edition.
3. Pillai, S. O. (2010). Solid State Physics. New Age International Publishers.
4. Streetman, B. G., & Banerjee, S. K. (2015). Solid State Electronic Devices. Pearson. 7th Edition.

Reference Books:

1. Halliday, D., Resnick, R., & Walker, J. (2021). Fundamentals of Physics. John Wiley & Sons. 12th Edition.
2. Kasap, S. O. (2018). Principles of Electronic Materials and Devices. McGraw-Hill Education. 4th Edition.
3. Callister, W. D., & Rethwisch, D. G. (2018). Materials Science and Engineering: An Introduction. Wiley. 10th Edition.
4. Kittel, C. (2005). Introduction to Solid State Physics. Wiley. 8th Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Analyze the principles of interference, laser physics and fiber optic systems for applications in communication, sensing and medical.
CO2	Understand the fundamental principles of quantum mechanics including wave-particles duality, uncertainty principle and Schrödinger wave equation.
CO3	Analyze the electrical properties of materials using classical and quantum free electron theories, Fermi-Dirac statistics and band theory.
CO4	Apply the concepts of carrier concentration, transport mechanisms and Halll effect to analyze the behavior of intrinsic and extrinsic semiconductors.
CO5	Apply the dielectric, magnetic and superconducting properties of materials and evaluate their suitability for engineering applications

26CSC01L	Problem Solving using C Programming (Common to AI&DS, BME, CSE, ECE, EEE and IT)	Category	L	T	P	C
		ES (G)	2	0	2	3

Prerequisite:

- Basic knowledge of mathematics and logical reasoning.
- Familiarity with fundamental computer concepts such as input, output and memory.
- Ability to understand simple problem statements and step-by-step procedures.

Course Objectives:

- To develop problem-solving skills by understanding problem definition, analysis and designing algorithms using flowcharts and pseudocode.
- To introduce the fundamentals of C programming, including syntax, data types, operators, control structures and error handling for writing efficient programs.
- To enable modular programming skills through functions, recursion, parameter passing and structured program design techniques.
- To provide knowledge of advanced C concepts such as arrays, strings, pointers, user-defined data types and file handling for building real-world applications.

Problem Solving and Algorithmic Thinking

Problem Solving: Problem definition, problem analysis, problem solving techniques, problem analysis chart – Algorithms: Characteristics, design, representation – Flowcharts: Symbols, construction, examples – Pseudocode: Writing structured pseudocode – Program Design Techniques: Top-down approach, modular approach.

C Fundamentals and Programming Constructs

Introduction to Programming Languages: History of C, structure of C program, compilation, execution process – Preprocessor Directives, Comments, Documentation, Indentation, Coding Standards – Types of Errors: Syntax, runtime, logical – Tokens, Delimiters: Keywords, identifiers, constants, variables, data types, reserved words – Operators: Arithmetic, relational, logical, bitwise, assignment, conditional, special operators, precedence, associativity – Input, Output Functions – Control Structures: if, if else, nested if, switch case, while, do while, for, nested loops, jump statements.

Functions and Modular Programming

Functions: Declaration, definition, calling, function parameters, return types, parameter passing: call by value, call by reference using pointers, recursive functions – Variables: Scope, lifetime, storage classes – Header Files – Modular Programming Concepts.

Arrays, Strings and Pointers

Arrays: One-dimensional arrays, multi-dimensional arrays, array processing, array as function argument – Strings: String declaration, input, output, string handling functions – Pointers: Pointer declaration, initialization, pointer arithmetic, pointers and arrays, pointers and functions.

User Defined Data Types and File Processing

Structures, Unions: Defining structures, using structures, array of structures, pointers to structures, unions, applications – Enumerations, Typedef – File Processing: File operations: open, read, write, close, text files, binary files, file pointers, error handling, sequential access, random access – Dynamic Memory Allocation – Command Line Arguments

Total periods (L): 30

List of Experiments:

1. Basic: Algorithm, Flowchart, Pseudocode.
2. Decision Making statements: Simple If, If – else, Nested-If, Switch- case.
3. Looping Statements: For, While, do – while, Jump, Go-to, break and continue statement.
4. Pass by value and pass by reference, Recursion using functions.
5. One-dimensional arrays and multi-dimensional arrays.
6. Operations on Strings.
7. String handling operations using pointers.
8. Structures and unions.
9. File operations and command line arguments.
10. Dynamic Memory Allocation.
11. Write a C program for Authentication and string comparison.
12. Write a C program for ATM Withdrawal System.

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Thareja, R. (2016). Programming in C. Oxford University Press. 2nd Edition.
2. Forouzan, B. A., & Afyouni, H. (2023). Computer Science: A Structured Programming Approach in C. Cengage Learning. 4th Edition.
3. Pont, M. J. (2007). Embedded C. Pearson Education. 2nd Edition.

Reference Books:

1. Balagurusamy, E. (2024). Programming in ANSI C. McGraw Hill Education. 9th Edition.
2. Gustedt, J. (2020). Modern C. Manning Publications. 2nd Edition.
3. Kanetkar, Y. (2020). Let Us C. BPB Publications.
4. Kalicharan, N. (2022). Learn to Program with C: An Introduction to Programming using the C Language. Apress.

E - Resources:

1. NPTEL "Programming in C" IIT Kharagpur (Free): nptel.ac.in | GDB Manual: sourceware.org/gdb | Valgrind Quick Start: valgrind.org/docs.
2. C Programming Tutorial: - https://www.geeksforgeeks.org/.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply problem-solving techniques to design algorithms, flowcharts and pseudocode for computational problems.

CO2	Develop C programs using fundamental concepts such as data types, operators, control structures and input/output functions.
CO3	Implement modular programming using functions, recursion and parameter passing techniques.
CO4	Develop programs using arrays, strings, pointers, user-defined data types and file handling for real-world applications.
CO5	Apply problem-solving techniques to design algorithms, flowcharts and pseudocode for computational problems.

26ECC01L	Basic Electrical and Instrumentation Engineering (Common to BME and ECE)	Category	L	T	P	C
		ES (PC)	2	0	2	3

Prerequisites:

- Basic knowledge of Physics, particularly electricity, magnetism and simple circuits.
- Familiarity with fundamental mathematics, including algebra and basic trigonometry.
- Understanding of basic scientific units and measurements.

Course Objectives:

- To develop fundamental understanding of DC and AC circuit principles and analyse electrical quantities in single-phase and three-phase systems.
- To study the principles, construction and operation of electrical machines used in engineering applications.
- To impart knowledge on the types, construction and working of AC rotating machines.
- To introduce the functional elements and working principles of measuring instruments.
- To introduce the basics of power system structure and electrical protection schemes.

DC and AC Fundamentals

DC Circuits: Ohm's law – Kirchhoff's laws – Series and parallel circuits – Voltage and current sources: Ideal, Practical – Mesh analysis – Nodal analysis – Source transformation – Star-delta transformation.

AC Circuits: Definition of AC quantities – Form factor – Peak factor – Analysis of steady-state AC circuits: R, L, C, R-L, R-C, R-L-C elements – Complex notation – Phasor diagrams – Power, Power factor.

DC Machines

DC Machines: Introduction – Constructional features – Motor, Generator modes – EMF equation – Torque equation – Applications.

Special DC Machines: Universal motor – Stepper motors – Brushless DC motors: Constructional features, Applications.

AC Machines

Single-phase Induction Motors: Construction, types and working principle.

Three-phase Induction Motors: Types, construction and principle of operation.

Synchronous Motors: Construction, principle of operation and applications.

Transformers: Introduction – Transformer: Ideal, Practical – EMF equation – Phasor diagram - Equivalent circuit - Applications.

Application-Based Learning: Problem-solving exercises - Case studies - Mini assignments: Machine selection, Performance analysis, Fault diagnosis in practical engineering scenarios.

Measurements and Instrumentation

Instruments: Functional elements of an instrument - Standards and calibration - Operating principles, Types of measuring instruments: Moving coil, Moving iron meters, Energy meter, Instrument transformers (CT, PT).

Digital Instruments: Digital storage oscilloscope (DSO): Block diagram, Data acquisition.

Basics of Power Systems

Power system structure: Generation, Transmission, Distribution.

Earthing: Methods of earthing - Circuit breakers: Miniature circuit breaker (MCB), Moulded case circuit breaker (MCCB), Earth leakage circuit breaker (ELCB).

Safety: Safety precautions in electrical systems, First aid for electrical accidents.

Total periods (L): 30

List of Experiments:

1. Verification of Ohm's Law and V–I Characteristics.
2. Verification of Kirchhoff's Laws (KVL & KCL).
3. Analysis of DC Circuits using Mesh and Nodal Methods.
4. Study of AC Circuits – R, L, C and RLC Combinations.
5. Measurement of Power and Power Factor in AC Circuits.
6. Open Circuit and Load Test on Single-Phase Transformer.
7. Speed Control of DC Motor.
8. Measurement of Electrical Quantities using Analog and Digital Instruments (Ammeter, Voltmeter, Energy Meter and Digital Storage Oscilloscope)

Total periods (P): 30

Total periods (L+P): 60

Text Books:

1. Kothari, D. P., & Nagrath, I. J. (2010). Basic Electrical Engineering. Tata McGraw-Hill Education. 3rd Edition.
2. Sawhney, A. K. (2015). A Course in Electrical and Electronic Measurements and Instrumentation. Dhanpat Rai & Co.
3. Bakshi, U. A., & Bakshi, V. U. (2009). Electrical Machines. Technical Publications.

Reference Books:

1. Sahdev, S. K. (2015). Basic Electrical Engineering. Pearson Education India.
2. Theraja, B. L., & Theraja, A. K. (2014). A Textbook of Electrical Technology – Volume I & II. S. Chand & Company.
3. Kalsi, H. S. (2010). Electronic Instrumentation. Tata McGraw-Hill. 3rd Edition.
4. Naidu, M. S., & Kamaraju, V. (2009). High Voltage Engineering. Tata McGraw-Hill. 4th Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand the fundamental concepts of DC and AC circuits.
CO2	Analyze electrical quantities in single-phase and three-phase circuits.
CO3	Illustrate the construction and working principle of DC machines, AC machines and transformers for various engineering applications.
CO4	Apply appropriate measuring instruments for electrical measurements.
CO5	Evaluate the power system structure, protection schemes and electrical safety practices.

26MEC01L	Engineering Drawing (Common to all Branches)	Category	L	T	P	C
		ES (G)	2	0	2	3

Course Prerequisites:

- Basic knowledge of geometry, including lines, angles, circles and simple shapes.
- Familiarity with basic mathematical concepts such as measurements, proportions and scaling.
- Basic computer literacy for operating CAD software and handling digital drawing tools.

Course Objectives:

- Introduce the fundamentals of engineering drawing, BIS standards, drawing instruments and conventions used in technical drawings.
- Develop the ability to construct engineering curves and apply the principles of projection for points, lines and plane surfaces.
- Enable students to understand and draw projections of solids and represent engineering components through freehand sketching.
- Familiarize students with sectional views and development of lateral surfaces of solids used in engineering applications.
- Provide exposure to isometric and perspective projections and the use of CAD software for basic 2D drafting and 3D modeling of engineering components.

Construction of Engineering Curves and their Applications

Construction of conic curves– ellipse, parabola and hyperbola by eccentricity method. Construction of special curves– cycloid, epicycloid and involute.

Activities: Virtual Demonstration of Conics and Cycloids

Projection of Points, Lines and Surfaces

Projection of points and projection of lines – inclined to both principal planes by rotating line method. Projection of surfaces inclined to both the principal planes – polygonal, rhomboidal and circular.

Projection of Solids and Free Hand Sketching

Projection of simple solids like prisms, pyramids, cylinder, cone 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.

Activities: Development of models of various solids and virtual demonstration of sectioning, CAD modelling of 2D objects.

Section of Solids, Lateral Surface Development and their Applications

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.

Activities: Development of 2D objects and 3D objects using CAD tools.

Isometric and Perspective Projections Principles of isometric projection — isometric scale - Isometric projections of simple solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical Position. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. **Activities:** Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects. Virtual demonstration of perspective views
Project: Development of 2D objects and 3D objects using CAD tools.
Total Periods (L + P): 60

Text Books:

1. Parthasarathy, N. S., & Murali, V. (2015). Engineering Drawing. Oxford University Press.
2. "Engineering Drawing + Auto CAD" by Venugopal K, V. Prabhu Raja, New Age International Publishers, 6th edition (1 January 2022).

Reference Books:

1. "Basic Engineering Drawing: Mechanical Semester Pattern" by Mehta and Gupta, Charotar Publishing House, 2nd edition, 2018.
2. "Engineering Drawing" by Basant Agrawal and C M Agrawal, Vikas Publishing House, 3rd edition, 2020.
3. "Engineering Drawing with Auto CAD" by B V R Gupta, McGraw Hill Education, 4th edition, 2019.
4. "Engineering Drawing" by P S Gill, Tata McGraw Hill Education, 5th edition, 2018.
5. "Engineering Drawing with an Introduction to AutoCAD" by Dhananjay Jolhe, Cengage Learning, 2nd edition, 2020.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply BIS standards, drawing conventions, dimensioning rules and basic geometric constructions in engineering drawing.
CO2	Construct engineering curves and develop projections of points, lines and plane surfaces using standard projection principles.
CO3	Illustrate projections of solids and freehand sketches of engineering components using first-angle projection methods.
CO4	Develop sectional views and lateral surface developments of solids for engineering applications.
CO5	Create isometric and perspective projections and develop basic 3D models of engineering components using CAD software.

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of BMG Dept.
Meeting No.: 01 Dated: 28.3.26

Semester – II

26MAC03T	Complex Functions and Transforms (Common to BME, Civil, ECE and EEE)	Category	L	T	P	C
		BS	3	1	0	4

Prerequisites:

- Basic knowledge of calculus, differential equations, complex numbers and elementary integration techniques.

Course Objectives:

- To understand analytic functions, apply the Cauchy-Riemann equations and use conformal and bilinear transformations in engineering contexts.
- To apply complex integration techniques - Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series and the residue theorem for evaluation of real integrals.
- To learn and apply Laplace and Z-transforms to solve continuous differential equations and discrete difference equations.
- To analyze periodic and non-periodic functions using Fourier series and Fourier transforms, including Parseval's identity and the convolution theorem.

Complex Differentiation

Analytic functions - Necessary and Sufficient conditions for analyticity in Cartesian, Polar coordinates - Cauchy-Riemann equations - Properties of analytic functions - Harmonic functions, Laplace's equation - Construction of analytic function: Milne-Thomson method - Conformal mapping - Mapping by functions: $w = z + c$, cz, $1/z$, z^2, $z + 1/z$ - Bilinear (Mobius) transformation.

Activities: Open-source software: Verify Cauchy-Riemann equations, check harmonic function: Laplace equation, Visualize conformal mapping.

Complex Integration

Line integral - Cauchy's integral theorem - Cauchy's integral formula (Statement only) - Derivatives of analytic functions: Using Cauchy's formula - Taylor's series - Laurent's series - Singularities, Zeros - Residues - Cauchy's residue theorem - Application of residue theorem: Evaluation of real integrals using circular contour, semicircular contour.

Activities: Open-source software: Line integral: Numerical approximation, Taylor series expansion, Laurent series, Evaluate real integral using residues.

Laplace and Z - Transforms

Laplace transform of standard functions - Linearity property - First shifting theorem - Second shifting theorem: t-shifting - Laplace transform of derivatives - Unit step function (Heaviside function) - Inverse Laplace transform: Partial fraction method and Convolution theorem - Z-transform: Definition - Linearity, Shifting properties - Inverse Z-transform: Partial fraction method - Difference equations - Solution of linear difference equations with constant coefficients using Z-transform.

Activities: Open-source software: Laplace transform, Inverse Laplace transform, Solve linear difference equations with constant coefficients using Z-transform method.

Fourier Series and Fourier Transforms

Fourier series - Dirichlet's conditions - Euler's formulae - Fourier series for functions with arbitrary period: Change of interval formula - Even, Odd functions - Half-range cosine, Sine series - Parseval's identity - Fourier transforms - Properties of Fourier transforms - Fourier cosine, Sine transforms - Convolution theorem for Fourier transforms.

Activities: Open-source software: Fourier series, Plot Fourier approximation, Fourier transform, Verify Parseval's identity.

Total periods (L: 45; T: 15): 60

Text Books:

1. Grewal, B. S. (2017). Higher Engineering Mathematics. Khanna Publishers. 44th Edition.
2. Kreyszig, E. (2016). Advanced Engineering Mathematics. John Wiley & Sons. 10th Edition.

Reference Books:

1. Churchill, R. V., & Brown, J. W. (2013). Complex Variables and Applications. McGraw-Hill. 9th Edition.
2. H. S. Govinda Rao (2008). Higher Engineering Mathematics. Viva books, New Delhi, India.
3. Veerarajan, T. (2014). Engineering Mathematics (Semester II). Tata McGraw-Hill. 4th Edition.
4. Narayanan, S., Manicavachagom Pillay, T. K., & Ramanaiah, G. (2009). Advanced Mathematics for Engineering Students (Vol. 2). S. Viswanathan Publishers. 2nd Edition.
5. Spiegel, M. R. (2018). Laplace Transforms. McGraw-Hill.
6. Simmons, G. F. (2016). Differential Equations with Applications and Historical Notes. CRC Press. 3rd Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply Cauchy-Riemann equations, construct analytic functions using Milne-Thomson method and use conformal and bilinear transformations.
CO2	Evaluate complex integrals using Cauchy's theorem and formula, expand functions in Taylor's and Laurent's series and apply the residue theorem to real integrals.
CO3	Compute Laplace and Z-transforms, find their inverses using partial fractions and convolution theorem and solve differential and difference equations.
CO4	Represent functions using Fourier series, construct half-range series and apply Fourier transforms with Parseval's identity and convolution theorem.

26TLC02T	தமிழர்களும் தொழில்நுட்பமும் (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு, சிவப்பு பானைகள் மற்றும் கீறல் குறியீடுகள்.

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

சங்க காலத்தில் வடிவமைப்பு, கட்டுமானங்கள் - சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகற்களும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்கள், கோவில்கள் - சோழர் காலத்து பெருங்கோயில்கள், பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் - மதுரை மீனாட்சி அம்மன் ஆலயம், திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

உற்பத்தித் தொழில் நுட்பம்

கப்பல் கட்டும் கலை - உலோகியல் - இரும்புத் தொழிற்சாலை - இரும்பு உருக்குதல் - எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு, தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - மணிகள்: கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்

அணை - ஏரி - குளங்கள் - மதகு - சோழர் காலக் குமிழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்

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

Total periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் - முனைவர் இள. சுந்தரம் (விகடன் பதிப்பகம்).
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) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26TLC02T	Tamils and Technology (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

Weaving and Ceramic Technology

Weaving industry during Sangam age - Ceramic technology - Black, Red ware potteries (BRW) - Graffiti on potteries.

Design and Construction Technology

Designing, Structural construction of houses during Sangam age - Design in household materials during Sangam age - Building materials, Hero stones of Sangam age - Details of stage constructions in Silappathikaram - Sculptures, Temples of Mamallapuram - Great temples of Cholas, Other worship places - Temples of Nayaka period - Type study: Madurai Meenakshi temple - Thirumalai Nayakar mahal - Chettinad houses - Indo-Saracenic architecture at Madras during British period.

Manufacturing Technology

Art of ship building - Metallurgical studies - Iron industry - Iron smelting - Steel - Copper, Gold coins as sources of history - Minting of coins - Bead making industries: Stone beads, Glass beads, Terracotta beads, Shell beads, Bone beads - Archaeological evidences - Gemstone types described in Silappathikaram.

Agriculture and Irrigation Technology

Dam - Tank - Ponds - Sluice - Significance of Kumizhi thoompu of Chola period - Animal husbandry - Wells designed for cattle use - Agriculture, Agro processing - Knowledge of sea - Fisheries - Pearl, Conch diving - Ancient knowledge of ocean - Knowledge-based society.

Scientific Tamil & Tamil Computing

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 periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இள. சுந்தரம் (விகடன் பதிப்பகம்).
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) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26BM201T	Human Anatomy and Physiology – II	Category	L	T	P	C
		ES (PC)	3	0	0	3

Prerequisite:

- Basic knowledge on human anatomy and physiology – I.

Course Objectives:

- To understand the physiology of major organ systems.
- To study cardiovascular, respiratory, digestive and renal systems.
- To analyze control and integration of body functions.
- To relate physiological mechanisms to biomedical applications.

Cardio Vascular System

Blood: Properties, composition and functions, Blood Groups, importance, identification and structure of Blood Vessel, Heart: structure and functions, functions of valves, cardiac cycle, ECG basics, circulatory system and types, blood pressure regulation.

Respiratory System

Structure of respiratory system, parts of respiratory system, mechanism of breathing, regulation of respiration, types of respiration, lung volumes and capacities, Respiratory acid – base balance, speech – phonation and articulation.

Digestive System

Structure of digestive system, digestion and absorption (carbohydrate, protein and fat), liver and pancreas functions, metabolic roles.

Urinary System

Structure of kidney and nephron, Mechanism of urine formation (filtration, reabsorption and secretion), fluid and electrolyte balance, acid-base balance.

Sensory and Reproductive System

Sensory System: Eye: Layers of eye, Mechanism of vision, Errors of refraction, Ear: Ear divisions, mechanism of hearing, Skin: layers of skin, functions of skin.
Reproductive System: male and female reproductive systems – hormones and reproductive physiology.

Total periods: 45

Text Books:

1. Gerard J. Tortora & Bryan Derrickson, Principles of Anatomy and Physiology, 16th Edition, Wiley India, 2023.
2. Cinnamon VanPutte et al., Seeley's Anatomy and Physiology, 13th Edition, McGraw Hill, 2022.

Reference Books:

1. Drake et al., Gray's Anatomy for Students, 5th Edition, Elsevier, 2023.
2. John E. Hall, Guyton and Hall Medical Physiology, 14th Edition, Elsevier, 2021.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Explain the structure and functions of cardiovascular and respiratory systems.
CO2	Describe the processes involved in digestion and metabolism.
CO3	Apply physiological principles to explain renal function and fluid balance.
CO4	Apply concepts of sensory and reproductive systems in human body functioning.
CO5	Analyze the integration of various organ systems in maintaining overall body homeostasis.

26PH201L	Medical Physics	Category	L	T	P	C
		BS	2	0	2	3

Prerequisites:

- Basic knowledge of higher secondary physics including electromagnetic waves, atomic & nuclear physics and acoustics
- Understandings on basic higher secondary mathematics.

Course Objectives:

- To understand the fundamentals of electromagnetic radiation, light and their biological effects.
- To understand atomic structure, radioactivity and radiation detection using devices like the Geiger-Muller counter.
- To analyze the interaction of radiation with matter and principles of radiation dosimetry.
- To explore radiation devices and their diagnostic and therapeutic applications.
- To learn the principles of sound and ultrasound in medical practice.

Low energy Electromagnetic Radiation and Medical Application

Physics of light, intensity, limits of vision and color vision - EM radiations - Ionizing and non-ionizing radiations, characteristics - Biological effects of non-ionizing radiation: tissue as a leaky dielectric, low and high-frequency effects - Thermography and medical applications.

Practicals:

1. Charging and Discharging study of materials.
2. Study of Thermal Radiation using an IR Thermometer.
3. To determine the Near Point (limit of accommodation) of the human eye.

Activity: Virtual demonstration of Thermography.

Atomic and Nuclear Physics

Atomic structure: atomic number, mass number, isotopes, nuclear structure - Atomic models: quantum mechanical atomic model, Rutherford nuclear model - Radioactivity: α, β, γ radiations and characteristics - Radiation detection devices: Geiger-Muller counter, scintillation detectors.
Activity: Rutherford atomic model- Alpha particle scattering (Virtual).

Interaction of Radiation with Matter and Dosimetry

Interaction of charged particles with matter: Specific ionization, Linear energy transfer, Range - Radiation processes: Bremsstrahlung, Annihilation- Interaction of X-rays and gamma rays with matter - Photoelectric effect – Compton scattering - Pair production – Attenuation of gamma radiation- Interactions of neutron with matter and clinical significance - Radioactive decay: Natural and Artificial radioactivity, Sources of radioisotopes - Radiation doses and measurement: SI units, inverse square law, maximum permissible exposure, Dosimetric quantities, LD 50 concept.

Practical:

4. Verification of Inverse Square law.

Radiation Devices and Applications

Diagnostic imaging: X-rays, CT scans, PET: Positron emission tomography – MRI instrumentation – Therapeutic applications: Radiotherapy using gamma rays, Brachytherapy – Radiation shielding materials.

Activity: Radiology Lab Visit.

Principles of sound in Medicine

Physics of sound: Normal sound levels, Ultrasound fundamentals – Ultrasound generation: Ultrasound transducer – Interaction of ultrasound with matter: Cavitation, Reflection, Transmission – Ultrasound imaging: Scanning methods, Artifacts – Doppler effect: Clinical applications.

Practicals:

5. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
6. Determination of velocity of ultrasonic waves in liquids - Acoustic Grating.

Total periods (L: 30; P: 30): 60

Text Books:

1. Halliday, D., Resnick, R., & Walker, J. (2014). Fundamentals of Physics (10th ed.). Wiley.
2. Cameron, J. R., Skofronick, J. G., & Grant, R. M. (1992). Medical Physics. Wiley.
3. Avadhanulu, M. N., & Kshirsagar, P. G. (2018). A Text Book of Engineering Physics 9th Revised Edition, S. Chand and Company, New Delhi.
4. Alrawi, H., & Al-Daamy, K. Laser Applications in Biomedical Engineering and Medical Device Technologies: From Principles to Diagnosis and Therapy. Bright Sky Publications TM, New Delhi.
5. Cromwell, L., Weibell, F. J., & Pfeiffer, E. A. (2011). Biomedical Instrumentation and Measurements. Prentice Hall of India.

Reference Books:

1. Thyagarajan, K., & Ghatak, A. K. (2010). Lasers: Fundamentals and Applications in Medicine. Springer.
2. Khan, F. M. (2014). The Physics of Radiation Therapy (5th ed.). Lippincott Williams & Wilkins.
3. Suetens, P. (2017). Fundamentals of Medical Imaging (2nd ed.). Cambridge University Press.
4. Hall, E. J. (2000). Radiation Physics for Medical Physicists. Lippincott Williams & Wilkins.
5. Chandra, R. (2012). Nuclear Medicine Physics. Jaypee Brothers.
6. Pattison, D. (2011). Essentials of Medical Radiation Physics. CRC Press.
7. Bronzino, J. D. (2000). The Biomedical Engineering Handbook (2nd ed.), Volume-1. CRC Press.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Explain the properties of electromagnetic radiation, classify ionizing and non-ionizing radiations and assess their effects.

CO2	Describe atomic and nuclear models, isotopes and identify types of radioactive emissions with detection methods.
CO3	Analyze radiation interactions with matter, evaluate radioactive decay and apply dosimetric concepts in clinical contexts.
CO4	Demonstrate knowledge of diagnostic imaging techniques, therapeutic radiation methods and radiation shielding materials.
CO5	Apply the physics of sound and ultrasound, interpret scanning methods and artifacts and utilize Doppler ultrasound in clinical applications.

26BM202L	Electronic Devices and Circuits	Category	L	T	P	C
		ES (PC)	2	0	2	3

Prerequisites:

- Basics of physics, especially semiconductor fundamentals and electrical concepts.
- Understanding of basic electrical circuits and electronic components.
- Knowledge of basic mathematics for circuit analysis.
- Ability to interpret circuit behaviour and graphical characteristics.

Course Objectives:

- Introduce the concept of diodes, Bipolar Junction Transistors and FET.
- Study the various model parameters of Transistors
- Learn the concept of special semiconductor devices, Power & Display devices
- Impart the knowledge of various configurations, characteristics, applications.
- To have knowledge of display and power devices.

Semiconductor Diode

PN junction diode: Structure, Energy band diagram, Current equations – Carrier transport: Diffusion current density, Drift current density – Biasing characteristics: Forward bias, Reverse bias – Junction capacitances: Transition capacitance, Diffusion capacitance – Switching characteristics – Breakdown mechanisms: PN junction diode.

Bipolar Junction Transistors

Bipolar junction transistors: NPN, PNP, Operation, Early effect, Current equations – Configurations: CE, CB, CC, Input characteristics, Output characteristics – Small-signal models: Hybrid-π model, h-parameter model – Large-signal models: Ebers-Moll model, Gummel-Poon model – Special transistors: Multi-emitter transistor.

Field Effect Transistors

MOSFETs: Drain characteristics, Transfer characteristics, Current equations – Pinch-off voltage, Threshold voltage, Channel length modulation – Small-signal characteristics – Types of MOSFET: Depletion MOSFET, Enhancement MOSFET, Characteristics – Comparison: MOSFET, BJT.

Special Semiconductor Devices

Metal-semiconductor junction – Devices: MESFET, FinFET, PiNFET, CNTFET, Dual-gate MOSFET – Diodes: Point-contact diode, p-i-n diode, Avalanche photodiode, Schottky barrier diode, Zener diode, Varactor diode, Tunnel diode – Semiconductor materials, Optoelectronic devices: Gallium arsenide device, Laser diode, LDR.

Power Devices and Display Devices

Power semiconductor devices: UJT, Thyristor family: SCR, DIAC, TRIAC – Power transistors: Power BJT, Power MOSFET, DMOS, VMOS – Optoelectronic devices: LED, LCD, Opto-coupler, Solar cell, CCD.

Total periods (L): 30

Practical Exercises:

1. Characteristics of PN and zener diode.
2. Characteristics of CE, CB configurations.

3. Half wave and Full wave rectifier with capacitor filter.
4. Voltage regulation using zener diode.
5. Study of characteristics of photo diodes
6. Study of characteristics of SCR

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Millman, J., & Halkias, C. C. (2015). Electronic devices and circuits (4th ed.). McGraw Hill.
2. Rashid, M. H. (2015). Electronic devices and circuits. Cengage Learning Pvt. Ltd.
3. Salivahanan, S., & Suresh Kumar, N. (2016). Electronic devices and circuits (4th ed.). McGraw Hill.

Reference Books:

1. Boylestad, R. L., & Nashelsky, L. (2014). Electronic devices and circuit theory (11th ed.). Pearson Prentice Hall.
2. Bhattacharya, D. K., & Sharma, R. (2014). Solid state electronic devices (2nd ed.). Oxford University Press.
3. Sedha, R. S. (2008). A textbook of electronic devices and circuits (2nd ed.). S. Chand Publications.
4. Bell, D. A. (2008). Electronic devices and circuits (5th ed.). Oxford University Press.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Analyze the characteristics of semiconductor diodes.
CO2	Analyze and solve problems of Transistor circuits using model parameters.
CO3	Identify and characterize diodes and various types of transistors.
CO4	Analyze the characteristics of special semiconductor devices.
CO5	Analyze the characteristics of Power and Display devices.

26CY202L	Biochemistry and Microbiology (For BME Department)	Category	L	T	P	C
		BS	2	0	2	3

Prerequisite:

- Basic analytical, problem-solving and laboratory skills with the ability to understand fundamental scientific concepts in chemistry and biology

Course Objectives:

- To provide fundamental understanding of biomolecules and their role in biological systems, including carbohydrates, proteins, lipids and nucleic acids.
- To explain enzyme kinetics, metabolic pathways and biological buffer systems and relate them to physiological and clinical conditions.
- To introduce the basic concepts of immunology, including immune system components, antigen–antibody interactions and their biomedical applications.
- To develop knowledge of microbiological principles, including classification, structure, growth and control of microorganisms relevant to healthcare.
- To develop practical skills in biochemical and microbiological techniques and enable students to correlate experimental observations with theoretical concepts for biomedical applications.

Biomolecules and Biological Systems

Structure and function of biomolecules – carbohydrates, proteins, lipids, nucleic acids – levels of protein structure – biological significance of macromolecules – water as a biological solvent – non-covalent interactions – overview of cell organization and biochemical composition.

Enzymes and Metabolism

Enzymes: classification, mechanism of enzyme action – factors affecting enzyme activity – enzyme kinetics (Michaelis-Menten concept) – enzyme inhibition – metabolism: overview of carbohydrate, protein and lipid metabolism – ATP and energy transfer – metabolic pathways and their regulation.

Acid–Base Balance and Biological Buffers

Concept of pH and pKa – biological buffers: bicarbonate, phosphate and protein buffer systems – Henderson–Hasselbalch equation – acid-base imbalance: acidosis and alkalosis – principles of osmosis, diffusion, surface tension and viscosity – applications in biological systems.

Immunology

Overview of immune system – innate and adaptive immunity – cells and organs of immune system – antigens and antibodies: structure and function – antigen-antibody interactions – hypersensitivity and immune disorders – monoclonal antibodies and immunotherapy applications.

Microbiology

Classification and structure of microorganisms – bacteria, viruses, fungi – microbial growth phases – culture media and microbial cultivation – sterilization and disinfection techniques – staining methods: simple, Gram, acid-fast – applications in healthcare and biomedical engineering.

Total periods (L): 30

List of Experiments:

1. Preparation of standard solutions (normality and molarity)
2. Preparation of buffer solutions and pH measurement
3. Calibration and use of pH meter
4. Estimation of biomolecules (carbohydrates, proteins, lipids)
5. Separation of serum and plasma from blood samples
6. Microscopic observation of cells and microorganisms
7. Simple staining and Gram staining techniques
8. Acid-fast staining technique
9. Microbial culture techniques (inoculation and growth observation)
10. Sterilization methods and aseptic techniques
11. Identification of microbes using staining and morphology
12. Hematological analysis (RBC and WBC estimation – demonstration/experiment)

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Satyanarayana, U., & Chakrapani, U. (2017). Biochemistry (5th ed.). Elsevier.
2. Ananthanarayan, R., & Paniker, C. K. J. (2020). Textbook of microbiology (11th ed.). Universities Press.

Reference Books:

1. Nelson, D. L., & Cox, M. M. (2021). Lehninger principles of biochemistry (8th ed.). W. H. Freeman.
2. Voet, D., & Voet, J. G. (2019). Biochemistry (5th ed.). John Wiley & Sons.
3. Prescott, L. M., Harley, J. P., & Klein, D. A. (2017). Microbiology (10th ed.). McGraw-Hill Education.
4. Owen, J. A., Punt, J., & Stranford, S. A. (2018). Kuby immunology (8th ed.). W. H. Freeman.

Course Outcomes

At the end of the course, students will be able to:	
CO1	Explain the structure and function of biomolecules and their role in biological systems.
CO2	Apply concepts of enzyme kinetics, metabolism and biological buffer systems to analyze physiological processes.
CO3	Describe immune system mechanisms, antigen–antibody interactions and their relevance in biomedical applications.
CO4	Describe and apply microbiological concepts including classification, growth, staining and control of microorganisms relevant to biomedical and clinical applications.
CO5	Perform biochemical and microbiological experiments, interpret results and relate them to biomedical and clinical applications.

26ENC02L	English Essentials – II (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	2	2

Prerequisites:

- Fundamental communication skills required for academic and professional contexts.

Course Objectives:

- To enhance practical communication skills through lab-based activities.
- To train students in professional and workplace communication.
- To improve listening, presentation and teamwork skills.
- To equip students with essential skills for interviews and career readiness.

Communication Concepts

Types of communication: Verbal, Non-verbal, Written - Process of communication - Interpersonal, Intrapersonal communication - Barriers to communication - Ways to overcome barriers - Listening skills - Active listening.

Lab Activities: Listening practice using audio clips: Note-taking - Role-play: Formal, Informal communication - Group activity: Identify communication barriers in real-life cases - Short self-introduction: Record, Review - Think-pair-share discussions.

Business Correspondence

Email writing - Cover letter, Resume writing - LinkedIn, Profile building basics - SOP writing.

Lab Activities: Write professional emails: Leave request, Complaint, Enquiry - Resume preparation: ATS-friendly format - Cover letter drafting: Internships, Jobs - Peer review of resumes - Email etiquette - Email writing: Request for education loan, Internship, Placement - Spot-the-error in business email.

Presentation Skills

Public speaking techniques - Structuring a presentation - Body language, Voice modulation - Use of visual aids: PPT - Poster making - Use of AI tools.

Lab Activities: 2-3-minute speech on technical, General topics - PPT presentation - Mirror practice for confidence building - Record, Analyse student presentations - Body language activity: Gesture control, Posture.

Workplace Readiness

Interviews - Types of interviews - Preparing for interviews - Mock interviews - Group discussion - Types of GDs - Preparing for GD - Parameters used for evaluating GD - Telephone, Video call etiquette.

Lab Activities: Simulated job interview: Peer panel - 5-minute group discussion on a given topic - Picture-based non-verbal communication exercise.

Total periods (L: 15; P: 30): 45

Text Books:

1. Raman, M., & Sharma, S. (2008). Technical Communication: English Skills for Engineers. Oxford University Press.
2. Subhashini, B., et al. (2025). English for Technical Communication. RK Publications.
3. Ibbotson, M. (2008). Cambridge English for Engineering. Cambridge University Press.

E - Resources:

1. Cambridge English - https://www.cambridgeenglish.org/learningenglish/grammar-and-vocabulary/
2. Communication for Business Success-https://open.umn.edu/opentextbooks/textbooks/8
3. TED Talks - https://www.ted.com/
4. Speechling - https://speechling.com/
5. mePro by Pearson - https://mepro.pearson.com/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Demonstrate improved listening and pronunciation skills.
CO2	Draft effective business emails, resumes and cover letters.
CO3	Deliver structured and impactful presentations.
CO4	Apply workplace communication skills including group discussion and interviews.

26MEC01P	Engineering Practices and Re-Engineering Laboratory (Common to all Branches)	Category	L	T	P	C
		SD	0	0	4	2

Prerequisites:

- Basic understanding of science concepts (Physics fundamentals like force, electricity and energy).
- Familiarity with basic tools, measurements and safety practices (school-level exposure is sufficient).
- Basic awareness of computers and simple programming concepts (intro level).
- Willingness to engage in hands-on activities and teamwork.

Course Objectives:

- To develop practical skills in fabrication, assembly and disassembly of everyday products using appropriate tools and safety practices.
- To provide hands-on training in electrical wiring, electronic components, sensors and microcontroller-based automation.
- To expose students to modern fabrication technologies including 3D printing and laser cutting.
- To cultivate product thinking through reverse engineering - sketching, measuring, modelling and proposing design improvements.
- To build confidence and problem-solving ability in students, particularly those with limited prior exposure to engineering tools and concepts.

List of Experiments

Tools, Safety and Hands - on - Fabrication

1. Identification and safe handling of common workshop and electrical tools - spanners, screw drivers, pliers, multimeter, soldering iron, drill machine.
2. Dis-assembly and assembly of common household appliances: Mixer-Grinder, Ceiling Fan / Table Fan, Washing Machine - understanding of mechanisms, bearings, switches and motor connections.
3. Dis-assembly and assembly of Refrigerator / Air-Conditioner - introduction to refrigeration cycle components (compressor, condenser, expansion valve, evaporator).
4. Dis-assembly and assembly of a Bicycle - chain drive, gearing, brake mechanism and frame joints.
5. Welding Practices: Safety measures, types of joints, hands-on session on SMAW and GMAW on mild steel / stainless steel plates.

Electrical Wiring and Electronics

1. Electrical installation tools and safety measures; handling of Fuses, Miniature Circuit Breakers (MCB) and Distribution Boards.
2. Hands-on wiring for domestic loads: Lights (series and parallel), Fans, Calling Bells.
3. Hands-on wiring for motors and UPS - single-phase motor starter circuit.
4. Electronic components identification: resistors, capacitors, diodes, transistors, LEDs, relays - safe use and testing using multimeter.

5. Soldering practices on Printed Circuit Board (PCB) - soldering, desoldering and inspection.
6. Hands-on construction and testing of a Bridge Rectifier circuit and an Op-Amp based amplifier.

Microcontroller Programming and Automation

1. Introduction to open-source microcontroller platforms (Arduino / ESP32) - architecture, IDE setup, pin configuration, digital and analog I/O.
2. Interfacing digital and analog sensors: temperature sensor (LM35 / DHT11), light sensor (LDR), soil moisture sensor, ultrasonic distance sensor.
3. Interfacing actuators: LED, buzzer, relay, DC motor with L298N driver, servo motor.
4. Mini Project 1 - Home Automation: Automatic light control using LDR sensor and relay.
5. Mini Project 2 - Agricultural Application: Soil moisture-based water pump automation.
6. Mini Project 3 - Healthcare Application: Temperature monitoring with alert system.

Digital Fabrication and Reverse Engineering Project

1. Introduction to Solid Modelling - demonstration and practice on CAD software (Fusion 360 / SolidWorks / Creo) for simple components.
2. 3D Printing - introduction to FDM technology, slicing software (Cura), printing parameters; fabrication of a simple mechanical component.
3. Laser Cutting - demonstration of cutting wood and acrylic sheets into complex profiles for mechanical parts / enclosures.
4. Reverse Engineering Activity (Group of 3-4 students): Select a familiar product (e.g., hand pump, door latch, bicycle brake, water tap, pressure cooker safety valve). Perform: complete disassembly; dimensional measurement using vernier calipers / screw gauge; freehand engineering sketching of each part; CAD modelling of at least two key parts; virtual assembly; identification of one design improvement; fabrication of improved part using 3D printing or workshop tools; presentation of the reverse-engineered model.

Total periods: 60

Text Books:

1. Christena, S. (2014). Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics. Crestline Books.
2. Lipson, H., & Kurman, M. (2013). Fabricated: The New World of 3D Printing. Wiley.
3. Wang, W. (2010). Reverse Engineering: Mechanisms, Structures, Systems & Materials. CRC Press.
4. Margolis, M. (2020). Arduino Cookbook: Recipes to Begin, Expand and Enhance Your Projects. O'Reilly Media. 3rd Edition.
5. Bureau of Indian Standards (2019). Code of Practice for Electrical Wiring Installations (IS 732:2019).

E - Resources:

1. GrabCAD (Free CAD models library) - https://grabcad.com/.
2. GitHub (Open-source microcontroller code repositories) - https://github.com/.
3. Tinkercad (Free browser-based CAD and Arduino simulation) - https://www.tinkercad.com/.

4. NPTEL - Workshop Technology / Manufacturing Processes - https://nptel.ac.in/.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply appropriate tools and safety measures to disassemble, inspect and reassemble common household appliances and mechanical systems.
CO2	Execute basic electrical wiring and electronic circuit connections for domestic and industrial applications.
CO3	Interface sensors and actuators with a microcontroller to realise simple automation systems relevant to home, agriculture and healthcare contexts.
CO4	Fabricate simple components using 3D printing and demonstrate cutting operations using laser cutting machines.
CO5	Reverse-engineer a given product by disassembling it, taking measurements, preparing sketches, creating a CAD model and identifying scope for design improvement.
CO6	Design and build a working prototype of an improved or alternative product using workshop tools, 3D printing and embedded system programming.

26FLC01P	Foreign Language (German) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To enable students to communicate in everyday situations using basic German vocabulary, greetings, numbers and simple sentence structures.
- To develop foundational German grammar skills including verb conjugation, articles, pronouns, question formation and basic tenses.
- To build practical communicative competence through dialogue, role-play and short writing tasks in real-life contexts such as food, travel, city navigation and social interactions.

GUTEN TAG!

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages.
2. Vocabulary: related to the topic.
3. Grammar: W - Questions, Verbs & Personal pronouns I.

FREUNDE, KOLLEGEN UND ICH

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues and frame simple questions & answers.
2. Vocabulary: related to the topic.
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural.

IN DER STADT

1. To know places, buildings, question, know transport systems, understand international words; build dialogues and write short sentences.
2. Vocabulary: related to the topic.
3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sie verbs.

GUTEN APPETIT!

1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialogues and write short sentences.
2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns & prepositions, Past tense of haben & sein verbs.

TAG FÜR TAG/ZEIT MIT FREUNDEN

1. To learn time related expressions, speak about family, about birthdays, understand & write invitations, converse in the restaurant; ask excuse, fix appointments on phone.
2. Vocabulary: related to the topic.
3. Grammar: Time related prepositions, Possessive articles, Modalverbs.

Total periods : 30

Text Books:

1. Dengler, S. (2013). Netzwerk A1.1. Klett-Langenscheidt GmbH.
2. Evans, S., & Pude, A. (2012). Menschen A1. Hueber Verlag.

Reference Books:

1. Funk, H., & Kuhn, C. (2009). Studio d A1. Goyal Publishers & Distributors Pvt. Ltd.
2. Dallapiazza, R.-M. (2004). Tangram Aktuell 1 (Deutsch als Fremdsprache). Max Hueber Verlag.
3. Lemcke, C., & Rohrmann, L. (2012). Grammatik Intensivtrainer A1. Goyal Publishers & Distributors Pvt. Ltd.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Use basic greetings, alphabet, numbers (1-20), telephone numbers and email conventions and identify countries and languages in German.
CO2	Describe hobbies and professions, form W-questions and yes/no questions and construct simple dialogues using correct verb forms and articles.
CO3	Identify places and buildings in a city, ask for and give directions, interpret transport-related information and use imperative and negation correctly.
CO4	Converse about food and shopping, apply accusative case with verbs, pronouns and prepositions and use past tense of haben and sein in context.
CO5	Express time and appointments, describe family and birthday events, write simple invitations and use modal verbs and possessive articles appropriately.

26FLC02P	Foreign Language (Japanese) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation and speaking.

Writing Systems & Basic Communication

Introduction to Hiragana: vowels, basic characters, reading & writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前、出身、年齢), Basic sentence structure: Subject-Object- Verb, Numbers 1-100, days of the week, classroom expressions.

Activities: Flashcard games and writing drills, Self-introduction, Numbers & date matching, greeting expressions, Listening to audio.

Grammar & Everyday Vocabulary

Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます、のみます), Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに、どこ、だれ、いつ, Vocabulary for family, food, colors and basic actions.

Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters.

Conversation & Cultural Etiquette

Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (～はどこですか？), Ordering food and making polite requests (～をください、～をおねがいします), Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal spSDh and Japanese etiquette.

Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.

Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.

Total periods: 30

References:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2011). Genki I: An integrated course in elementary Japanese. The Japan Times.
2. The Japan Foundation. (2017). Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand simple spoken Japanese in everyday contexts.
CO2	Communicate with widely used Japanese words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.

26FLC03P	Foreign Language (Korean) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To impart fundamentals of the Korean language, including reading, writing systems, pronunciation and speaking.

Fundamentals of Korean

Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).

Activity: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.

Essential Grammar and Vocabulary

Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, expressing possession and location, Asking simple questions (어디, 뭐, 누구).

Activity: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.

Everyday Korean Communication

Polite spSDh levels and honorifics introduction, talking about time, dates and schedules, ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, listening practice with short dialogues, Cultural notes on etiquette and communication.

Activity: Role-play ordering at a restaurant or buying items, listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.

Total periods: 30

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand simple spoken Korean in everyday contexts.
CO2	Communicate with widely used Korean words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.

	Foundations of Problem Solving (Common to all Branches)	Category	L	T	P	C
		MC	3	0	0	NC

Course Objectives:

- To impart high-speed mental arithmetic techniques (Vedic Mathematics and derivative systems) covering addition, subtraction, multiplication, squaring, division and approximation.
- To develop numerical intuition and estimation abilities that support quantitative aptitude, data interpretation and engineering calculations.
- To build visual and spatial problem-solving skills for non-verbal reasoning, figure analysis and diagrammatic interpretation.
- To cultivate lateral and lexical reasoning through word-puzzles, cryptarithms and language-logic games.

Speed Mathematics – I (Saw, OZ, Mirror Method)

Introduction to Vedic mathematics: Sixteen sutras, Thirteen sub-sutras, Mental-math mindset, Relevance in aptitude tests: TCS NQT, Infosys, Accenture, CAT, GATE aptitude.

SAW method (Split-and-weave): High-speed addition, Subtraction of multi-digit numbers, Carry-less addition, Column-compression techniques.

OZ method (One-zero technique): Multiplication near powers of 10, Base-method multiplication, Use of deficiencies, Surplus.

Mirror method: Left-to-right multiplication of 2-digit × 2-digit, 3-digit × 2-digit numbers, Applications in currency conversion, Instant percentage computation – Classroom drills: 50-problem speed rounds, Target < 60 seconds per set.

Speed Mathematics – II (High5, Minion, Butterfly Methods)

High5 method: Rapid squaring of numbers ending in 5, Squaring close to 50, 100, Instant computation: 55^2, 95^2, 105^2, 995^2.

Minion method: Multiplication of two 2-digit numbers: Same tens digits, Units digits sum to 10, General criss-cross (Urdhva-Tiryagbhyam) for 2×2, 3×2 multiplication.

Butterfly method: Fast addition, Subtraction of fractions without LCM, Instant comparison of fractions, Application in ratio-proportion, Data interpretation problems – Division shortcuts: Nikhilam, Paravartya division, Approximate division for percentage DI questions – Timed drill: 30 questions in 8 minutes, Target accuracy ≥ 85%.

Speed Mathematics – III (Inception, Golden Eye Method)

Inception method: Recursive approximation for square-roots, Cube-roots, Powers – Digit-sum-based verification of computations.

Golden-eye method: Estimation, Approximation heuristics for large-number arithmetic, Rounding-and-adjust technique for advanced data interpretation (CAT-level caselets).

Percentage, Ratio, Average shortcuts: Conversion of fractions to percentages, Allegation, Weighted-average tricks – Application bridge to placement tests: Mapping shortcuts to TCS NQT, AMCAT, eLitmus, CAT question types.

Thinking with numbers and Number-Sense reasoning

Number-sense development: Divisibility rules: 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, Composite divisors, Unit-digit patterns, Last-two-digit patterns, Cyclicity of powers – Number series, Pattern recognition: Arithmetic, Geometric, Squares, Cubes, Mixed, Wrong-term identification – Logical arithmetic puzzles: Cryptarithms (SEND + MORE = MONEY), Alpha-numeric puzzles, Kakuro-style number placements – Magic squares, Number-grid puzzles, Sudoku.

Mini-project: Each student maintains a personal "trick-log" notebook of at least 25 speed-math shortcuts with worked examples.

Visual Problem Solving and Word Puzzles

Problem solving with visual information: Figure series, Analogy, Odd-one-out, Embedded figures, Water images, Mirror images, Paper folding, Cutting problems – Spatial reasoning: Cube, Dice problems, Rotation of 3-D figures, Counting of figures, Pattern completion – Word puzzles: Anagrams, Word ladders, Palindromes, Logical deductions from verbal statements, Syllogism warm-ups – Cross-word, Coded-word puzzles, Lateral-thinking riddles, Introduction to Fermi-style estimation questions.

Group workshop: Teams of 3-4 students solve a 10-puzzle sprint in 30 minutes and present solution strategies to the class.

Total Periods: 45

Text Books:

1. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publishing, Revised Edition, 2017. (Units I–IV)

Reference Books:

1. Dhaval Bathia, "Vedic Mathematics Made Easy", Jaico Publishing House, Revised Edition, 2019.
2. Kenneth Williams, "The Cosmic Calculator: A Vedic Mathematics Course for Schools", Motilal Banarsidass Publishers, 2nd Edition, 2015.
3. Jagadguru Sri Bharati Krishna Tirthaji, "Vedic Mathematics", Motilal Banarsidass Publishers, Revised Edition, 2015.
4. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education, 10th Edition, 2023.
5. Shakuntala Devi, "Puzzles to Puzzle You & More Puzzles", Orient Paperbacks, Revised Edition, 2020.

Online Resources / MOOCs:

1. Vedic Maths Forum India - free video lectures and printable drill sheets (https://www.vedicmathsindia.org)
2. PrepInsta Aptitude Daily - TCS NQT pattern quantitative drills (https://prepinsta.com)
3. IndiaBIX Aptitude section - topic-wise unlimited practice (https://www.indiabix.com)
4. NPTEL / SWAYAM - "Speed Mathematics" and "Developing Soft Skills & Personality" MOOCs (https://nptel.ac.in)

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Execute Vedic-math and derivative speed techniques (SAW, OZ, Mirror, High5, Minion, Butterfly, Inception, Golden-Eye) to perform multi-digit arithmetic mentally within target time limits.
CO2	Apply number-sense, divisibility rules and pattern-recognition heuristics to solve quantitative-aptitude and number-series problems with ≥ 85 % accuracy.
CO3	Interpret and solve visual, spatial and non-verbal reasoning problems encountered in placement aptitude tests and competitive examinations.
CO4	Crack word puzzles, cryptarithms and lateral-thinking problems, demonstrating improved cognitive agility and logical fluency.

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of BMG Dept.
Meeting No.: 01 Dated: 28.3.26

CK COLLEGE OF ENGINEERING AND TECHNOLOGY

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(An Autonomous Institution)

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Jayaram Nagar, Chellangkuppam, Cuddalore-607 003, Tamil Nadu, India.