BIOMEDICAL ENGINEERING

R2024

CURRICULUM
&
SYLLABI

GRT INSTITUTE OF ENGINEERING AND TECHNOLOGY, Tiruttani

(An Autonomous Institution)

Accredited by NBA (ECE), NAAC with "A++" Grade & An ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

B.E - BIOMEDICAL ENGINEERING

CURRICULUM REGULATIONS - 2024

CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABI (SEMESTER I TO VIII)

(FOR THE STUDENTS ADMITTED DURING 2024)

SEMESTER - I									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	IP24101	Induction Programme	-	-	-	-	-	**0**	-
THEORY COURSES									
2	HS24101	Professional English	HS	3	-	-	3	3	60/40
3	MA24101	Algebra and Calculus	BS	3	1	-	4	4	60/40
4	PH24101	Engineering Physics	BS	3	-	-	3	3	60/40
5	CY24101	Engineering Chemistry	BS	3	-	-	3	3	60/40
6	GE24101	Problem Solving and Python Programming	ES	3	-	-	3	3	60/40
7	TA24101	Heritage of Tamils	HS	1	-	-	1	1	60/40
PRACTICAL COURSES									
8	GE24102	Problem Solving and Python Programming Laboratory	ES	-	-	4	4	2	40/60
9	PC24101	Physics and Chemistry Laboratory	BS	-	-	4	4	2	40/60
10	HS24102	English Laboratory	HS	-	-	2	2	1	0/100
TOTAL				**16**	**1**	**10**	**27**	**22**	

SEMESTER - II									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24201	Statistics and Numerical Techniques	BS	3	1	-	4	4	60/40
2	GE24201	Engineering Graphics	ES	2	-	3	5	4	60/40
3	PH24203	Medical Physics	BS	3	-	-	3	3	60/40
4	TA24201	Tamils and Technology	HS	1	-	-	1	1	60/40
THEORY CUM PRACTICAL COURSES									
5	BM24201	Anatomy and Human Physiology	PC	3	-	2	5	4	50/50
6	EE24203	Basic Electrical and Electronics Engineering	ES	3	-	2	5	4	50/50
PRACTICAL COURSES									
7	GE24202	Engineering Practices Laboratory	ES	-	-	4	4	2	40/60
8	HS24201	English Communication Laboratory	HS	-	-	4	4	2	40/60
TOTAL				**15**	**1**	**16**	**32**	**24**	

SEMESTER - III									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24302	Transforms and Partial Differential Equations	BS	3	1	-	4	4	60/40
2	BM24301	Signals and Systems	PC	3	-	-	3	3	60/40
3	CS24307	Fundamentals of Data Structures	ES	3	-	-	3	3	60/40
THEORY CUM PRACTICAL COURSES									
4	BM24302	Biosciences for Medical Engineering	PC	3	-	2	5	4	50/50
5	BM24303	Bio Sensors and Measurements	PC	3	-	2	5	4	50/50
6	BM24304	Fundamentals of Electronic Devices and Circuits	PC	3	-	2	5	4	50/50
PRACTICAL COURSES									
7	CS24308	Fundamentals of Data Structures Laboratory	**ES**	-	-	4	4	2	40/60
TOTAL				**18**	**1**	**10**	**29**	**24**	

SEMESTER - IV									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24402	Random Processes	BS	3	1	-	4	4	60/40
2	BM24401	Analog and Digital Integrated Circuits	PC	3	-	-	3	3	60/40
3	EC24407	Microprocessors and Microcontrollers	PC	3	-	-	3	3	60/40
4	GE24402	Environmental Science and Sustainability	BS	2	-	-	2	2	60/40
THEORY CUM PRACTICAL COURSES									
5	BM24402	Bio Signal Processing	PC	3	-	2	5	4	50/50
6	BM24403	Biomedical Instrumentation	PC	3	-	2	5	4	50/50
PRACTICAL COURSES									
7	BM24404	Analog and Digital Integrated Circuits Laboratory	PC	-	-	3	3	2	40/60
8	GE24S03	Soft Skills and Aptitude	EEC	2	-	-	2	0	0/100
TOTAL				**20**	**1**	**7**	**27**	**22**	

SEMESTER - V									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	BM24501	Diagnostic and Therapeutic Equipment	PC	3	-	-	3	3	60/40
2	BM24502	Bio Control Systems	PC	3	-	-	3	3	60/40
3		Open Elective I	OE	-	-	-	-	3	-
4		Professional Elective I	PE	3	-	-	3	3	60/40
5		Professional Elective II	PE	3	-	-	3	3	60/40
6		Non-Credit Mandatory course I	EEC	3	-	-	3	-	0/0
THEORY CUM PRACTICAL COURSES									
7	BM24503	Medical Image Processing	PC	3	-	2	5	4	50/50
PRACTICAL COURSES									
8	BM24504	Diagnostic and Therapeutic Equipment Laboratory	PC	-	-	4	4	2	40/60
9	BM24S01	Design Thinking and Innovation Laboratory	ES	2	-	-	2	1	0/100
TOTAL				**-**	**-**	**-**	**-**	**22**	

SEMESTER - VI									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	BM24601	Biomechanics and Rehabilitation Engineering	PC	3	-	-	3	3	60/40
2	BM24602	Virtual Instrumentation	PC	3	-	-	3	3	60/40
3	AD24604	Artificial Intelligence and Machine Learning	ES	3	-	-	3	3	60/40
4		Professional Elective III	PE	3	-	-	3	3	60/40
5		Professional Elective IV	PE	-	-	-	-	3	-
6		Open Elective II	OE	3	-	-	3	3	60/40
7		Non-Credit Mandatory course II	EEC	3	-	-	3	-	0/0
PRACTICAL COURSES									
8	BM24603	Biomechanics and Virtual Instrumentation laboratory	PC	-	-	4	4	2	40/60
9	BM24604	Mini Project	EEC	-	-	3	3	2	0/100
TOTAL				**-**	**-**	**-**	**-**	**22**	

SEMESTER - VII									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	BM24701	Healthcare Management Systems	PC	3	-	-	3	3	60/40
2	GE24701	Human Values and Ethics	HS	2	-	-	2	2	60/40
3		Management Elective	HS	3	-	-	3	3	60/40
4		Professional Elective V	PE	3	-	-	3	3	60/40
5		Professional Elective VI	PE	3	-	-	3	3	60/40
6		Open Elective III	OE	3	-	-	3	3	60/40
7		Open Elective IV	OE	3	-	-	3	3	60/40
PRACTICAL COURSES									
8	BM24702	Hospital Internship with Training	EEC	-	-	4	4	2	40/60
TOTAL				**-**	**-**	**-**	**-**	**21**	

SEMESTER - VIII									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
PRACTICAL COURSES									
1	BM24801	Project Work/ Internship	EEC	-	-	20	20	10	40/60
TOTAL				**-**	**-**	**-**	**-**	**10**	

TOTAL CREDITS	168

SUMMARY

Name of the Programme: Biomedical Engineering										
S.No	Subject Area	Credits per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HS	5	3					5		13
2	BS	12	7	4	6					29
3	ES	5	10	5		1	3			24
4	PC		4	15	16	12	8	3		58
5	PE					6	6	6		18
6	OE					3	3	6		12
7	EEC						2	2	10	14
8	Non-Credit Mandatory					✓	✓			
TOTAL		22	24	24	22	22	22	22	10	168

MANDATORY COURSE

NON-CREDIT MANDATORY COURSE I: SEMESTER V								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	MX24C71	Introduction to Women and Gender Studies	MC	3	-	-	3	-
2	MX24C72	Elements of Literature	MC	3	-	-	3	-
3	MX24C73	Disaster Risk Reduction and Management	MC	3	-	-	3	-
4	MX24C74	Film Appreciation	MC	3	-	-	3	-

NON-CREDIT MANDATORY COURSE II: SEMESTER VI								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	MX24C75	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	-	-	3	-
2	MX24C76	History of Science and Technology in India	MC	3	-	-	3	-
3	MX24C77	Industrial Safety	MC	3	-	-	3	-
4	MX24C78	Political and Economic Thought for a Human Society	MC	3	-	-	3	-
5	MX24C79	State, Nation Building and Politics in India	MC	3	-	-	3	-

MANAGEMENT ELECTIVE

MANAGEMENT ELECTIVE : SEMESTER VII								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	GE24M01	Principles of Management	HS	3	-	-	3	3
2	GE24M02	Total Quality Management	HS	3	-	-	3	3
3	GE24M03	Engineering Economics and Financial Accounting	HS	3	-	-	3	3
4	GE24M04	Human Resource Management	HS	3	-	-	3	3
5	GE24M05	Knowledge Management	HS	3	-	-	3	3
6	GE24M06	Industrial Management	HS	3	-	-	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Management (Healthcare)	Vertical II Communication	Vertical III Advanced Signal Processing	Vertical IV Image Processing and Bio Engineering	Vertical V Mechanics	Verticals VI Advanced Healthcare Devices	Verticals VII Medical Device Innovation and Development
Clinical Engineering	Communication Systems	Bio Signal Analysis	Embedded Systems and IoMT	Biomechanics	Bio MEMS	Foundation Skills in Integrated Product Development
Hospital Planning and Management	Wearable Devices	Computer Vision	Telehealth Technology	Genetic Engineering	Critical Care and Operation Theatre Equipment	Patient safety, Standards and Ethics
Medical Waste Management	Body Area Networks	Speech and Audio Signal Processing	Medical Device Design	Physiological Modeling	Human Assist Devices	Principles of Tissue Engineering
Economics and Management for Engineers	Virtual Reality and Augmented Reality in Healthcare	Rapid Prototyping	Rapid Prototyping	Assistive Technology	Advancements in Healthcare Technology	Medical Innovation and Entrepreneurship
Biostatistics	Medical Device Regulations	Brain Computer Interface and Applications	Artificial Organs and Implants	Ergonomics	Robotics in Medicine	Biomaterials
Forensic Science in Healthcare	Medical Informatics	Biometric Systems	Neural Engineering	Haptics	Therapeutic Equipment	Biomedical Optics and Photonics

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I: MANAGEMENT (HEALTHCARE)								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P01	Clinical Engineering	PE	3	-	-	3	3
2	BM24P02	Hospital Planning and Management	PE	3	-	-	3	3
3	BM24P03	Medical Waste Management	PE	3	-	-	3	3
4	BM24P04	Economics and Management for Engineers	PE	3	-	-	3	3
5	BM24P05	Biostatistics	PE	3	-	-	3	3
6	BM24P06	Forensic Science in Healthcare	PE	3	-	-	3	3

VERTICAL II: COMMUNICATION								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P07	Communication Systems	PE	3	-	-	3	3
2	BM24P08	Wearable Devices	PE	3	-	-	3	3
3	EC24P38	Body Area Networks	PE	3	-	-	3	3
4	BM24P09	Virtual Reality and Augmented Reality in Healthcare	PE	3	-	-	3	3
5	BM24P10	Medical Device Regulations	PE	3	-	-	3	3
6	BM24P11	Medical Informatics	PE	3	-	-	3	3

VERTICAL III: ADVANCED SIGNAL PROCESSING								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P12	Bio Signal Analysis	PE	3	-	-	3	3
2	BM24P13	Computer Vision	PE	3	-	-	3	3
3	BM24P14	Speech and Audio Signal Processing	PE	3	-	-	3	3
4	BM24P15	Rapid Prototyping	PE	3	-	-	3	3
5	BM24P16	Brain Computer Interface and Applications	PE	3	-	-	3	3
6	BM24P17	Biometric Systems	PE	3	-	-	3	3

VERTICAL IV: IMAGE PROCESSING AND BIO ENGINEERING								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P18	Embedded Systems and IoMT	PE	2	-	2	4	3
2	BM24P19	Telehealth Technology	PE	2	-	2	4	3
3	BM24P20	Medical Device Design	PE	2	-	2	4	3
4	BM24P21	Rapid Prototyping	PE	2	-	2	4	3
5	BM24P22	Artificial Organs and Implants	PE	3	-	-	3	3
6	BM24P23	Neural Engineering	PE	3	-	-	3	3

VERTICAL V: MECHANICS								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P24	Biomaterials	PE	3	-	-	3	3
2	BM24P25	Genetic Engineering	PE	3	-	-	3	3
3	BM24P26	Physiological Modeling	PE	3	-	-	3	3
4	BM24P27	Assistive Technology	PE	3	-	-	3	3
5	BM24P28	Ergonomics	PE	3	-	-	3	3
6	BM24P29	Haptics	PE	3	-	-	3	3

VERTICAL VI: ADVANCED HEALTHCARE								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM24P30	Bio MEMS	PE	3	-	-	3	3
2	BM24P31	Critical Care and Operation Theatre Equipment	PE	3	-	-	3	3
3	BM24P32	Human Assist Devices	PE	3	-	-	3	3
4	BM24P33	Advancements in Healthcare Technology	PE	3	-	-	3	3
5	BM24P34	Robotics in Medicine	PE	3	-	-	3	3
6	BM24P35	Biomedical Optics and Photonics	PE	3	-	-	3	3

OPEN ELECTIVES

OPEN ELECTIVE I								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	AS24901	Space Science	OE	3	-	-	3	3
2	IE24901	Introduction to Industrial Engineering	OE	3	-	-	3	3
3	FD24901	Food, Nutrition and Health	OE	3	-	-	3	3
4	CE24902	Environmental and Social Impact Assessment	OE	3	-	-	3	3
5	EE24901	Renewable Energy System	OE	3	-	-	3	3
6	EI24901	Introduction to Industrial Instrumentation and Control	OE	3	-	-	3	3
7	MA24901	Graph Theory	OE	3	-	-	3	3
8	AD24906	Neural Networks and Deep Learning	OE	2	-	2	4	3
9	CS24901	Digital Marketing	OE	2	-	2	4	3

OPEN ELECTIVE II								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	IE24902	Resource Management Techniques	OE	3	-	-	3	3
2	MG24901	Fintech Regulation	OE	3	-	-	3	3
3	FD24902	Holistic Nutrition	OE	3	-	-	3	3
4	AI24902	IT in Agricultural System	OE	3	-	-	3	3
5	EE24903	Introduction to PLC Programming	OE	3	-	-	3	3
6	CS24904	DevOps	OE	2	-	2	4	3
7	RA24901	Robotic Process Automation	OE	2	-	2	4	3
8	IP24901	Intellectual Property Rights	OE	3	-	-	3	3
9	CE24901	Climate Change and its Impact	OE	3	-	-	3	3

OPEN ELECTIVE III								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	RA24902	Remote Sensing Concepts	OE	3	-	-	3	3
2	CH24901	Nano Technology	OE	3	-	-	3	3
3	MF24901	Cost Management of Engineering Projects	OE	3	-	-	3	3
4	EE24905	Sensors	OE	3	-	-	3	3
5	BT24901	Biotechnology in Health Care	OE	3	-	-	3	3
6	BT24902	Lifestyle Diseases	OE	3	-	-	3	3
7	HS24902	Project Report Writing	OE	3	-	-	3	3
8	ME24901	Applied Design Thinking	OE	3	-	-	3	3
9	MG24902	Democracy and Good Governance	OE	3	-	-	3	3
10	HS24901	English for Competitive Examinations	OE	3	-	-	3	3

OPEN ELECTIVE IV								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	SF24902	Fire Safety Engineering	OE	3	-	-	3	3
2	MR24901	Mechatronics	OE	3	-	-	3	3
3	EC24902	VLSI Design	OE	3	-	-	3	3
4	BT24903	Biotechnology for Waste Management	OE	3	-	-	3	3
5	FD24903	Food safety and Quality Regulations	OE	3	-	-	3	3
6	AU24901	Batteries and Management system	OE	3	-	-	3	3
7	RA24903	Foundation of Robotics	OE	3	-	-	3	3
8	AD24903	Multivariate Data Analysis	OE	3	-	-	3	3
9	AI24904	Agriculture Entrepreneurship Development	OE	3	-	-	3	3
10	RA24904	Drone Technologies	OE	3	-	-	3	3

SEMESTER-I
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

HS24101	PROFESSIONAL ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Improve the communicative competence of learners.
- Help learners use language effectively in academic /work contexts.
- Build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- Develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- Use language efficiently in expressing their opinions via various media

UNIT I INTRODUCTION OF EFFECTIVE COMMUNIATION 1

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

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 8

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

UNIT II NARRATION AND SUMMATION 9

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

UNIT III DESCRIPTION OF PROCESS AND PRODUCT 9

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

UNIT IV CLASSIFICATION 9

Reading–Newspaper articles; Journal reports–and Non-Verbal Communication (tables, pie charts etc.,). Writing–Note-making/Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from nonverbal (chart , graph etc., to verbal mode) Grammar–Forms of Verbs, Articles; Pronouns- Possessive & Relative pronouns. Vocabulary-Collocations; Fixed/Semi fixed expressions.

UNIT V EXPRESSION OF VIEWS 9

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

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Use appropriate words in a professional context**.**

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

CO3: Read and interpret and also infer information presented in tables, charts, denotative and connotative meanings of technical texts and other graphic forms.

CO4: Write definitions, descriptions, narrations and essays on various topics.

TEXTBOOKS:

1. English for Engineers & Technologists Orient Black Swan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology CambridgeUniversityPress,2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K N. Shoba, and Dr. Lourdes Joevani Department of English, Anna University.

REFERENCEBOOKS:

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

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		2		2	2		3	3	2	2	1		
CO2		2		2		2	2		3	3	2	2	1		
CO3		2		2		2	2		3	3	2	3	1		
CO4		1		2		3	2		3	3	2	3	1		
Avg		**1.75**		**2**		**2.25**	**2**		**3**	**3**	**2**	**2.5**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

MA24101	ALGEBRA AND CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To introduce integral ideas in solving areas, volumes and other practical problems in vector.

UNIT I MATRICES 9+3

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

UNIT II DIFFERENTIAL CALCULUS 9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS 9+3

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

UNIT V VECTOR CALCULUS 9+3

Gradient, divergence and curl (excluding vector identities) – Directional derivative –Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane and Gauss divergence theorem and Stoke's theorem (without proof) – Simple applications involving cubes and rectangular parallelopipeds.

Total: 60 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Demonstrate the matrix techniques in solving the related problems in engineering and technology.

CO2: Apply differential calculus tool to solve engineering applications.

CO3: Use differential calculus ideas on functions several variables.

CO4: Evaluate the area and volume by applying the concept of multiple integration.

CO5: Utilize the concept of vector calculus in evaluating integrals.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition,
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCEBOOKS:

1. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
3. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2					2		2	3		1	1
CO2	3	3	1	2					2		2	3		1	1
CO3	3	3	2	2					2		2	3		1	1
CO4	3	3	1	1					2		2	3		1	1
CO5	3	3	2	2					2		2	3		1	1
Avg	**3**	**3**	**1.6**	**1.6**					**2**		**2**	**3**		**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

PH24101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I MECHANICS 9

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

UNIT II ELECTROMAGNETIC WAVES 9

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

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

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

UNIT IV BASIC QUANTUM MECHANICS 9

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

UNIT V APPLIED QUANTUM MECHANICS 9

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

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Recognized the importance of mechanics.

CO2: Express their knowledge in electromagnetic waves.

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

CO4: Illustrate the importance of quantum physics.

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

TEXTBOOKS:

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

REFERENCEBOOKS:

1. R. Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. Halliday, R. Resnick and J. Walker. Principles of Physics, Wiley (Indian Edition), 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	1	-	-	1	-	1	-	-	-	-	-
CO2	3	2	2	1	2	1	2	2	-	1	-	2	-	1	
CO3	3	2	1	1	2	1	1	1	-	1	-	2	-	1	-
CO4	3	3	2	2	2	-	1	2	-	1	-	2	-	1	1
CO5	2	3	2	1	1	1	-	2	-	1	-	2	-	-	-
Avg	**2.8**	**2.6**	**1.75**	**1.25**	**1.6**	**1**	**1.3**	**1.6**	**-**	**1**	**-**	**2**	-	1	1

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

CY24101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I WATER AND ITS TREATMENT 9

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

UNIT II NANOCHEMISTRY 9

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

UNIT III PHASE RULE AND COMPOSITES 9

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

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil – cetane number; Power alcohol and biodiesel. - natural gas- compressed natural gas (CNG)- liquefied petroleum gases(LPG).

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO2 emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor- environmental consequences of fossil fuel- Importance of renewable energy sources -Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Batteries: Types of batteries- lead acid battery- Solid Battery – Lithium Battery, Lithium-ion; Battery Electric vehicles-working principles; Fuel cells: H2-O2 fuel cell, microbial fuel cell.

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

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

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

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

CO4: Analyze the quality of fuel and its various uses.

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

TEXTBOOKS:

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

REFERENCEBOOKS:

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

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				1	1	2							
CO2	2		1	1	2	2	2	1				3		1	1
CO3	3	1				-	-	2				3			
CO4	3	1	1			1	3	2				2			
CO5	3	2	2	2		3	3	1				3			1
Avg	**2.8**	**1.5**	**1.33**	**1.5**	**2**	**1.75**	**2.25**	**1.6**				**2.75**		**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

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

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

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

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

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

UNIT IV LISTS, TUPLES, DICTIONARIES 9

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

UNIT V FILES, MODULES, PACKAGES 9

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

Total: 45 Periods

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Develop and execute simple Python programs.

CO3: Write simple Python programs using conditionals and loops for solving problems.

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

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

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Python Data Science Handbook: Essential Tools for Working with Data, Second Edition (Grayscale Indian Edition) by Jake VanderPlas.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.Comparison of Existing and Revised Syllabus

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2							1	1		
CO2	3	3	3		2							1	1		
CO3	3	3	3		2							1	1	1	
CO4	3	3	3		2						1	1	1	1	
CO5	3	2	1		1						1	1	1	1	
Avg	**3**	**2.8**	**2.6**		**1.8**						**0.5**	**1**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

TA24101	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

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

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Total: 15 Periods

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடு மற்றும் கல்வியியல் பணிகள் கழகம்.
2. கணினித் தமிழ் முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தோல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தோல்லியல் 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 C ivilization 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.

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24102	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the problem-solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

LIST OF EXPERIMENTS

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

Total: 60 Periods

COURSE OUTCOMES:

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

CO1 : Develop algorithmic solutions to simple computational problems

CO2 : Develop and execute simple Python programs.

CO3 : Implement programs in Python using conditionals and loops for solving problems.

CO4 : Process compound data using Python data structures.

CO5 : Utilize Python packages in developing software applications.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	2	1		
CO2	3	3	3	3	2						3	2	1		
CO3	3	3	3	3	2						3		1	1	
CO4	1	2			1						1		1	1	
CO5	2	2			2						2		1	1	
Avg	**2.4**	**2.6**	**3**	**3**	**1.8**						**2.4**	**2**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

PC24101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

EXPERIMENT TOPICS: (Any seven experiments to be conducted)

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

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

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

EXPERIMENT TOPICS: (Any seven experiments to be conducted)

1. Preparation of Na2CO3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

COURSE OUTCOMES:

Upon completion of the course, the students should be able to

CO1 : Analysis the Modulus of elasticity of materials.
CO2 : Illustrate the Laser and Optical fiber.
CO3 : Determine the wavelength of Ultrasonic wave in Liquid.
CO4 : Analyze the effect of chloride in water and DO present in sample water.
CO5 : Identify basicity acidity and pH of the materials

TEXT BOOKS:

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

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1			2	2	1				2			
CO2	3	1	2			1	2	2				1		1	1
CO3	3	2	1	1			1	1						1	1
CO4	2	1	2			2	2	2							
CO5	2	1	2		1	2	2	2				1	1		1
Avg	**2.6**	**1.3**	**1.6**	**1**	**1**	**1.4**	**1.8**	**1.6**				**1.3**	**1**	**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

HS24102	ENGLISH LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

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

UNIT II NARRATION AND SUMMATION 6

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

UNIT III DESCRIPTION OF PROCESS/ PRODUCT 6

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

UNIT IV CLASSIFICATOIN AND RECOMMENDATIONS 6

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

UNIT V DISCUSSION 6

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

Total: 30 Periods

COURSE OUTCOMES:

At the end of the course, learners will be able

CO1 : To listen and comprehend complex academic texts

CO2 : To speak fluently and accurately in formal and informal communicative contexts

CO3 : To express their opinions effectively in both oral and written medium of communication

Assessment Pattern

- Conduction of Assessment to test speaking and writing skills

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		3		2	3		3	3	3	1	1		
CO2		2		3		2	3		3	3	3	1	1		
CO3		2		3		1	1		1	3	1	1	1		
Avg		**2**		**3**		**1.6**	**2.3**		**2.3**	**3**	**2.3**	**1**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

MA24201	STATISTICS AND NUMERICAL TECHNIQUES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The student should be made to:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two - way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION 9+3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

Total: 60 Periods

COURSE OUTCOMES

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

CO1 : Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO2 : Apply the basic concepts of classifications of design of experiments in the field of agriculture.

CO3 : Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

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

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

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	1						2	2			
CO2	3	2	1	2	2						2	3		1	
CO3	2	2	1	1	1						2	2		1	
CO4	2	3	1	1	1						1	3			
CO5	2	3	1	1	1						2	2			
Avg	**2.2**	**2.6**	**1**	**1.2**	**1.2**						**1.8**	**2.4**		1	

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24201	ENGINEERING GRAPHICS	L	T	P	C
		2	0	3	4

COURSE OBJECTIVES:

- To understand the importance of the drawing in engineering applications.
- To develop graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings.

UNIT-I PLANE CURVES AND PROJECTION OF POINTS 5+9

Importance of graphics in engineering applications–Use of drafting instruments– BIS conventions and specifications–size, layout and folding of drawing sheets– lettering and dimensioning. (Not for examination)
Curves used in engineering practices: Conics–construction of ellipse, parabola and hyperbola by eccentricity method, cycloidal curves–construction of cycloid, construction of involutes of square and circle–drawing of tangents and normal to the above curves. Orthographic projection – principles – principal planes – first angle projection – projection of points.

UNIT-II PROJECTION OF LINES AND PLANE SURFACES 5+9

Projection of straight lines (only first angle projection) inclined to both the principal planes – determination of true lengths and true inclinations by rotating line method and traces.
Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III PROJECTION OF SOLIDS AND SECTION OF SOLIDS 5+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Sectioning of solids in simple position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

UNIT-IV DEVELOPMENT OF SURFACE AND ISOMETRIC PROJECTIONS 5+9

Development of lateral surfaces of simple and sectioned solids – prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale –isometric projections of simple solids and truncated solids –prisms, pyramids, cylinders, cones and combination of two solid objects in simple vertical positions.

UNIT-V FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS 5+9

Visualization concepts–representation of three dimensional objects – layout of views–freehand sketching of multiple views from pictorial views of objects.
Principle of perspective projection – terminology –perspective projection of simple solids-prisms, pyramids, cylinder and cone by visual ray method.

UNIT-VI COMPUTER AIDED DRAFTING (Not for examination) 5

Introduction to drafting packages: Initial Setup Commands, Coordinate system in AutoCAD, UCS, WCS, and MCS. Draw Commands, Modify Commands, View Commands, Annotation commands, 2D Drawings and 3D Models -Simple Exercises.

Total: 75 Periods

COURSE OUTCOMES

On successful completion of this course, the student will be able

CO1 : To construct different plane curves and to comprehend the theory of projection.

CO2 : To project orthographic projections of lines and plane surfaces.

CO3 : To draw the projection of simple solids and sectional solids.

CO4 : To draw the development of lateral surfaces of sectional solids and Isometric projections of solids.

CO5 : To perform freehand sketching of multiple views from pictorial viewand visualize perspective view of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 51th Edition, 2012.
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 31th Edition, 2018.

REFERENCE BOOKS:

1. Varghese P I., "Engineering Graphics", McGraw Hill Education (I) Pvt. Ltd., First Edition, 2013.
2. Venugopal K. and PrabhuRaja V., "Engineering Graphics", New Age International (P) Limited, 12th Edition, 2014.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 23th Edition, 2017.
4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	2	-	3	-	2	2	2	
CO2	3	2	2	-	-	-	-	2	-	3	-	2	2	2	
CO3	3	2	2	-	-	-	-	2	-	3	-	2	2	2	
CO4	3	2	2	-	-	-	-	2	-	3	-	2	2	2	
CO5	3	2	2	-	-	-	-	2	-	3	-	2	2	2	
Avg	**3**	**2**	**2**	-	-	-	-	**2**	-	**3**	-	**2**	**2**	**2**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-II

B.E. - BIOMEDICAL ENGINEERING

PH24203	MEDICAL PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide understanding of the application of the radiation concepts and methods of Physics in Medical science
- To accentuate the principle, effects and clinical applications of ionizing, non-ionizing and electromagnetic radiation.
- To instill the basics of logical information about the interaction of light with material.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To study effects of sound and light in human body

UNIT I LOW ENERGY ELECTROMAGNETIC SPECTRUM AND ITS MEDICAL APPLICATION 9

Physics of light, Intensity of light, limits of vision and color vision an overview, Non-ionizing Electromagnetic Radiation: Overview of non-ionizing radiation effects-Tissue as a leaky dielectric-Low Frequency Effects-Higher frequency effects. Thermography– Application.

UNIT II PRINCIPLES OF RADIOACTIVE NUCLIDES 9

Radioactive Decay – Spontaneous Emission – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture, Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology, Decay series, Production of radionuclides – Cyclotron produced Radionuclide- Reactor produced Radionuclide-fission and neutron capture reaction, radionuclide Generator-Technetium generator.

UNIT III INTERACTION OF RADIATION WITH MATTER 9

Interaction of charged particles with matter –Specific ionization, Linear energy transfer range, Bremsstrahlung, Annihilation, Interaction of X and Gamma radiation with matter- Photoelectric effect, Compton Scattering , Pair production, Attenuation of Gamma Radiation, Interaction of neutron with matter and their clinical significance.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) – photo current in a P- N diode – solar cell – photo detectors - LED – Organic LED – Optics in quantum structures – quantum well laser.

UNIT V PRINCIPLES AND APPLICATIONS OF SOUND IN MEDICINE 9

Physics of sound, Normal sound levels, ultrasound fundamentals, Generation of ultrasound (Ultrasound Transducer), Interaction of Ultrasound with matter- Cavitation's, Reflection, Transmission, Scanning methods, Artifacts, Ultrasound- Doppler effect, Clinical Applications

Total: 45 Periods

COURSE OUTCOMES:

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

CO1 : Interpret the properties of electromagnetic radiations and its effect on human.

CO2 : Apply the principles and understand the production of radioactive nuclides.

CO3 : Explain the interaction of radiation with matter

CO4 : Illustrate the optical properties of materials and working principles of various optical devices

CO5 : Demonstrate the knowledge on the properties of sound and its application in medicine.

TEXT BOOKS:

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.
4. B.H. Brown, R.H. Smallwood, D.C. Barber, P.V. Law ford, D.R. Hose, ―Medical Physics and Biomedical
5. Engineering‖, Institute of physics publishing, Bristol and Philadelphia, 1999.
6. Gopal B. Saha ―Physics and Radiobiology of Nuclear Medicine‖ Fourth edition Springer, 2006.

REFERENCES:

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. W.J. Meredith and J.B. Massey "Fundamental Physics of Radiology" Varghese Publishing house, Third Edition, 2013.
5. Steve Webb, The Physics of Medical Imaging, Taylor & Francis, New york, Second Edition, 2012.
6. R.S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	-	-	1	-	-	-	-	1	-	1
CO2	3	2	1	2	-	2	-	2	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	2	-	-	-	-	2	-	2
CO4	3	-	1	-	3	2	3	1	-	-	-	1	-	-	1
CO5	3	-	2	1	-	2	-	2	-	-	-	1	-	-	2
Avg	**3**	**2**	**1.4**	**1.5**	**2.5**	**2**	**3**	**1.6**	**-**	**-**	**-**	**1**	**1.5**	**-**	**1.5**

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

TA24201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries –Sorkuvai Project.

Total: 15 Periods

SEMESTER-II
Common To All Branches
(B.Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

TA242001	தமிழரும் மற்றும் தொழில்நுட்பம்	L	T	P	C
		1	-	-	1

அலகு I நெசவு மற்றும் பானை தொழில்நுட்பம் 3

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

அலகு II வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் 3

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

அலகு III உற்பத்தி தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற் சாலை- இரும்பு உருகுதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சாடித்தல் - மணிகள் உருவக்கும் தொழிற் சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுங்கள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3

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

அலகு V அறிவியல் தமிழ் மற்றும் கணிதத்தமிழ் 3

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

Total: 15 Periods

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடு மற்றும் கல்வியியல் பணிகள் கழகம்.
2. கணினித் தமிழ் முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தோல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தோல்லியல் 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 C ivilization 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.

SEMESTER-II

B.E. - BIOMEDICAL ENGINEERING

BM24201	ANATOMY AND HUMAN PHYSIOLOGY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The student should be:

- To integrate the individual functions of all the cells and tissues and organs into functional whole, the human body.
- Function is dependent on a structure, the curriculum lays stress on functional anatomy of the organs.
- Emphasizes on the cardiovascular, respiratory, urinary and nervous system and their interrelatedness.
- Stimulate the students to understand the basic functioning of every system and the resultant unified organization.

UNIT I BASIC ELEMENTS OF HUMAN BODY 9

Cell – Cell Structure and organelles - Functions of each component in the cell. Cell membrane –transport across membrane - Action potential (Nernst, Goldman equation), Homeostasis. Tissue: Types, functions.

UNIT II SKELETAL AND MUSCULAR SYSTEM 9

Skeletal: Types of Bone and function – Physiology of Bone formation – Division of Skeleton -Types of joints and function – Types of cartilage and function. –Types of muscles – Structure and Properties of Skeletal Muscle- Changes during muscle contraction- Neuromuscular junction.

UNIT III CARDIOVASCULAR AND RESPIRATORY SYSTEM 9

Cardiovascular System: Structure – Conduction System of heart – Cardiac Cycle – Cardiac output. Blood: Composition – Functions - Haemostasis – Blood groups and typing. Blood Vessels – Structure and types - Blood pressure - Respiratory system: Parts of respiratory system – Respiratory physiology – Lung volumes and capacities – Gaseous exchange.

UNIT IV DIGESTIVE AND EXCRETORY SYSTEMS 9

Structure and functions of gastrointestinal system - secretory functions of the alimentary tract - digestion and absorption in the gastrointestinal tract - structure of nephron - mechanism of urine formation - skin and sweat gland - temperature regulation.

UNIT V NERVOUS AND SENSORY SYSTEM 9

Structure and function of nervous tissue – Brain and spinal cord – Functions of CNS – Nerve conduction and synapse – Reflex action – Somatic and Autonomic Nervous system. Physiology of Vision, Hearing, Integumentary, Olfactory systems. Taste buds.

Total: 45 Periods

LIST OF EXPERIMENTS:

1. Collection of Blood Samples
2. Identification of Blood groups (Forward and Reverse)
3. Bleeding and Clotting time
4. Estimation of Haemoglobin

5. Total RBC and WBC Count
6. Differential count of Blood cells
7. Estimation of ESR, PCV, MCH, MCV, MCHC
8. Hearing test – Tuning fork
9. Visual Activity – Snellen's Chart and Jaeger's Chart

Total: 30 Periods
Total: 75 Periods

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

CO1 : Identify and explain basic elements of human body
CO2 : Explain the functions of skeletal and muscular system
CO3 : Describe the structure, function of cardiovascular system and respiratory system
CO4 : Discuss the structure of digestive and excretory system.
CO5 : Describe the physiological process of Nervous and sensory system

TEXT BOOKS:

1. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.

REFERENCES:

1. Guyton & Hall, "Text book of Medical Physiology", 13th Edition, Saunders, 2015.
2. Ranganathan T S, "Text book of Human Anatomy", S.Chand & Co. Ltd., New Delhi, 2012.
3. Sarada Subramanyam, K Madhavan Kutty, Singh H D, "Textbook of Human Physiology", S. Chand and Company Ltd, New Delhi, 2012.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	1	-	1	-	-	-	1	3	3	-
CO2	3	3	2	-	-	1	-	1	-	-	-	1	3	3	-
CO3	3	3	2	-	-	1	-	1	-	-	-	1	3	3	-
CO4	3	3	3	-	-	1	-	1	-	-	-	1	3	3	-
CO5	3	3	3	-	-	1	-	1	-	-	-	1	3	3	-
Avg	**3**	**3**	**2**	-	-	**1**	-	**1**	-	-	-	**1**	**3**	**3**	-

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To B.E. – EEE & MECH

EE24201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To illustrate the basics of electric circuits and analysis of DC & AC circuits.
- To understand the knowledge in the basics of working principles and application of electrical machines.
- To evaluate the fundamentals of analog electronics and their characteristics.
- To demonstrate the fundamental concepts of digital electronics.
- To compute the functional elements and working of measuring instruments.

UNIT - I BASIC ELECTRIC CIRCUITS 9

DC Circuits: Basic Circuit elements – Ohm's Law - Kirchhoff's Laws with Independent Sources – Resistors in Series and Parallel- Current division and Voltage division- Nodal Analysis, Mesh analysis with Independent sources only - Thevenin's and Norton's Theorem. Introduction to AC circuit Fundamentals: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor.

UNIT II ELECTRICAL MACHINES 9

Construction and Working principle - DC Machines, EMF equation, Types and Applications. Construction and Working Principle of Transformers & Induction Motors, V/F drives.

UNIT III ANALOG ELECTRONICS 9

PN Junction Diode, Zener Diode – V-I Characteristics & Applications, BJT, SCR, MOSFET, IGBT Types– Basics of Rectifier and Inverter.

UNIT IV DIGITAL ELECTRONICS 9

Number system and its conversion, binary codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps.

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers - CT and PT, DSO – Block diagram – Data Acquisition.

Total: 45 Periods

LIST OF EXPERIMENTS:

1. Simulation and experimental verification of electrical circuit using Mesh analysis.
2. Simulation and experimental verification of electrical circuit using Nodal analysis.
3. Measurement of Three Phase Power using two Wattmeter method.
4. Load test on single-phase transformer.
5. Load test on DC shunt motor.
6. VI characteristic of PN junction diode.

7. VI characteristic of Zener Diode.
8. Study Of solar PV.

Total: 30 Periods

Total: 75 Periods

COURSE OUTCOMES

After completing this course, the students will be able to

CO1 : Compute the electric circuit parameters.

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

CO3 : Plot the characteristics of analog electronics.

CO4 : Summarize the basic concepts of digital electronics.

CO5 : Interpret the operating principles of measuring instruments.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., Third Edition, 2015.
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCES:

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 9th edition, 2021.
3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 7th Edition 2017.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 4th Edition, 2019.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	1	-	1	-	2	-	1	1
CO2	2	2	1	-	-	-	-	1	-	1	-	2	-	1	1
CO3	2	2	1	-	-	-	-	1	-	1	-	2	-	1	1
CO4	2	2	1	-	-	-	-	1	-	1	-	2	-	1	1
CO5	2	2	1	-	-	-	-	1	-	1	-	2	-	1	1
Avg	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**-**	**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24201	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

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

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Welding various joints in steel plates using arc welding; machining various simple processes like turning, drilling, and tapping in parts.
- Wiring various electrical joints in common household electrical wire work.
- Soldering and testing simple electronic circuits; assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL ENGINEERING)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
b. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
c. Preparation of plumbing line sketches for water supply.
d. Laying pipe connection to the suction and delivery side of a pump
e. Mixed pipe material connection – Pipe connections with different joining components.

WOOD WORK:

a. Study of the joints in roofs, doors, windows and furniture.
b. Making joints like Mortise and Tenon joint, T-Joint and Dovetail joint by sawing, planning and cutting.

PART II MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a. Welding of Butt joints, Lap joints and Tee joints using arc welding.
b. Gas welding practice

BASIC MACHINING WORK:

a. Simple step turning, taper turning
b. Simple drilling.

ASSEMBLY WORK:

a. Study of centrifugal pump
b. Study of air conditioner
c. Study of household mixer.

SHEET METAL WORK:

a. Making models of a square/Rectangular tray and funnels.

FOUNDRY WORK:

a. Demonstrating basic foundry operations.

GROUP B (ELECTRICAL & ELECTRONICS ENGINEERING)

PART III ELECTRICAL ENGINEERING PRACTICES 15

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

PART IV ELECTRONIC ENGINEERING PRACTICES 15

STUDY OF ELECTRONIC COMPONENTS

a. Measurement of Resistance of a resistor using Color Coding.
b. Measurement of AC signal parameters (Peak-Peak, RMS period, Frequency) using CRO.

SOLDERING WORK:

a. Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a. Assembling and testing electronic components on a small PCB.

STUDY OF LOGIC GATES:

a. Verification of logic gates - AND, OR, NOT, NAND, NOR, EXOR, EX-NOR.

ELECTRONIC EQUIPMENT STUDY:

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

Total = 60 Periods

***At end of the semester students should submit the prototypes of their stem projects.**

COURSE OUTCOMES

On successful completion of this course, the student will be able to:

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

CO2: weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, and tapping in parts.

CO3: assemble simple mechanical assembly of common household equipment's; Make a simple model using sheet metal work.

CO4: wiring of various electrical joints in common household electrical wire work.

CO5: solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO6: understand the concept and verification of logic gates.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1	1	1					2	1		
CO2	3	2			1	1	1					2	1		
CO3	3	2			1	1	1					2	1		
CO4	3	2			1	1	1					2	1		
CO5	3	2			1	1	1					2	1		
CO6	3	2			1	1	1					2	1		
Avg	**3**	**2**			**1**	**1**	**1**					**2**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

HS24202	ENGLISH COMMUNICATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To be able to communicate effectively through writing.

UNIT I SELF INTRODUCTION AND EMAIL DRAFTING 12

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

UNIT II INDIVIDUAL DISCUSSION ON SOCIAL ISSUES 12

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

UNIT III PRESENTATION ON TECHNICAL AND NON-TECHNICAL TOPICS 12

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

UNIT IV IMPORTANCE OF DESCRIPTIVE WRITING & INSTRUCTIONS 12

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

UNIT V GROUP DISCUSSION AND IMPORTANCE OF RESUME WRITING 12

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

Total: 60 Periods

COURSE OUTCOMES

After completion of this course, the students should be able to

CO1 : Speak effectively in group discussions held in a formal/semi formal contexts.
CO2 : Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions

CO3 : Write emails, letters and effective job applications.
CO4 : Write critical reports to convey data and information with clarity and precision.
CO5 : Give appropriate instructions and recommendations for safe execution of tasks.

Assessment Pattern

- Conduction of Assessment to test speaking and writing skills

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3		3		3	3		3	3	3	3			
CO2		3		3		3	3		3	3	3	3			
CO3		2		3		3	3		3	3	3	3			
CO4		3		3		3	3		3	3	3	3			
CO5		3		3		3	3		3	3	3	3			
Avg		**2.8**		**3**		**3**	**3**		**3**	**3**	**3**	**3**			

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

MA24302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the concepts of Fourier series, Transforms and formation of partial differential equations, which will enable them to model and analyze the physical phenomena.
- Implementing the Fourier analysis, an elegant method in the study of heat flow, fluid mechanics and electromagnetic fields.
- Developing enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of PDE – Method of separation of variables - Fourier series solutions of one-dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms - Initial and final value theorems - Inverse Z-transform using partial fraction- Residue method - convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

UNIT V FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Exemplify the concepts of partial differential equations and able to apply them to solve real scenarios.

CO2: Analyze the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.

CO3: Appreciate the physical significance of Fourier series techniques in solving one and two-dimensional heat flow problems and one-dimensional wave equations.

CO4: Apply the Z-transform to convert a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency domain representation.

CO5: Apply Fourier transform to convert the function in time domain into a sum of sine waves of different frequencies, each of which represents a frequency component.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016.
3. Sankara Rao. K, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt Ltd., New Delhi, 2007.

REFERENCES:

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi,2016.
4. Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited, New Delhi, 2016.
5. Peter V O Neil., Advanced Engineering Mathematics, 7th Edition, TBH Publishers, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1					2			2	1	1	
CO2	2	3	1	1					2			3	1	1	
CO3	3	2	1	1					2			3	1	1	
CO4	3	2	1	1					2			3	1	1	
CO5	2	3	2	2					2			2	1	1	
Avg	**2.6**	**2.4**	**1.2**	**1.2**					**2**			**2.6**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

BM24301	SIGNALS AND SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the various types and classifications of continuous-time and discrete-time signals.
- Exploring the representation and classification of continuous-time and discrete-time systems.
- Learning ability to analyze signals in the frequency domain using Fourier Series, Fourier Transform, Laplace Transform, DTFT, and Z-Transform.
- Understanding the frequency response and system behavior of continuous-time LTI systems using Laplace transforms and differential equations.
- Understanding the discrete-time LTI systems using difference equations, convolution, Z-transforms, and frequency domain techniques such as the DFT.

UNIT I CONTINUOUS AND DISCRETE TIME SIGNALS 9

Standard Elementary Signals of Continuous time signals (CT signals) & Discrete time signals (DT signals): Step, Ramp, Pulse, Impulse, Complex exponential and Sinusoidal signals. Classification of CT and DT signals: Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, Even and Odd signals.

UNIT II CONTINUOUS AND DISCRETE TIME SYSTEMS 7

Classification of CT systems and DT systems: Static & Dynamic, Linear & Nonlinear, Time-variant & Time invariant, Causal & Non-causal, Stable & Unstable.

UNIT III ANALYSIS OF CONTINOUS AND DISCRETE TIME SIGNALS 11

Representation of Fourier series, Trigonometric Fourier Series, Fourier Transform and their properties, Laplace Transform and their properties. Discrete Time Fourier Transform (DTFT), Properties of DTFT, Z-Transforms, Region of convergence, Properties of Z transforms, Inverse Z Transform using Partial Fraction Method.

UNIT IV LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Convolution Integrals, Frequency response of LTI systems, Analysis and characterization of LTI systems using Laplace transform, Computation of impulse response and transfer function using Laplace transform, Computation of impulse response from differential equation.

UNIT V LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS 9

LTI-DT systems -Difference equation– Impulse response, Convolution Sum and Frequency response -Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Identify and classify different types of continuous and discrete time signals.

CO2: Comprehend and categorize various CT and DT systems.

CO3: Apply various transforms (FS, FT, Laplace, DTFT, Z-transform) to analyze and characterize signals.

CO4: Determine the behavior of continuous-time LTI systems using Laplace Transform techniques.

CO5: Extract the behavior of discrete-time LTI systems using convolution, Z-transform, and DFT.

TEXT BOOKS:

1. Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002
2. Oppenheim, Willsky and Hamid, "Signals and Systems", 2nd Edition, Pearson Education, New Delhi, 2015.
3. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2nd edition, 2007.

REFERENCES:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete",Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.
4. M.J.Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", TataMcGrawHill, 2007.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2							2	2	2	2	2
CO2	3	3	3	2							2	2	2	2	2
CO3	3	3	3	2							2	2	2	2	2
CO4	3	3	3	2							2	2	2	2	2
CO5	3	3	3	2							2	2	2	2	2
Avg	**3**	**3**	**3**	**2**							**2**	**2**	**2**	**2**	**2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

CS24307	FUNDAMENTALS OF DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Introducing the basics of C programming language.
- Learning the concepts of advanced features of C.
- Understanding the concepts of ADTs and linear data structures.
- Learning the concepts of non-linear data structure and hashing.
- Familarizing the concepts of sorting and searching techniques.

UNIT I C PROGRAMMING FUNDAMENTALS 9

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

UNIT II C PROGRAMMING - ADVANCED FEATURES 9

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

UNIT III LINEAR DATA STRUCTURES 9

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

UNIT IV NON-LINEAR DATA STRUCTURES 9

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

UNIT V SORTING AND SEARCHING TECHNIQUES 9

Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Develop C programs for any real world/technical application.
CO2: Apply advanced features of C in solving problems.
CO3: Write functions to implement linear and non–linear data structure operations.
CO4: Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
CO5: Appropriately use sort and search algorithms for a given application.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.
2. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.

REFERENCES:

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education,1983.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.

List of Open-Source Software/ Learning website:

https://www.coursera.org/specializations/data-structures- algorithms
https://nptel.ac.in/courses/112107243
https://nptel.ac.in/courses/112105598

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	1	1		1	2	1	3	1	2	
CO2	1	2	1	2	2				1	1	1	2	1	2	
CO3	2	3	1	2	3				1	1	1	2	1	2	
CO4	2	1	1	1	1				2	1	1	2	1	2	
CO5	1	2	1	2	2	1	1		1	2	1	3	1	2	
Avg	**1.6**	**2.2**	**1**	**1.8**	**2**	**0.6**	**0.6**		**1.2**	**1.4**	**1**	**2.4**	**1**	**2**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

BM24302	BIOSCIENCES FOR MEDICAL ENGINEERING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Studying the basic fundamentals to biochemistry.
- Exploring the structural and functional properties of carbohydrates, proteins, lipids and amino acids.
- Emphasizing the role of enzymes by providing basic information on specific enzyme activities.
- Gaining knowledge on the structural and functional aspects of living organisms.
- Learning the etiology and remedy in treating the pathological diseases.

UNIT I FUNDAMENTALS TO BIOCHEMISTRY 9

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson - Hasselbalch equation, physiological buffers in living systems-Properties of water and their applications in biological systems.

UNIT II CARBOHYDRATES, LIPIDS, PROTEIN 9

Classification of carbohydrates - mono, di, oligo and polysaccharides. Structure, physical and chemical properties of carbohydrates. Classification of lipids- simple, compound, and derived lipids. Nomenclature of fatty acid-Physical and chemical properties of triglycerides. Nucleic acid: Structural aspects – Components of DNA and RNA, Double helical structure of DNA (Watson-Crick model), various forms of DNA. Amino acid: Classification. Protein: structural organization.

UNIT III ENZYMES 9

Enzymes: classification, Factors affecting enzymatic activity, kinetics – Michaelis-Menten equation, Line weaver burk plot, Mode of action, Regulation: Feedback, allosteric and covalent regulation. Clinical significance of enzymes – case studies

UNIT IV CELL DEGENERATION, REPAIR AND NEOPLASIA & FLUID 9

Cell injury - Reversible cell injury and Irreversible cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. Edema, Hyperemia/Ischemia, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock, chronic venous congestion.

UNIT V FUNDAMENTALS OF MICROBIOLOGY AND IMMUNOPATHOLOGY 9

Structure of Bacteria and Virus - Morphological features and structural organization of bacteria and virus - List of common bacterial, fungal and viral diseases of human beings. - Basics of Microscopes: Light microscope, Electron microscope (TEM & SEM). - Natural and artificial immunity.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. General tests for Carbohydrates.
2. General tests for Proteins.
3. General tests for Lipids.
4. Separation of proteins by SDS electrophoresis (Demo) and amino acids by thin layer chromatography (Demo).
5. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood).
6. Preparation of serum and plasma from blood.
7. Estimation of creatinine, urea and Uric acid.
8. Types of Staining: Simple stain, Gram stains Hematoxylin and eosin staining.
9. Study of parts of compound microscope.
10. Study of Histopathological and Hematology slides of anemia, leukemia and slides of benign and malignant tumors.

TOTAL PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Describe the Fundamentals of Biochemistry.
CO2: Analyze structural and functional properties of carbohydrates, proteins, lipids and amino acids.
CO3: Identify the role of enzymes by providing basic information on specific enzyme activities.
CO4: Elucidate the structural and functional aspects of living organisms.
CO5: Relate methods involved in analysis the pathological diseases.

TEXT BOOKS:

1. RAFI MD "Text book of biochemistry for Medical Student" Fourth Edition, Universities Press, Orient Blackswan Private Limited - New Delhi 2021.
2. Ramzi S Cotran, Vinay Kumar & Stanley L Robbins, "Pathologic Basis of Diseases", 10th edition: South Asia Edition Elsevier India, 2020. (Units IV).
3. Ananthanarayanan & Panicker, "Microbiology" Orientblackswan, 2017 10th edition. (Units IV and V).

REFERENCES:

1. Keith Wilson & John Walker, "Practical Biochemistry - Principles & Techniques", Oxford University Press, 2009.
2. Underwood JCE: General and Systematic Pathology Churchill Livingstone, 3rd edition, 2000.
3. Dubey RC and Maheswari DK. "A Text Book of Microbiology" Chand & Company Ltd, 2007
4. Prescott, Harley and Klein, "Microbiology", 10th edition, McGraw Hill, 2017

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2										2			2
CO2	2	2										2			2
CO3	2	2	2			3	2					2			2
CO4	2	2	2		3	3	2					2			2
CO5	2	2	2	2	3	3	2	2		1		2			2
Avg	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**		**1**		**2**			**2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

BM24303	BIOSENSORS AND MEASUREMENTS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the purpose of measurement, the methods of measurements, errors associated with measurements.
- Knowing the principle of transduction, classifications and the characteristics of different transducers
- Learning the different bridges for measurement.
- Knowing the different display and recording devices and
- Understanding the various type of biosensors.

UNIT I FUNDAMENTALS OF MEASUREMENTS 9

Measurement System – Instrumentation - Classification and Characteristics of Transducers - Static and Dynamic - Errors in Measurements and their statistical analysis- methods of error analysis, - uncertainty analysis-expression of uncertainty: accuracy, precision index and propagation of errors– Calibration – Primary and secondary standards.

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS 9

Strain Gauge: Gauge factor, sensing elements, configuration, and unbounded strain gauge. Capacitive transducer, Inductive transducer, LVDT, Passive types: RTD materials & range, relative resistance vs. temperature characteristics, thermistor characteristics, Active type: Thermocouple - characteristics.

UNIT III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS 9

Phototube, scintillation counter, photovoltaic, photo conductive cells, photo diodes, phototransistor- Optical displacement sensors and optical encoders. Piezoelectric active transducer- Equivalent circuit and its applications.

UNIT IV SIGNAL CONDITIONING CIRCUITS AND METERS 9

Functions of signal conditioning circuits, Preamplifiers, Concepts of passive filters, AC and DC Bridges - wheat stone bridge, Kelvin, Maxwell, Hay, Schering, Digital voltmeter – Multi meter.

UNIT V RECORDING DEVICES AND ADVANCED BIOSENSORS 9

CRO, LCD monitor, thermal recorder, photographic recorder, magnetic tape recorder, - Electronic nose - Biosensors: Introduction, Advantages and limitations, various components of Biosensors - Introduction to Smart Sensors, Semiconductor sensors and MEMS.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. Characteristics of thermistor.
2. Characteristics of thermocouple
3. Characteristics of Photo Diode.
4. Characteristics of Photo Transistor.
5. Characteristics of RTD.
6. Characteristics of LVDT.
7. Measurement of unknown Resistance using Maxwell's Bridge.
8. Measurement of unknown Resistance using Hay's Bridge.
9. Characteristics of strain gauge.
10. Characteristics of Gas Sensor.

TOTAL PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1 : Measure various electrical parameters with accuracy, precision, resolution.

CO2 : Select appropriate passive or active transducers for measurement of physical phenomenon.

CO3 : Describe the working principles and applications of photoelectric and piezoelectric sensors.

CO4 : Design and evaluate signal conditioning circuits and utilize digital measuring instruments.

CO5 : Demonstrate the working principles of various recording devices and advanced biosensors.

TEXT BOOKS:

1. A.K. Sawhney, "Electrical & Electronics Measurement and Instrumentation",10th edition, Dhanpat Rai & Co, New Delhi, 19th Revised edition 2011, Reprint 2014.
2. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.

REFERENCES:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition,Tata McGraw-Hill, New Delhi, 2014.
2. Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice Hall of India, New Delhi, 2015.
3. Advances in biosensors, B. D. Malhotra & A. P. F. Turner (eds), Volume 5, Elsevier science 2003.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2					1				1	1		
CO2	3	3	2									1	1		
CO3	3	3	2									1	1		
CO4	3	3	3									1	1		
CO5	3	3	3					1				1	1		
Avg	**3**	**3**	**2**					**1**				**1**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

BM24304	FUNDAMENTALS OF ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Introducing the concept of diodes, Bipolar Junction Transistors and FET.
- Studying the various model parameters of Transistors.
- Learning the characteristics, operation, and modeling of MOSFETs.
- Imparting the knowledge of various BJT amplifiers.
- Exploring the principles of feedbacks in amplifiers and functioning of various oscillator circuits.

UNIT I PN JUNCTION SEMICONDUCTOR DIODE 9

Introduction to PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, Transition and Diffusion Capacitances, Breakdown in PN Junction Diodes, Zener Diode.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

BJT types (NPN, PNP), Operations (NPN, PNP), Current equations, Input and Output characteristics of CE, CB, CC, Hybrid -π model - h-parameter model, Ebers Moll Model- Gummel Poon- model.

UNIT III FIELD EFFECT TRANSISTORS 9

MOSFETs: Drain and Transfer characteristics, Current Equations, Pinch off voltage and its significance, Threshold voltage, Channel length modulation, small signal Characteristics, D- MOSFET, E-MOSFET, Characteristics, Comparison of MOSFET with BJT.

UNIT IV BJT AMPLIFIERS 9

Introduction to BJT Amplifiers: Need for Biasing, DC Load line and Bias Point, Various Biasing methods of BJT, Analysis of CB, CE, and CC amplifiers, Differential amplifier - Common mode and Difference mode analysis.

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback, Voltage / Current, Series, Shunt feedback Amplifiers, positive feedback, Condition for oscillations, Wien bridge, Hartley and Crystal oscillators.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction Diode.
2. Characteristics of ZENER Diode.
3. Characteristics of CE configurations.
4. Characteristics of CB configurations.
5. Drain and Transfer Characteristics of CS configurations.
6. Drain and Transfer Characteristics of CD configurations.
7. Design and construct BJT Amplifier.
8. Construct a Differential amplifier using BJT.
9. Frequency response of Series and Shunt feedback amplifiers.
10. Characteristics of Hartley Oscillator.

TOTAL PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1 : Describe the construction, operation, and characteristics of PN junction diodes.
CO2 : Analyze the characteristics of Bipolar Junction Transistors (BJTs) in different configuration
CO3 : Examine the structure, characteristics, and operation of various Field Effect Transistors (FETs).
CO4 : Interpret the functioning of BJT amplifier circuits.
CO5 : Explain the concepts of feedback in amplifiers and Oscillator Circuits.

TEXT BOOKS:

1. Millman and Halkias, "Electronic Devices and Circuits", 4th Edition, McGraw Hill, 2015.
2. Mohammad Rashid, "Electronic Devices and Circuits", Cengage Learning Pvt. Ltd, 2015.
3. Salivahanan. S, Suresh Kumar. N, "Electronic Devices and circuits", 4th Edition, McGraw Hill, 2016.

REFERENCES:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
2. Bhattacharya and Sharma, "Solid State Electronic Devices", 2nd Edition, Oxford University Press, 2014.
3. R.S.Sedha, "A Textbook of Electronic Devices and Circuits", 2nd Edition, S.Chand Publications, 2008.
4. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2							2	2	2		
CO2	3	3	2	2							2	2	2		
CO3	3	3	2	2							2	2	2		
CO4	3	3	3	2							2	2	2		
CO5	3	3	3	2							2	2	2		
Avg	**3**	**3**	**2**	**2**							**2**	**2**	**2**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
(B.E - BME)

CS24308	FUNDAMENTALS OF DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS

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

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Use different constructs of C and develop applications.
CO2: Write functions to implement linear and non-linear data structure operations.
CO3: Suggest and use the appropriate linear / non-linear data structure operations for a given problem.
CO4: Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.
CO5: Implement Sorting and searching algorithms for a given application.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	1			3	2	3	1	1	2	2
CO2	1	2	1	2	2				2	1	1	2	2	1	2
CO3	2	3	1	2	3				2	2	1	1	1	2	2
CO4	2	1		1	1				1	2	1	2	1	3	2
CO5	1	2	1	2	2	1			3	2	3	2	2	2	1
Avg	**1.6**	**2.2**	**0.8**	**1.8**	**2**	**0.4**			**2.2**	**1.8**	**1.8**	**1.6**	**1.4**	**2**	**1.8**

1 - Low, 2 - Medium, 3 – High

SEMESTER-IV
(B.E - BME)

MA24402	RANDOM PROCESSES	L	T	P	C
		3	0	1	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the basic concepts of probability with characteristics and also two-dimensional random variables
- Acquainting the student with the concept of Random Processes.
- Providing the basic knowledge to the student with correlation and spectral densities.

UNIT I PROBABILITY AND RANDOM VARIABLES 9+3

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variables - Probability mass function - Probability density functions - Properties.

UNIT II STANDARD DISTRIBUTIONS 9+3

Discrete distributions: Binomial - Poisson - Negative Binomial - Continuous distributions: Uniform - Exponential - Normal distributions and their properties.

UNIT III TWO- DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT IV RANDOM PROCESSES 9+3

Definition and examples - first order, second order, strictly stationary, wide sense stationary and Ergodic processes - Markov process - Poisson and Normal processes.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena.

CO2: Apply the concepts of probability distributions in an appropriate place of science and Engineering.

CO3: Execute the knowledge of solving two-dimensional random variables using correlation Techniques**.**

CO4: Apply the concept of random process.

CO5: Evaluate the autocorrelation and spectral density of a random process and recognize the relation between them.

TEXT BOOKS:

1. Ibe.O.C., “Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Stark. H and Woods. J.W "Probability and Random Processes with Applications to Signal Processing", 3rd Edition,Pearson Education, Asia, 2002.
2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
3. Hwei Hsu, Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 2004.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									2	1	2	
CO2	2	2	1									3	1	2	
CO3	2	2	1									2	1	2	
CO4	3	2	1									3	1	2	
CO5	3	3	1									2	1	2	
Avg	**2.6**	**2.2**	**1**									**2.4**	**1**	**2**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

BM24401	ANALOG AND DIGITAL INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the fundamental characteristics and configurations of operational amplifiers.
- Exploring the principles and applications of Analog to Digital and Digital to Analog Converters.
- Learning the number systems and Boolean algebra, enabling the design and analysis of combinational logic circuits.
- Understanding the sequential logic circuits, including flip-flops and counters.
- Investigating the integration of analog and digital integrated circuits in biomedical applications.

UNIT I INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS 9

Basic OPAMP configurations and characteristics, Linear & Non-Linear Applications, Inverting and Non inverting amplifier, Differentiator, Integrator, Voltage to Current converter, Instrumentation amplifier.

UNIT II FILTERS AND TIMERS 9

Introduction to Filters: Low pass, High pass and band pass filters, IC 555 Timer: Working Principle, Astable and Monostable Multivibrator, Design of basic active filters using ICs.

UNIT III DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS 9

Analog switches, High speed sample and hold circuit and IC ‘s, Types of D/A converter -Weighted resistor, R-2R ladder DAC, D/A Accuracy and Resolution. A/D converter - Flash, Dual slope, Successive approximation, A/D Accuracy and Resolution. Voltage controlled oscillator, Voltage to Frequency converters.

UNIT IV COMBINATIONAL LOGIC CIRCUITS 9

Boolean algebra; Logic Gates, Standard POS and SOP form, Minimization of Boolean functions using K map, Combinational Logic Circuits; Arithmetic circuits, decoders, encoders, multiplexers, de-multiplexers, Magnitude Comparator.

UNIT V SEQUENTIAL LOGIC CIRCUITS 9

Latches and Flip Flops (SR, JK, D, T), Basic concepts and design of Moore and Mealy machines examples, state minimization, state assignment, Counters, Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Describe the Non inverting, inverting, integrator, Differentiator amplifier circuits using op-amp.

CO2: Evaluate and implement digital-to-analog and analog-to-digital converters.

CO3: Apply Number System and solve Boolean equations using Boolean algebra and Karnaugh Map.

CO4: Design and analyze sequential logic circuits, including flip-flops, counters, and registers.

CO5: Develop circuits using analog and Digital ICS for biomedical applications.

TEXT BOOKS:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, 3rd Edition, 2017.
2. John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018
3. M.Morris Mano, "Digital logic and Computer design" Prentice Hall 1994.
4. Ramakant A. Gayakwad, "OP AMP and linear IC'S" Prentice Hall, 1994

REFERENCES:

1. Taub and Schilling, "Digital Integrated Electronics", Mc Graw Hill, 2017.
2. Charles H.Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 7th Edition, 2013.
3. M. Morris Mano and Michael D.Ciletti, "Digital Design", Pearson, 5th Edition, 2013.
4. S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, 3rd Edition, 2018

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2					2		1	2	1	2	1
CO2	3	3	3	2					2		1	2	1	2	1
CO3	3	3	3	2					2		1	2	1	2	1
CO4	3	3	3	2					2		1	2	1	2	1
CO5	3	3	3	2					2		1	2	1	2	1
Avg	**3**	**3**	**3**	**2**					**2**		**1**	**2**	**1**	**2**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

EC24407	MICROPROCESORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the architecture, addressing modes, instruction set, and basic programming concepts of the 8086 microprocessors.
- Exploring the system bus structure, multiprogramming concepts, and processor configurations of the 8086 microprocessors.
- Learning the interfacing techniques and programming of peripheral ICs with microprocessors for data acquisition and control.
- Understanding the architecture, programming, and peripheral features of the 8051 microcontrollers.
- Gaining insight into modern embedded platforms and RTOS concepts using microcontrollers like Arduino, ARM Cortex-M, and ESP32.

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 - Microprocessor architecture - Addressing modes - Instruction set and assembler directives - Assembly language programming - Modular Programming - Linking and Relocation - Interrupts and interrupt service routines.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals - Basic configurations - IO programming - Introduction to Multiprogramming - System Bus Structure - Multiprocessor configurations - Coprocessor, closely coupled and loosely Coupled configurations - Introduction to advanced processors.

UNIT III INTERFACING BASICS AND IC's 9

Study of Architecture and programming of ICs: 8255 PPI, 8259PIC, 8251USART, 8279 Keyboard display controller and 8254 Timer/Counter – Interfacing with 8086 -A/D and D/A converter interfacing.

UNIT IV THE 8051 MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Programming 8051 Timers - Serial Communication.

UNIT V ADVANCED MICROCONTROLLERS WITH EMBEDDED PLATFORMS 9

Introduction to real-time operating systems (RTOS) - Comparison of CISC and RISC Architecture - Overview of modern microcontrollers: Arduino, ARM Cortex-M, ESP32 - Embedded Tools and Development Environments (IDE, Debuggers and Emulators)

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Describe the architecture, instruction set, and programming techniques of the 8086 microprocessors to develop basic assembly-level applications.

CO2: Analyze the system bus structure and processor configurations of the 8086 to design simple multiprocessor and I/O interfacing systems.

CO3: Interface and program peripheral ICs such as 8255, 8259, 8251, 8279, and 8254 with microprocessors for real-world data acquisition and control.

CO4: Develop embedded programs using the 8051 microcontrollers for timing, serial communication, and I/O operations.

CO5: Apply knowledge of modern microcontrollers and embedded platforms, including RTOS concepts, to design basic biomedical and IoT systems.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007. (UNIT I-III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011. (UNIT IV)

REFERENCES:

1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH,2012
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3					1	2		2	1
CO2	3	2	2	1	3	3					1	2		2	1
CO3	3	2	2	1	3	3					1	2		2	1
CO4	3	2	2	1	3	3					1	2		2	1
CO5	3	2	2	1	3	3					1	2		2	1
Avg	**3**	**2**	**2**	**1**	**3**	**3**					**1**	**2**		**2**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

GE24402	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Introducing ecological concepts and biodiversity, emphasizing conservation and public awareness.
- Understanding pollution types, impacts, and waste management practices, with industrial safety focus.
- Exposing students to various renewable energy technologies and their practical applications.
- Studying how people harm the environment and learn ways to prevent and manage disasters.
- Promoting sustainability awareness and application of sustainable practices in industry and society.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope, and importance of environment; need for public awareness. Ecosystem and energy flow with ecological succession. Types and values of biodiversity; India as a mega-diversity nation and biodiversity hotspots. Threats like habitat loss, poaching, man-wildlife conflict, impacts from industrial and infrastructure development. Endangered and endemic species of India and conservation methods (in-situ and ex-situ), Role of information technology in species monitoring.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of water, air, soil, noise, and radioactive pollution. Waste management covers municipal solid waste, hazardous waste, and E-Waste - gold extraction. Carbon Credit and Footprint concepts related to industry. Environmental protection acts. Case studies on OHASMS (Occupational health and safety management systems) emphasizing industrial safety practices and engineering risk management.

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Case studies on biofuel production from agricultural waste.

UNIT IV HUMAN POPULATION AND ENVIRONMENT IMPACT 6

Human population -Importance of value education, human rights. Land degradation and deforestation- Man-Made Disasters: Industrial Accidents-Nuclear Accidents-Oil Spills - Prediction and management. Science and technology of Carbon Sequestration - Ozone depletion and environmental responsibility. Case Study: A low-cost water purification project implemented in a densely populated village.

UNIT V SUSTAINABILITY MANAGEMENT AND PRACTICES 6

Suitability Management - Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability and protocols Sustainable Development Goals-targets. Suitability Practices - Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment. Sustainable habitat: green buildings, green materials, energy efficiency, sustainable transports. Sustainable energy. Case studies on sustainable building design in industrial facilities.

TOTAL PERIODS: 30

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Explore ecosystem functions, biodiversity, and the importance of species protection.

CO2: Identify types of pollution, their effects, and preventive measures including waste management.

CO3: Describe renewable energy sources and their applications in sustainable energy production.

CO4: Analyze human impact on the environment and propose disaster management strategies.

CO5: Apply sustainability concepts and practices in environmental and industrial systems.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	1			1	3	2		1	-	1			2
CO2	1	2	2		1	2	3	2		1	-	2			2
CO3	1	1	2		2	3	3	2		1	-	2			2
CO4	1					3	3	3		1	-	2			2
CO5		1	2		1	3	3	3		1	-	2			2
Avg	**1**	**1.25**	**1.75**		**1.33**	**2.40**	**3**	**2.40**		**1.00**	**-**	**1.80**			**2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

BM24402	BIOSIGNAL PROCESSING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the continuous time and discrete time signals and systems.
- Exploring the analysis of LTI systems using Laplace and Z transform.
- Representing the signal in frequency domain using FFT.
- Understanding the architecture, programming, and peripheral features of the 8051 microcontrollers.
- Gaining the knowledge about the design of IIR and FIR filters.

UNIT I DISCRETE FOURIER TRANSFORM 9

DFT and its properties, magnitude and phase representation-Linear Convolution- Correlation-Circular Convolution, Overlap-add and overlap-save methods. FFT - Decimation in Time Algorithm, Decimation in Frequency Algorithm

UNIT II INFINITE IMPULSE RESPONSE FILTERS 9

Realization structures for IIR filters –direct, cascade and parallel forms, Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method, Design of digital filters – Butterworth, Chebyshev Type I for LPF, BPF, BSF& HPF.

UNIT III FINITE IMPULSE RESPONSE FILTERS 9

Realization structures for FIR filters – Transversal and Linear phase structures, Design of linear phase FIR filters – windowing techniques – Rectangular window, Hamming window & Hanning Window, Frequency sampling methods.

UNIT IV BIOSIGNAL DETECTION AND COMPRESSION 9

QRS detection methods – Differentiation based and template-based approach. Rhythm analysis and Arrhythmia detection algorithms. Data compression techniques: Data reduction algorithms- Lossy and Lossless types, Turning Point algorithm, AZTEC, CORTES.

UNIT V BIOSIGNAL ANALYSIS USING WAVELETS 9

Wavelets in Medicine: Need for wavelets, Types of wavelets, Selection of a wavelet for an application, Decomposition and reconstruction of signals using wavelets, Denoising using wavelets, Typical medical applications.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. Generation of unit step, unit ramp & unit impulse signal.
2. Generation of Sine, Cosine & Exponential signal
3. Analyze the stability of a CT System with various inputs.
4. Analyze the stability of a DT System with various inputs.
5. Reconstruct a signal from samples and study the effect of Aliasing.
6. DFT of a discrete sequence.
7. Spectrum Analysis using FFT
8. Impulse and Step response of Digital filter.
9. IIR Filter Design Using Butterworth Low Pass and High Pass filter Approximation.
10. IIR Filter Design Using Butterworth Band Pass and Band Reject filter Approximation.

TOTAL PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1 : Compute the DFT and FFT algorithms for efficient spectral analysis and convolution operations.

CO2 : Design and realize IIR digital filters using appropriate mathematical techniques.

CO3 : Realize FIR digital filters using appropriate mathematical techniques.

CO4 : Analyze the Biosignal using different detection and compression techniques.

CO5 : Evaluate the Biosignal using Wavelets.

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, Indian Reprint, 2nd Edition, 2015.
2. John G Proakis and Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson, 4 th Edition, 2014.
3. Rangaraj M. Rangayyan, “Biomedical Signal Analysis”, John Wiley & Sons, 2nd Edition, 2015.

REFERENCES:

1. S. Haykin and B. Van Veen, "Signals and Systems", Wiley, 2 nd Edition, 2007
2. B. P. Lathi, “Principles of Linear Systems and Signals”, Oxford, 2nd Edition, 2009.
3. Emmanuel Ifeachor, Barrie Jervis, “Digital Signal Processing- A practical approach”, Pearson, 2nd Edition, 2002.
4. M. H. Hayes, “Digital Signal Processing, Schaum’s outlines”, Tata McGraw Hill, 2nd Edition,2011.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1				1	1	1		2	1	
CO2	3	2	2	2	1				1	1	1		2	1	
CO3	3	2	2	2	1				1	1	1		2	1	
CO4	3	2	2	2	1				1	1	1		2	1	
CO5	3	2	2	2	1				1	1	1		2	1	
Avg	**3**	**2**	**2**	**2**	**1**				**1**	**1**	**1**		**2**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

BM24403	BIOMEDICAL INSTRUMENTATION	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Understanding the origin of various biological signals and electrode configurations specific to bio-potential measurements.
- Exploring the characteristics of Bio signals.
- Understanding the design of bio amplifiers.
- Explaining the different techniques used for measurement of non-electrical bio parameters.
- Representing the biochemical measurement techniques as applicable for diagnosis and treatment.

UNIT I ELECTRODE CONFIGURATIONS 9

Bio signals characteristics – Origin of bio potential and its propagation. Frequency and amplitude ranges. Electrode configurations: Electrode-electrolyte interface, electrode–skin interface impedance, polarization effects of electrode – non-polarizable electrodes. Unipolar and bipolar configuration, classification of electrodes.

UNIT II BIOSIGNAL CHARACTERISTICS 9

Bio signals characteristics – ECG-frequency and amplitude ranges – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode. EMG - Electrode configuration -unipolar and bipolar mode.

UNIT III BIOAMPLIFIERS 9

Need for bio-amplifier - Differential bio-amplifier – Single ended amplifier - Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference.

UNIT IV MEASUREMENT OF BIO SIGNALS 9

Temperature, respiration rate and pulse rate measurements. Blood Pressure - direct and indirect methods, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurements.

UNIT V BIOCHEMICAL MEASUREMENTS 9

Biochemical sensors - pH, pO2 and pCO2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors. Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. Design of preamplifiers to acquire bio signals.
2. Design of frontal EEG amplifier
3. Design of EOG amplifier to detect eye blink
4. Design and study the characteristics of optical Isolation amplifier.
5. Measurement of pulse-rate using Photo Transducer.
6. Measurement of pH and conductivity.
7. Measurement of blood pressure using sphygmomanometer.
8. Measurement and recording of peripheral blood flow.
9. Simulation of a PCB layout for any bio amplifier using LABVIEW.

TOTAL PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1 : Illustrate the origin of various biological signals and their characteristics.

CO2 : Gain knowledge on characteristics of bio signals.

CO3 : Acquire knowledge on various amplifiers involved in monitoring and transmission of bio signals.

CO4 : Explain the different measurement techniques for non-electrical bio-parameters.

CO5 : Demonstrate the biochemical measurement techniques as applicable for diagnosis.

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, 2015.
2. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.
3. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003

REFERENCES:

1. John Enderle, Susan Blanchard, Joseph Bronzino, "Introduction to Biomedical Engineering", second edition, Academic Press,2005..
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1				1	1	1		2	1	
CO2	3	2	2	2	1				1	1	1		2	1	
CO3	3	2	2	2	1				1	1	1		2	1	
CO4	3	2	2	2	1				1	1	1		2	1	
CO5	3	2	2	2	1				1	1	1		2	1	
Avg	**3**	**2**	**2**	**2**	**1**				**1**	**1**	**1**		**2**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
(B.E - BME)

BM24404	ANALOG AND DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Designing the digital logic and circuits
- Learning the function of different ICs
- Understanding the applications of operation amplifier.
- Learning the working of multivibrators
- Designing circuits for generating waveforms using ICs

LIST OF EXPERIMENTS:

1. Inverting, non-inverting amplifier.
2. Integrator and Differentiator.
3. Design and analysis of active filters using Operational amplifier.
4. Instrumentation amplifier using operational amplifier.
5. Study of logic gates, Half adder and Full adder.
6. Encoder, decoder and Multiplexer, demultiplexer using digital ICs.
7. Register using flip flops.
8. Design of mod-N counter.
9. Multivibrators using IC555 Timer
10. Simulation and analysis of Electronic circuits using PSPICE software.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Design and analyze analog circuits using operational amplifiers.
CO2: Develop and evaluate digital logic circuits using standard digital ICs.
CO3: Construct and analyze multivibrators and timing circuits using IC 555.
CO4: Implement and demonstrate the functionality of sequential circuits.
CO5: Simulate and interpret the behavior of analog and digital circuits using simulation software tools.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1				1	1			1		
CO2	3	3	1	1	1				1	1			1		
CO3	3	3	1	1	1				1	1	1		1		
CO4	3	3	1	1	1				1	1	1		1		
CO5	3	3	1	1	1				1	1	1		1		
Avg	**3**	**3**	**1**	**1**	**1**				**1**	**1**	**1**		**1**		

1 - Low, 2 - Medium, 3 – High

SEMESTER-IV
(B.E - BME)

GE24S03	SOFT SKILLS & APTITUDE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Enhancing students' interpersonal skills by focusing on the dynamics of leadership, teamwork, and networking, essential for academic and professional success.
- Developing leadership capabilities that include effective communication, managing change, and stepping out of comfort zones.
- Providing strategies for managing stress through emotional intelligence and self-awareness techniques.
- Improving the aptitude skills of the students.
- Nourishing the students with decision-making abilities with aptitude techniques.

UNIT I LEADERSHIP SKILLS 3

Team Management and Time Management- Stress Management- Types of Stress- How to prevent stress and depression- Stress Busters- Habit Cycle, Forming Good Habits.

UNIT II INTERPERSONAL SKILLS 3

Understanding the relationship between Leadership, Networking, and Teamwork. Realizing one's skills in Leadership, Networking & Teamwork. Assessing interpersonal skills. Situation description of interpersonal skill.

UNIT III SETS AND SERIES 3

Set Theory- Types of sets-Set operations -Representation of Sets- Number- Series- ODD man out series-Letter Series-Logical Sequence of Words.

UNIT IV CODING AND ARRANGEMENT 3

Coding and De-coding LED – Letter Coding- Number Coding- Symbol Coding- Seating Arrangement-Circular Seating Arrangement-Linear Seating Arrangement.

UNIT V CLASSIC REASONING 3

Blood Relations- Family Tree- Jumbled Descriptions- Relationship Puzzle – Coded Relations- Syllogism-Statement of Syllogisms- Major Premise- Minor Premise.

TOTAL PERIODS: 15

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to

CO1: Demonstrate interpersonal skills including leadership, teamwork, and networking.

CO2: Exhibit leadership qualities and manage change effectively.

CO3: Apply stress management techniques and understand emotional intelligence.

CO4: Resolve issues of multiple kinds with Aptitude Skills

CO5: Apply Logical Reasoning for making life comfortable for all living beings.

TEXT BOOKS:

1. Frederick H. Wentz, McGraw, Hill (2020). Soft Skills Training: A Workbook to Develop Skills for Employment.
2. A modern practical workbook for classroom and workshop-based soft skills development.

REFERENCES:

1. Dr. R.S Agarval, "Quantitative Aptitude for Competitive Examinations" (English), 7th Edition, S Cahnd Publications.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		2			2		3	3	3	3		1	
CO2		2		2			2		3	3	3	3		1	
CO3		2		2			2		3	3	3	2		1	
CO4	3	2	3	2		2	2		3	3	3	1		1	
CO5	2	2	2	2		3	2		3	3	3	1		1	
Avg	**1**	**2**	**1**	**2**		**1**	**2**		**3**	**3**	**3**	**2**		**1**	

1 - Low, 2 - Medium, 3 - High