



KSR College of
Engineering

AN AUTONOMOUS INSTITUTION



NAAC
ACCREDITED **A++**

NBA
ACCREDITED
PROGRAMMES



B.E. - BIOMEDICAL ENGINEERING

REGULATIONS 2024

(Academic Year 2024-25 Onwards)

**Curriculum & Syllabus
Semester I to IV**





K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE-637215

(Autonomous)

DEPARTMENT OF BIOMEDICAL ENGINEERING

B.E.–BIOMEDICAL ENGINEERING

(REGULATIONS 2024)

Vision of the Institution

IV	To become a globally renowned institution in Engineering and Management, committed to providing holistic education that fosters research, innovation and sustainable development.
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Mission of the Institution

IM1	Deliver value-based quality education through modern pedagogy and experiential learning.
IM2	Enrich Engineering and Managerial Skills through cutting-edge laboratories to meet evolving global demands.
IM3	Empower research and innovation by integrating collaboration, social responsibility, and commitment to sustainable development.

Vision of the Department/Programme: Biomedical Engineering

DV	To produce erudite Biomedical Engineers, Researchers and Entrepreneurs with ethical values to develop a sustainable environment
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Mission of the Department/Programme: Biomedical Engineering

DM1	Deliver value-based Biomedical Engineering education that fosters leadership, innovation, and ethical integrity
DM2	Strengthen engineering proficiency through state-of-the-art laboratories and clinical collaborations, addressing evolving healthcare needs.
DM3	Promote interdisciplinary research and entrepreneurial thinking in Biomedical Engineering with a focus on sustainability, innovation, and societal impact.

Programme Educational Objectives (PEOs): Biomedical Engineering

The graduates of the programme will be able to	
PEO 1	Core Competency: Apply engineering and life science knowledge to design and develop innovative and sustainable biomedical solutions, contributing to global healthcare needs.
PEO 2	Professionalism: Demonstrate ethical responsibility, leadership, and effective teamwork across multidisciplinary domains, addressing societal and environmental challenges.
PEO 3	Career Development: Pursue lifelong learning, higher studies, and entrepreneurial ventures to remain at the forefront of biomedical engineering and technological innovation.



Program Outcomes (POs)

PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Programme Specific Outcomes (PSO's)

PSO1	Medical Device and Signal Processing	Apply engineering principles to design, develop, and enhance medical devices, and analyze biomedical signals and medical images for effective diagnosis and treatment.
PSO2	Healthcare Computing and Clinical Integration	Design/ develop AI-driven healthcare solutions and collaborate with clinicians to enable sustainable medical innovation


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		K.S.R COLLEGE OF ENGINEERING (Autonomous) Approved by AICTE and Affiliated to Anna University, Chennai Accredited by NAAC ('A++' Grade)							Curriculum UG R-2024			
Department		BIOMEDICAL ENGINEERING										
Programme		B.E.										
SEMESTER I												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
Induction Programme		-										
THEORY COURSES												
1.	24ENT19	Professional Communication	HSMC	45	0	0	45	90	3	40	60	100
2.	24EET06	Basics of Electrical and Electronics Engineering	ESC	45	0	0	45	90	3	40	60	100
3.	24ITT16	Programming for Problem Solving	ESC	45	0	0	45	90	3	40	60	100
4.	24GET19	தமிழர்மரபு/Heritage of Tamils	HSMC	15	0	0	15	30	1	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
5.	24MAI19	Matrices and Calculus	BSC	30	15	30	45	120	4	50	50	100
6.	24PHI07	Engineering Physics	BSC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24ITP16	Programming for Problem Solving Laboratory	ESC	0	0	30	0	30	1	60	40	100
8.	24MEP16	Engineering Graphics Laboratory	ESC	15	0	30	15	60	2	60	40	100
9.	24GEP16	Engineering Experience Laboratory	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
10.	24SSP19	Aptitude and Coding Skills-I	EEC	0	0	30	0	30	1	60	40	100
MANDATORY COURSE												
11.	24MCP09	Mandatory Course-I	MC	0	0	30	0	30	0	-	-	-
TOTAL				240	15	210	255	720	23	1000		


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SEMESTER II												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24CST29	Python Programming	ESC	45	0	0	45	90	3	40	60	100
2.	24ECT21	Design Thinking	PCC	30	0	0	30	60	2	40	60	100
3.	24BMT21	Medical Physics	PCC	45	0	0	45	90	3	40	60	100
4.	24GET29	தமிழரும் தொழில் துட்பமும்/ Tamil and Technology	HSMC	15	0	0	15	30	1	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
5.	24MAI29	Probability and Statistics	BSC	30	15	30	45	120	4	50	50	100
6.	24CHI06	Chemistry for Engineers	BSC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24ENP29	Professional Communication Laboratory	HSMC	0	0	30	0	30	1	60	40	100
8.	24CSP29	Python Programming Laboratory	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE												
9.	24SSP29	Aptitude and Coding Skills-II	EEC	0	0	30	0	30	1	60	40	100
TOTAL				210	15	150	225	600	20	900		
SEMESTER III												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24MAT38	Transforms and Partial Differential Equations	BSC	45	15	0	60	120	4	40	60	100
2.	24BMT31	Anatomy and Human Physiology	PCC	45	0	0	45	90	3	40	60	100
3.	24BMT32	Biocontrol Systems	PCC	45	15	0	60	120	4	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
4.	24BMI31	Electronic Devices and Circuits	PCC	45	0	30	45	120	4	50	50	100
5.	24BMI32	Biosciences	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
6.	24BMP31	Anatomy and Human Physiology Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
7.	24ECP36	Design Studio-I	PCC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
8.	24SDP39	Soft Skills Development-III	EEC	0	0	30	0	30	1	60	40	100
TOTAL				225	30	165	255	675	22.5	800		

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SEMESTER IV												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24MAT46	Numerical and Computational Techniques	BSC	45	15	0	60	120	4	40	60	100
2.	24BMT41	Biomedical Instrumentation	PCC	45	0	0	45	90	3	40	60	100
3.	24GET09	Universal Human Values and Ethics	HSMC	45	0	0	45	90	3	40	60	100
4.	-	Open Elective - I	OEC	45	0	0	45	90	3	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
5.	24BMI41	Analog and Digital Integrated Circuits	PCC	45	0	30	45	120	4	50	50	100
6.	24BMI42	Sensors and Measurements	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24BMP41	Biomedical Instrumentation Lab	PCC	0	0	45	0	45	1.5	60	40	100
8.	24ECP46	Design Studio-II	PCC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
9.	24SDP49	Soft Skills Development - IV	EEC	0	0	30	0	30	1	60	40	100
TOTAL				270	15	165	285	735	24.5	900		
*The students should undergo 2 weeks Internship/Industrial Training during the IV semester summer vacation												
SEMESTER V												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24BMT51	Hospital Management	PCC	45	0	0	45	90	3	40	60	100
2.	-	Professional Elective-I	PEC	45	0	0	45	90	3	40	60	100
3.	-	Open Elective-II	OEC	45	0	0	45	90	3	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
4.	24BMI51	Medical Image Processing	PCC	45	0	30	45	120	4	50	50	100
5.	24BMI52	Biosignal Processing	PCC	45	0	30	45	120	4	50	50	100
6.	24BMI53	Diagnostic and Therapeutic Equipment	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COURSE												
7.	24BMP51	Modeling Laboratory	PCC	0	0	60	0	60	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
8.	24BMP52	Internship - I*	EEC	-	-	-	-	-	1	100	-	100
9.	24BMP53	Seminar Presentation	EEC	0	0	30	0	30	1	100	-	100
10.	24BMP54	Industry oriented course-I	EEC	-	-	-	-	-	1	100	-	100
MANDATORY COURSE												
11.	-	Mandatory Course - II	MC	30	0	0	0	30	0	100	-	100
TOTAL				300	0	180	270	750	26	1100		

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SEMESTER VI												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24GET69	Entrepreneurship Development	HSMC	45	0	0	45	90	3	40	60	100
2.	-	Professional Elective-II	PEC	45	0	0	45	90	3	40	60	100
3.	-	Professional Elective-III	PEC	45	0	0	45	90	3	40	60	100
4.	-	Open Elective-III	OEC	45	0	0	45	90	3	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
5.	24BMI61	AI and ML for Biomedical Engineers	PCC	45	0	30	45	120	4	50	50	100
6.	24BMI62	Embedded Systems and IoMT	PCC	45	0	30	45	120	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE												
7.	24BMP61	Mini Project	EEC	0	0	60	0	60	2	60	40	100
8.	24BMP62	Technical Comprehension	EEC	0	0	30	0	30	1	100	-	100
9.	24BMP63	Industry oriented course-II	EEC	-	-	-	-	-	1	100	-	100
MANDATORY COURSE												
10.	-	Mandatory Course - III	MC	30	0	0	0	30	0	100	-	100
TOTAL				300	0	150	270	720	24	1000		
SEMESTER VII												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
THEORY COURSES												
1.	24BMT61	Radiological Equipment	PCC	45	0	0	45	90	3	40	60	100
2.	24GET79	Project Management	HSMC	45	0	0	45	90	3	40	60	100
3.	-	Professional Elective-IV	PEC	45	0	0	45	90	3	40	60	100
4.	-	Professional Elective-V	PEC	45	0	0	45	90	3	40	60	100
5.	-	Professional Elective-VI	PEC	45	0	0	45	90	3	40	60	100
EMPLOYABILITY ENHANCEMENT COURSES												
6.	24BMP71	Project Work-Phase I	EEC	0	0	60	0	60	2	60	40	100
TOTAL				225	0	60	255	510	17	600		
SEMESTER VIII												
S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
EMPLOYABILITY ENHANCEMENT COURSE												
1.	24BMP81	Project Work-Phase II	EEC	0	0	240	0	240	8	60	40	100
TOTAL				0	0	240	0	240	8	100		
TOTAL CREDITS										165		

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 165

Note: HS-Humanities and Social Sciences including Management Courses, BS-Basic Science Courses, ES-Engineering Science Courses, PC-Professional Core Courses, PE-Professional Elective Courses, OE- Open Elective Courses, EEC-Employability Enhancement Courses and MC-Mandatory Courses.



	K.S.R. COLLEGE OF ENGINEERING (Autonomous) (Approved by AICTE & Affiliated to Anna University) K.S.R. Kalvi Nagar, Tiruchengode - 637 215	Curriculum UG R-2024
	Department	Department of Biomedical Engineering
	Programme	B.E. Biomedical Engineering

HUMANITIES, SOCIAL SCIENCE AND MANAGEMENT COURSES(HSMC)

S. No.	Course Code	Course Title	Semester	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
1.	24ENT19	Professional Communication	I	45	0	0	45	90	3	40	60	100
2.	24GET19	தமிழர்மரபு / Heritage of Tamils	I	15	0	0	15	30	1	40	60	100
3.	24GET29	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	II	15	0	0	15	30	1	40	60	100
4.	24ENP29	Professional Communication Laboratory	II	0	0	30	0	30	1	60	40	100
5.	24GET09	Universal Human Values and Ethics	IV	45	0	0	45	90	3	40	60	100
6.	24GET69	Entrepreneurship Development	VI	45	0	0	45	90	3	40	60	100
7.	24GET79	Project Management	VII	45	0	0	45	90	3	40	60	100
TOTAL				210	0	30	210	450	15	700		

BASIC SCIENCE COURSES(BSC)

S. No.	Course Code	Course Title	Semester	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
1.	24MAI19	Matrices and Calculus	I	30	15	30	45	120	4	50	50	100
2.	24PHI07	Engineering Physics	I	45	0	30	45	120	4	50	50	100
3.	24MAI29	Probability and Statistics	II	30	15	30	45	120	4	50	50	100
4.	24CHI06	Chemistry for Engineers	II	45	0	30	45	120	4	50	50	100
5.	24MAT38	Transforms and Partial Differential Equations	III	45	15	0	60	120	4	40	60	100
6.	24MAT46	Numerical and Computational Techniques	IV	45	15	0	60	120	4	40	60	100
TOTAL				240	60	120	300	720	24	600		


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ENGINEERING SCIENCE COURSES(ESC)												
S. No.	Course Code	Course Title	Semester	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
1.	24EET06	Basics of Electrical and Electronics Engineering	I	45	0	0	45	90	3	40	60	100
2.	24ITT16	Programming for Problem Solving	I	45	0	0	45	90	3	40	60	100
3.	24ITP16	Programming for Problem Solving Laboratory	I	0	0	30	0	30	1	60	40	100
4.	24MEP16	Engineering Graphics Laboratory	I	15	0	30	15	60	2	60	40	100
5.	24GEP16	Engineering Experience Laboratory	I	0	0	30	0	30	1	60	40	100
6.	24CST29	Python Programming	II	45	0	0	45	90	3	40	60	100
7.	24CSP29	Python Programming Laboratory	II	0	0	30	0	30	1	60	40	100
TOTAL				150	0	120	150	420	14	700		

EMPLOYABILITY ENHANCEMENT COURSES(EEC)												
S. No.	Course Code	Course Title	Semester	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
1.	24SSP19	Aptitude and Coding Skills- I	I	0	0	30	0	30	1	60	40	100
2.	24SSP29	Aptitude and Coding Skills– II	II	0	0	30	0	30	1	60	40	100
3.	24SDP39	Soft Skills Development- III	III	0	0	30	0	30	1	60	40	100
4.	24SDP49	Soft Skills Development– IV	IV	0	0	30	0	30	1	60	40	100
5.	24BMP52	Internship–I*	V	-	-	-	-	-	1	100	-	100
6.	24BMP53	Seminar Presentation	V	0	0	30	0	30	1	100	-	100
7.	24BMP54	Industry oriented course-I	V	-	-	-	-	-	1	100	-	100
8.	24BMP61	Mini Project	VI	0	0	60	0	60	2	60	40	100
9.	24BMP62	Technical Comprehension	VI	0	0	30	0	30	1	100	-	100
10.	24BMP63	Industry oriented course-II	VI	-	-	-	-	-	1	100	-	100
11.	24BMP71	Project Work – Phase I	VII	0	0	60	0	60	2	60	40	100
12.	24BMP81	Project Work – Phase II	VIII	0	0	240	0	240	8	60	40	100
TOTAL				0	0	540	60	540	21	1200		

PROFESSIONAL CORE COURSES(PCC)

S. No.	Course Code	Course Title	Semester	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
1.	24ECT21	Design Thinking	II	30	0	0	30	60	2	40	60	100
2.	24BMT21	Medical Physics	II	45	0	0	45	90	3	40	60	100
3.	24BMT31	Anatomy and Human Physiology	III	45	0	0	45	90	3	40	60	100
4.	24BMT32	Biocontrol Systems	III	45	15	0	60	120	4	40	60	100
5.	24BMI31	Electronic Devices and Circuits	III	45	0	30	45	120	4	50	50	100
6.	24BMI32	Biosciences	III	45	0	30	45	120	4	50	50	100
7.	24BMP31	Anatomy and Human Physiology Laboratory	III	0	0	45	0	45	1.5	60	40	100
8.	24ECP36	Design Studio-I	III	0	0	30	0	30	1	60	40	100
9.	24BMT41	Biomedical Instrumentation	IV	45	0	0	45	90	3	40	60	100
10.	24BMI41	Analog and Digital Integrated Circuits	IV	45	0	30	45	120	4	50	50	100
11.	24BMI42	Sensors and Measurements	IV	45	0	30	45	120	4	50	50	100
12.	24BMP41	Biomedical Instrumentation Lab	IV	0	0	45	0	45	1.5	60	40	100
13.	24ECP46	Design Studio-II	IV	0	0	30	0	30	1	60	40	100
14.	24BMT51	Hospital Management	V	45	0	0	45	90	3	40	60	100
15.	24BMI51	Medical Image Processing	V	45	0	30	45	120	4	50	50	100
16.	24BMI52	Biosignal Processing	V	45	0	30	45	120	4	50	50	100
17.	24BMI53	Diagnostic and Therapeutic Equipment	V	45	0	30	45	120	4	50	50	100
18.	24BMP51	Modeling Laboratory	V	0	0	60	0	60	2	60	40	100
19.	24BMI61	AI and ML for Biomedical Engineers	VI	45	0	30	45	120	4	50	50	100
20.	24BMI62	Embedded Systems and IoMT	VI	45	0	30	45	120	4	50	50	100
21.	24BMT61	Radiological Equipment	VII	45	0	0	45	90	3	40	60	100
TOTAL				705	15	480	720	1920	64	2100		

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PROFESSIONAL ELECTIVE COURSES(PEC): VERTICALS

<u>VERTICAL 1:</u> BIOENGINEERING	<u>VERTICAL 2:</u> MEDICAL DEVICE INNOVATION AND DEVELOPMENT	<u>VERTICAL 3:</u> MECHANICS	<u>VERTICAL 4:</u> COMMUNICATION ENGINEERING	<u>VERTICAL 5:</u> ADVANCED HEALTHCARE DEVICES	<u>VERTICAL 6:</u> MANAGEMENT (HEALTH CARE)
Biomaterials	Foundation Skills in integrated product Development	Biomechanics	Communication Systems	Bio MEMS	Clinical Engineering
Artificial Organs and Implants	Medical Device Design	Biofluids	Wearable devices	Critical Care Equipment	Hospital planning and Management
Biomedical Optics and Photonics	Patient safety, Standards and Ethics	Rehabilitation Engineering	Body Area Networks	Biomaterials and Human Assist Devices	Medical Waste Management
Advances in Drug Delivery	Medical Ethics and Regulatory Standards	Sports Biomechanics	Virtual reality and Augmented Reality in Healthcare	Advancements in Healthcare Technology	Quality Management and Accreditations in Healthcare
Principles of Tissue Engineering	Medical Innovation and Entrepreneurship	Assistive Technology	Telehealth Technology	Analytical Instrumentation	Hospital Information System
Genetic Engineering	Medical Device Testing	Ergonomics	Medical Informatics	Nuclear Medicine	Human Behavior for Biomedical Engineers
Bioprinting	Rapid Prototyping	Haptics	Virtual Instrumentation and DAQ systems	Bio-inspired Technology	Biostatistics
Nanotechnology in Medicine	Healthcare Data Analytics	Implant Design and Development	VLSI for Medical Devices	Robotics in Medicine	Forensic science in Healthcare

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S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
VERTICAL1: BIOENGINEERING												
1.	24BME01	Biomaterials	PEC	45	0	0	45	90	3	40	60	100
2.	24BME02	Artificial Organs and Implants	PEC	45	0	0	45	90	3	40	60	100
3.	24BME03	Biomedical Optics and photonics	PEC	45	0	0	45	90	3	40	60	100
4.	24BME04	Advances in Drug Delivery	PEC	45	0	0	45	90	3	40	60	100
5.	24BME05	Principles of Tissue Engineering	PEC	45	0	0	45	90	3	40	60	100
6.	24BME06	Genetic Engineering	PEC	45	0	0	45	90	3	40	60	100
7.	24BME07	Bioprinting	PEC	45	0	0	45	90	3	40	60	100
8.	24BME08	Nanotechnology in Medicine	PEC	45	0	0	45	90	3	40	60	100
VERTICAL2: MEDICAL DEVICE INNOVATION AND DEVELOPMENT												
1.	24BME09	Foundation Skills in integrated Product Development	PEC	45	0	0	45	90	3	40	60	100
2.	24BME10	Medical Device Design	PEC	45	0	0	45	90	3	40	60	100
3.	24BME11	Patient safety, Standards and Ethics	PEC	45	0	0	45	90	3	40	60	100
4.	24BME12	Medical Ethics and Regulatory Standards	PEC	45	0	0	45	90	3	40	60	100
5.	24BME13	Medical Innovation and Entrepreneurship	PEC	45	0	0	45	90	3	40	60	100
6.	24BME14	Medical Device Testing	PEC	45	0	0	45	90	3	40	60	100
7.	24BME15	Rapid Prototyping	PEC	45	0	0	45	90	3	40	60	100
8.	24BME16	Healthcare Data Analytics	PEC	45	0	0	45	90	3	40	60	100
VERTICAL3: MECHANICS												
1.	24BME17	Biomechanics	PEC	45	0	0	45	90	3	40	60	100
2.	24BME18	Biofluids	PEC	45	0	0	45	90	3	40	60	100
3.	24BME19	Rehabilitation engineering	PEC	45	0	0	45	90	3	40	60	100
4.	24BME20	Sports Biomechanics	PEC	45	0	0	45	90	3	40	60	100
5.	24BME21	Assistive Technology Engineers	PEC	45	0	0	45	90	3	40	60	100
6.	24BME22	Ergonomics	PEC	45	0	0	45	90	3	40	60	100
7.	24BME23	Haptics	PEC	45	0	0	45	90	3	40	60	100
8.	24BME24	Implant Design and Development	PEC	45	0	0	45	90	3	40	60	100

Shree
Chairman (BoS)



S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
VERTICAL4: COMMUNICATION ENGINEERING												
1.	24BME25	Communication Systems	PEC	45	0	0	45	90	3	40	60	100
2.	24BME26	Wearable devices	PEC	45	0	0	45	90	3	40	60	100
3.	24BME27	Body Area Networks	PEC	45	0	0	45	90	3	40	60	100
4.	24BME28	Virtual reality and Augmented Reality in Healthcare	PEC	45	0	0	45	90	3	40	60	100
5.	24BME29	Telehealth Technology	PEC	45	0	0	45	90	3	40	60	100
6.	24BME30	Medical Informatics	PEC	45	0	0	45	90	3	40	60	100
7.	24BME31	Virtual Instrumentation and DAQ systems	PEC	45	0	0	45	90	3	40	60	100
8.	24BME32	VLSI for Medical Devices	PEC	45	0	0	45	90	3	40	60	100
VERTICAL5: ADVANCED HEALTHCARE DEVICES												
1.	24BME33	BioMEMS	PEC	45	0	0	45	90	3	40	60	100
2.	24BME34	Critical Care Equipment	PEC	45	0	0	45	90	3	40	60	100
3.	24BME35	Biomaterials and Human Assist Devices	PEC	45	0	0	45	90	3	40	60	100
4.	24BME36	Advancements in Healthcare Technology	PEC	45	0	0	45	90	3	40	60	100
5.	24BME37	Nuclear Medicine	PEC	45	0	0	45	90	3	40	60	100
6.	24BME38	Analytical Instrumentation	PEC	45	0	0	45	90	3	40	60	100
7.	24BME39	Bio-inspired Technology	PEC	45	0	0	45	90	3	40	60	100
8.	24BME40	Robotics in Medicine	PEC	45	0	0	45	90	3	40	60	100
VERTICAL6: MANAGEMENT (HEALTHCARE)												
1.	24BME41	Clinical Engineering	PEC	45	0	0	45	90	3	40	60	100
2.	24BME42	Hospital planning and Management	PEC	45	0	0	45	90	3	40	60	100
3.	24BME43	Medical Waste Management	PEC	45	0	0	45	90	3	40	60	100
4.	24BME44	Quality Management and Accreditations in Healthcare	PEC	45	0	0	45	90	3	40	60	100
5.	24BME45	Hospital Information System	PEC	45	0	0	45	90	3	40	60	100
6.	24BME46	Human Behavior for Biomedical Engineers	PEC	45	0	0	45	90	3	40	60	100
7.	24BME47	Biostatistics	PEC	45	0	0	45	90	3	40	60	100
8.	24BME48	Forensic science in Healthcare	PEC	45	0	0	45	90	3	40	60	100

Ruee
Chairman (BoS)



S. No.	Course Code	Course Title	Category	Periods per Sem					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
MANDATORY COURSE – I, II & III												
1.	24MCP09	Yoga and Stress Management	MC	0	0	30	0	30	0	-	-	-
2.	24MCT51	Constitution of India	MC	15	0	0	15	30	0	100	-	100
3.	24MCT52	Environmental Sciences and Sustainability	MC	15	0	0	15	30	0	100	-	100
4.	24MCT53	Engineering Economics	MC	15	0	0	15	30	0	100	-	100
5.	24MCT54	Introduction to Gender Studies	MC	15	0	0	15	30	0	100	-	100
6.	24MCT61	Essence of Indian Traditional Knowledge	MC	15	0	0	15	30	0	100	-	100
7.	24MCT62	Life Science for Engineers	MC	15	0	0	15	30	0	100	-	100
8.	24MCT63	Disaster Management	MC	15	0	0	15	30	0	100	-	100
9.	24MCT64	Industrial Maintenance and Safety Engineering	MC	15	0	0	15	30	0	100	-	100

S. No.	Course Code	Course Title	Category	Periods / Semester					Credit C = T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
OPEN ELECTIVE DETAILS												
AUTOMOBILE ENGINEERING												
1	24AU001	Basics of Automobile Engineering	OEC	45	0	0	45	90	3	40	60	100
2	24AU002	Hybrid Vehicles	OEC	45	0	0	45	90	3	40	60	100
BIO-MEDICAL ENGINEERING												
3	24BMO01	Basics of Biomedical Instrumentation	OEC	45	0	0	45	90	3	40	60	100
4	24BMO02	Biometric systems	OEC	45	0	0	45	90	3	40	60	100
CIVIL ENGINEERING												
5	24CEO01	Smart Buildings	OEC	45	0	0	45	90	3	40	60	100
6	24CEO02	Climate Change	OEC	45	0	0	45	90	3	40	60	100
COMPUTER SCIENCE AND ENGINEERING												
7	24CSO01	Data structures and Algorithms using C	OEC	45	0	30	45	90	4	50	50	100
8	24CSO02	Fundamentals of Java Programming	OEC	15	0	90	15	90	4	50	50	100
9	24CSO03	Full Stack Framework	OEC	45	0	0	45	90	3	40	60	100
10	24CSO04	Digital Marketing	OEC	45	0	0	45	90	3	40	60	100



S. No.	Course Code	Course Title	Category	Periods / Semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot		CA	ES	Tot
COMPUTER SCIENCE AND ENGINEERING (IoT)												
11	24IOO01	Industrial Internet of Things	OEC	45	0	0	45	90	3	40	60	100
12	24IOO02	Introduction to Sensors and IoT	OEC	45	0	0	45	90	3	40	60	100
COMPUTER SCIENCE AND ENGINEERING (Cyber Security)												
13	24CBO01	Ethical Hacking	OEC	45	0	0	45	90	3	40	60	100
14	24CBO02	Digital and Mobile Forensics	OEC	45	0	0	45	90	3	40	60	100
15	24CBO03	Applied Java Programming	OEC	15	0	90	15	90	4	50	50	100
ARTIFICIAL INTELLIGENCE AND DATA SCIENCE												
16	24CSO06	Data Science Fundamentals	OEC	45	0	0	45	90	3	40	60	100
17	24CSO07	Artificial Intelligence and Machine learning	OEC	45	0	0	45	90	3	40	60	100
18	24CSO08	Data Exploration and Visualization	OEC	45	0	0	45	90	3	40	60	100
ELECTRONICS AND COMMUNICATION ENGINEERING												
19	24ECO01	Drone Technology	OEC	45	0	0	45	90	3	40	60	100
20	24ECO02	Wearable Devices	OEC	45	0	0	45	90	3	40	60	100
21	24ECO03	5G /6G Communication	OEC	45	0	0	45	90	3	40	60	100
22	24ECO04	Embedded IoT	OEC	45	0	0	45	90	3	40	60	100
ELECTRICAL AND ELECTRONICS ENGINEERING												
23	24EEO01	Solar and Wind Energy System	OEC	45	0	0	45	90	3	40	60	100
24	24EEO02	Hydrogen and Hybrid Energy System	OEC	45	0	0	45	90	3	40	60	100
25	24EEO03	Electric Vehicle Technology	OEC	45	0	0	45	90	3	40	60	100
26	24EEO04	Energy Conservation and Management	OEC	45	0	0	45	90	3	40	60	100
INFORMATION TECHNOLOGY												
27	24ITO01	Introduction to Mobile Application Development	OEC	45	0	0	45	90	3	40	60	100
28	24ITO02	Introduction to Big Data and Analytics	OEC	45	0	0	45	90	3	40	60	100
29	24ITO03	Augmented Reality / Virtual Reality	OEC	45	0	0	45	90	3	40	60	100
MECHANICAL ENGINEERING												
30	24MEO01	3D Printing	OEC	45	0	0	45	90	3	40	60	100
31	24MEO02	Robotics and Automation	OEC	45	0	0	45	90	3	40	60	100
32	24MEO03	Lean Manufacturing	OEC	45	0	0	45	90	3	40	60	100
SAFETY AND FIRE ENGINEERING												
33	24SFO01	Occupational health and safety	OEC	45	0	0	45	90	3	40	60	100
34	24SFO02	Electrical safety	OEC	45	0	0	45	90	3	40	60	100



S. No.	Course Code	Course Title	Category	Periods / Semester					Credit	Max. Marks		
				L	T	P	SL	Tot		C= T/30	CA	ES
35	24SFO03	Building Fire Safety	OEC	45	0	0	45	90	3	40	60	100
36	24SFO04	Construction Safety	OEC	45	0	0	45	90	3	40	60	100

Summary										
Name of the Programme: B.E Biomedical Engineering										
CATEGORY	I	II	III	IV	V	VI	VII	VIII	TOTAL CREDITS	%
HSMC	4	2	-	3	-	3	3	-	15	9
BSC	8	8	4	4	-	-	-	-	24	15
ESC	10	4	-	-	-	-	-	-	14	8
PCC	-	5	17.5	13.5	17	8	3	-	64	39
PEC	-	-	-	-	3	6	9	-	18	11
OEC	-	-	-	3	3	3	-	-	9	5
EEC	1	1	1	1	3	4	2	8	21	13
MC	✓	-	-	-	✓	✓	-	-	-	-
Total	23	20	22.5	24.5	26	24	17	8	165	100%


Chairman (BoS)



24ENT19	PROFESSIONAL COMMUNICATION	Category	L	T	P	SL	C
		HSMC	45	0	0	45	3
(Common to All Branches)							
PRE-REQUISITE: A comprehensive understanding of basic English grammar, vocabulary, and sentence structure with familiarity in Communication and Technical Writing are considered as pre-requisite for the course.							
OBJECTIVE: To equip learners with essential verbal and written communication skills, including technical writing, necessary for academic, professional, and workplace success.							
UNIT - I	UNDERSTANDING COMPARISONS AND CONTRASTS	(9)					
Reading: Technical brochures, telephone messages, social media messages. Writing: Emails/letters introducing oneself, Compare and Contrast Essay. Grammar: Present Tenses, Framing WH and Yes-No questions. Vocabulary: Portmanteau words, One–word substitutions.							
UNIT - II	WRITING REPORTS AND PARAGRAPHS	(9)					
Reading: Technical texts, biographies, travelogues, travel & technical blogs. Writing: Paragraph writing, Short Report on an event/industrial visit. Grammar: Past Tenses, Active & Passive Voice transformations, Prepositions. Vocabulary: Word formations using Prefixes & Suffixes.							
UNIT - III	DESCRIBING THE PROCESS/PRODUCT	(9)					
Reading: Advertisements, gadget reviews, user manuals, news reports. Writing: Definitions, Instructions, Product/Process description, Checklists. Grammar: Future Tenses, If clauses, Concord. Vocabulary: Nominal Compounds, Discourse Markers (connectives & sequence words).							
UNIT - IV	TRANSCODING AND RECOMMENDATIONS	(9)					
Reading: Newspaper articles, Journal reports. Writing: Recommendations, Transcoding.(Conversion of non-verbal to verbal information) Grammar: Articles, Relative pronouns, Modals. Vocabulary: Collocations, Homonyms.							
UNIT - V	SUMMATION AND DESCRIPTION	(9)					
Reading: Editorials and Opinion blogs, Company profiles. Writing: Descriptive/Narrative Essays, Job/Internship Application with Resume. Grammar: Numerical adjectives, Relative Clauses. Vocabulary: Cause & Effect Expressions, Homophones.							
TOTAL (T:45 , SL:45) = 90 PERIODS							

Pravin Kumar
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the learners will be able to:

COs	Course Outcome	Cognitive Level
CO1	Recognize the structure of comparison texts using correct tenses and appropriate vocabulary.	Understand
CO2	Construct short paragraphs and reports using past tense and clear expressions.	Understand
CO3	Comprehend processes and products using future forms and appropriate vocabulary.	Understand
CO4	Interpret visuals like charts or graphs to produce well-structured written content.	Understand
CO5	Draft essays and job applications clearly, using proper grammar and structure.	Understand

TEXT BOOKS:

1. English for Engineers & Technologists, Orient Blackswan Private Ltd. Department of English, Anna University, 2023.
2. Nitin Bhatnagar, Communicative English for Engineers and Professionals, Pearson, 2024.

REFERENCES:

1. Dr. K.N. Shoba, and Dr. Lourdes Joevani, English for Science & Technology-II Cambridge University Press. Francis, Department of English, Anna University, 2023.
2. Lakshminarayanan, A Course Book on Technical English, Scitech Publications (India) Pvt. Ltd.2022.
3. Kulbhusan Kumar, RS Salaria, Effective Communication Skill, Khanna Publishing House, 2023.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	2	3	-	3	-	-

1-Low, 2-Medium, 3-High

M. Srinivas
Chairman (BoS)



24EET06	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	Category	L	T	P	SL	C
		ESC	45	0	0	45	3
(Common to AE, BME, CSE, CSE (CS), CSD, CSE (IoT), IT, MECH, SFE)							
PREREQUISITE: Basic knowledge of calculus, differential equations, and physics (especially electromagnetism) with strong problem-solving skills for circuit analysis.							
OBJECTIVE: <ul style="list-style-type: none"> To introduce the fundamentals of electrical and electronic systems, enabling analysis and application of basic circuits, machines and digital components. 							
UNIT - I	DC AND AC CIRCUITS	(9)					
DC circuits: Electrical quantities – Ohm's law – Kirchhoff's current and voltage laws – Series and parallel resistors – Simple problems. AC circuits: Waveforms, average value, RMS value, form factor, peak factor, power and power factor – Pure R, L and C – Series RL and RC circuits.							
UNIT - II	ELECTRICAL MACHINES	(9)					
DC machine: construction, working principle and applications – Single phase induction motor: Capacitor start capacitor run induction motor – Three phase induction motor: construction and working principle – Single phase transformer: construction and working principle.							
UNIT - III	ELECTRICAL INSTALLATIONS	(9)					
Classification of wiring system – Earthing – Types: pipe earthing, plate earthing, strip earthing – On-line and Off-line UPS – Lamps: Fluorescent tube, LED.							
UNIT - IV	ANALOG ELECTRONICS	(9)					
PN junction diode and Zener diode: Principle of operation and V-I characteristics – Half and full wave rectifier – Bipolar Junction Transistor: Construction and working.							
UNIT - V	DIGITAL ELECTRONICS	(9)					
Digital logic gates: NOT, AND, OR, NAND, NOR, EXOR – Digital circuits: half-adder, full-adder, JK and D flip flop – Introduction to Arduino components and IDE.							
LECTURE = 45, SELF LEARNING = 45, TOTAL = 90 PERIODS							


Chairman (BoS)



COURSE OUTCOMES:														
Upon completion of the course, the students will be able to:														
COs	Course Outcome												Bloom's Taxonomy Level	
CO1	Interpret the fundamental concepts of electrical circuits to solve the DC and AC circuit problems.												Understand	
CO2	Elaborate the construction and working principles of DC machines, induction motors and transformers.												Understand	
CO3	Describe the wiring systems, earthing techniques and the functionality of UPS and lighting systems.												Understand	
CO4	Identify the operation and characteristics of PN junction, Zener diode and BJT.												Understand	
CO5	Illustrate the functionality of digital logic gates, adders, flip-flops and Arduino components.												Understand	
TEXT BOOKS:														
1 Kothari D.P and Nagrath I.J, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill, Uttar Pradesh, 2020.														
2 Bhattacharya S.K, "Basic Electrical and Electronics Engineering", Pearson Education, Delhi, Second Edition, 2017.														
REFERENCES:														
1 Jain V.K, Amitabh Bajaj, "Design of Electrical Installation", University Science Press, New Delhi, 2016.														
2 Ramamoorthy M, Chandra Sekhar O, "Electrical Machines", PHI Learning Pvt. Ltd, Delhi, 2018.														
3 Christopher Siu, "Electronic Devices, Circuits, and Applications", Springer International Publishing, 2022.														
4 Kothari D.P, Dhillon J.S, "Digital Circuits & Design", First Edition, Pearson, Delhi, 2015.														
Mapping of COs with POs and PSOs														
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	1	-	2	-	-
CO4	3	2	-	-	-	-	-	-	1	1	-	2	-	-
CO5	3	2	-	-	-	-	-	-	1	1	-	2	-	-


Chairman (BoS)



24ITT16	PROGRAMMING FOR PROBLEM SOLVING	Category	L	T	P	SL	C
		ESC	45	0	0	45	3
(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), IT, ECE, EEE)							
PREREQUISITE:							
Students must have basic computer literacy, including familiarity with operating systems, file management, and software usage. A Basic understanding of algorithms and flowcharts are required to design and visualize problem solving strategies. Students must have basic knowledge on programming principles, such as variables, simple data types, control structures, problem solving and logical thinking skills.							
OBJECTIVES:							
The course introduces fundamental programming concepts using the C language, covering computer organization, algorithm representation, and basic syntax. Students will learn control structures, functions, arrays, pointers, and string handling. The course also covers complex data types like structures and unions, storage classes, and file operations. By the end, students will be able to analyze problems, design algorithms, and implement solutions using C programming.							
UNIT - I	INTRODUCTION TO COMPUTING AND C	(9)					
Introduction to Computing: Organization of computer – Hardware and Software – Number system and Conversions – Representation of an algorithm: pseudo code, flowchart with examples. Introduction to C –features of C – Structure of C program – Character set – C tokens – Keywords – Identifiers – Constants – Variables – Data types – Operators – Precedence and Associativity.							
UNIT - II	CONTROL STRUCTURES	(9)					
Decision Making and Branching: Introduction – decision making with if statement – simple if statement – if-else statement – nested if-else statements – if-else-if ladder statement – switch statement – goto statement – conditional operator – Decision making and looping: Introduction – while statement – do-while statement – for statement.							
UNIT - III	FUNCTIONS AND ARRAY	(9)					
Functions: Declaration and definition – Function prototype – parameter and arguments – Return type – passing argument by value and by reference – Function scope and lifetime – Function pointer – Arrays: array declaration and initialization – One dimensional array and Two-dimensional array with example.							
UNIT - IV	POINTERS AND STRINGS	(9)					
Pointers: Definition – Initialization – Pointer's arithmetic – Pointers to pointers – Pointers and arrays. String: Declaring and initializing string variables – String handling functions and operations.							
UNIT - V	STRUCTURE, UNION AND FILE	(9)					
Structures: Declaration – Definition – Structure within a structure – Union – Storage classes – Preprocessor directives – Files: Defining and opening a file – Closing a file – input/output operations on files – Command line arguments.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Pragna
Chairman (BoS)



COURSE OUTCOMES:

At the end of the course, the learners will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss about number systems and perform conversions between different number systems and depict about basic structure of C program.	Understand
CO2	Apply the concept of Looping and conditional statements to solve real-world programming problems efficiently.	Apply
CO3	Develop modular programs using functions and implement single and two-dimensional arrays for efficient data storage and manipulation.	Apply
CO4	Apply pointer concepts with arrays and functions, and develop efficient C programs using string operations for effective memory management and text processing.	Apply
CO5	Implement user-defined data types using structures and unions, manage memory with storage classes and perform file operations and command-line processing in C programs.	Apply

TEXT BOOKS:

1. Herbert Schildt, C - The Complete Reference, Tata McGraw-Hill, New Delhi, Fourth Edition, 2017.
2. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, 2011.

REFERENCES:

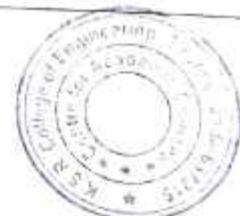
1. Yashavant Kanetkar, "Let Us C: Authentic guide to C programming language", BPB Publication, 19th Edition, 2022.
2. Robert C. Seacord, "Effective C", No Starch Press, 2020.
3. E Balagurusamy, "Programming In Ansi C", McGraw Hill Education, Eighth Edition, 2019.
4. Ashok N.Kamathane, 'Computer Programming, Pearson Education, India, Third Edition ,2015.
5. <https://archive.nptel.ac.in/courses/106/105/106105171/>

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	-	-	-
CO2	3	3	3	-	-	-	-	1	1	-	-	-	-
CO3	3	3	3	-	-	-	-	1	1	-	-	-	-
CO4	3	3	3	-	-	-	-	1	1	-	-	-	-
CO5	3	3	3	-	-	-	-	1	1	-	-	-	-

1-low, 2-medium, 3-high


Chairman (BoS)



24GET19	தமிழர்மரபு	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(அனைத்து துறைகளுக்கும் பொதுவானது)							
முன்கூட்டிய துறைசார் அறிவு : தேவை இல்லை							
அலகு - I	மொழி மற்றும் இலக்கியம்						[03]
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலயக்கிகியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள், தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலகியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.							
அலகு - II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை						[03]
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனியில் திருவள்ளுவர் சிலை - இசை கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூகப்பொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
அலகு - III	நாட்டுப் புறக் கலைகள் மற்றும் வீர விளையாட்டுக்கள்						[03]
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.							
அலகு - IV	தமிழர்களின் திணைக் கோட்பாடுகள்						[03]
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்கக்காலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.							
அலகு - V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு						[03]
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு கல்வெட்டுகள் கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்கள்களின் அச்ச வரலாறு.							
Total (L= 15, SL=15)=30 Periods							

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பாடம் கற்றத்தின் விளைவுகள்: பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்		அறிவாற்றல் நிலை
CO1:	தமிழ்மொழியின் செந்தன்மை மற்றும் இலக்கியம் குறித்த தெரிதல்	புரிதல்
CO2:	தமிழர்களின் சிற்பக்கலை, ஓவியக்கலை மற்றும் இசைக் கருவிகள் குறித்த தெளிவு.	புரிதல்
CO3:	தமிழர்களின் நாட்டுப் புரைக் கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு	புரிதல்
CO4:	தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககாலவணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.	புரிதல்
CO5:	இந்திய தேசிய இயக்கம், சுயமரியாதை இயக்கம் மற்றும் சித்த மருத்தவம் பற்றிய புரிதல்.	புரிதல்

Text Books:

1	தமிழகவரலாறு-மக்களும்பண்பாடும்-கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்) உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002
2	கணினித்தமிழ்முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016

Reference Books :

1	கீழடி-வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல்துறைவெளியீடு)
2	பொருறை – ஆற்றங்கரை நாகரிகம்.(தொல்லியல் துறை வெளியீடு)
3	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL. – (in print)
4	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-

1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)

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24GET19	HERITAGE OF TAMILS	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(Common to all branches)							
<i>Prerequisite(s): No prerequisites are needed for enrolling into the course</i>							
UNIT - I	LANGUAGE AND LITERATURE						[03]
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						[03]
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						[03]
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.							
UNIT - IV	THINAI CONCEPT OF TAMILS						[03]
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						[03]
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 (L= 15, SL=15) =30 Periods							
Course Outcomes:							
At the end of the course, the student will be able to							Cognitive Level
CO1:	Recognize the extensive literature of Tamil and its classical nature.					Understand	
CO2:	Apprehend the heritage of sculpture, painting and musical instruments of ancient people.					Understand	
CO3:	Review on folk and martial arts of Tamil people.					Understand	
CO4:	Insight thinai concepts, trade and victory of Chozha dynasty.					Understand	
CO5:	Realize the contribution of Tamil in Indian freedom struggle, self-esteem movement and siddha medicine.					Understand	

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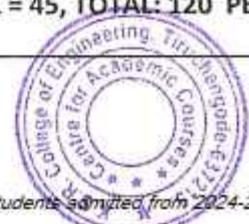
Text Books:	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
Reference Books:	
1	Social Life of the Tamils – The. Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
2	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished by International Institute of Tamil Studies).
3	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)													

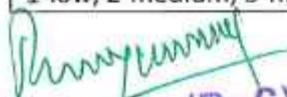
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24MAI19	MATRICES AND CALCULUS	Category	L	T	P	SL	C
		BSC	30	15	30	45	4
SEMESTER I - B.E / B.TECH (Common to All Branches)							
PREREQUISITE							
The Students should have a basic understanding of calculus, matrices, and differential equations to effectively follow the concepts in this course.							
OBJECTIVES:							
Build a strong foundation in eigen values, eigen vectors, quadratic forms, and higher-order linear differential equations. Develop skills in differential and vector calculus to analyze curves, optimize multivariable functions, and interpret vector fields.							
UNIT - I	LINEAR ALGEBRA	(9)					
Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (Excluding proof) – Cayley Hamilton theorem (excluding proof) – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.							
UNIT - II	ORDINARY DIFFERENTIAL EQUATIONS	(9)					
Linear differential equations of second and higher order with constant coefficients – Differential equations with variable coefficients – Cauchy’s and Legendre’s linear equations – Method of variation of parameters.							
UNIT - III	DIFFERENTIAL CALCULUS	(9)					
Curvature - Radius of curvature (Cartesian co-ordinates only) – Centre of curvature and Circle of curvature – Involute and Evolute (Parabola, Ellipse, Hyperbola and Rectangular hyperbola).							
UNIT - IV	FUNCTIONS OF SEVERAL VARIABLES	(9)					
Partial derivatives – Euler’s theorem for homogenous functions – Taylor’s series expansion - Maxima and Minima for functions of two variables – Method of Lagrangian multipliers.							
UNIT - V	VECTOR CALCULUS	(9)					
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Green’s theorem in plane, Gauss divergence theorem and Stoke’s theorem (Cube, Cuboid and Rectangular Paralleopiped only).							
List of Exercise/Experiments(MAT LAB):							
<ol style="list-style-type: none"> 1. Calculate the characteristic equation and eigenvalues 2. Find the eigenvector and diagonalization of a given matrix. 3. Solving ODE with constant coefficients 4. Detect the solution of ODE with variable coefficients 5. Identify the radius of curvature 6. Establish the Evolute of curve. 7. Reckon the Taylor’s series for functions of two variables. 8. Compute the maxima and minima. 9. Estimate the directional derivative, divergence and curl. 10. Determine line integral, surface integral and volume integral. 							
L = 30 , T = 15 & P = 30 & SL = 45, TOTAL: 120 PERIODS							



COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply eigen values, eigen vectors, and the Cayley-Hamilton theorem to solve matrix problems and diagonalize quadratic forms into canonical form.											Apply	
CO2	Apply methods to solve second and higher-order linear differential equations with constant and variable coefficients.											Apply	
CO3	Apply concepts of differential calculus to find curvature, center of curvature, and evolutes of standard Cartesian conic sections.											Apply	
CO4	Apply partial derivatives, Jacobians, and lagrangian multipliers to determine local extremum of multivariable functions.											Apply	
CO5	Apply vector differential operators to the vector fields and verify Green’s, Gauss divergence, and Stokes’ theorems for geometries.											Apply	
TEXT BOOKS:													
1.Ravish R Singh and Mukul Bhatt, “Engineering Mathematics – I”, Mc-Graw Hill Publications, New Delhi, 2 nd Edition, 2020.													
2.B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40 th Edition, 2020.													
REFERENCES:													
1. Bali N. P and Manish Goyal, “Engineering Mathematics”, Laxmi Publications Pvt Ltd., 7 th Edition, 2020.													
2.Dass H.K, “Advance Engineering Mathematics”, S. Chand and company, 11 th Edition, 2014.													
3. Jain R.K. and Iyengar S.R.K, “Advanced Engineering Mathematics”, Narosa Publications, 8 th Edition, 2012.													
4.Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India, New Delhi, 10 th Edition 2016.													
5. https://archive.nptel.ac.in/courses/111/108/111108157/													
6. https://archive.nptel.ac.in/courses/111/105/111105122/													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	-	-	1	-	-	2	-	-
CO2	3	3	3	3	2	-	-	1	-	-	2	-	-
CO3	3	3	3	3	2	-	-	1	-	-	2	-	-
CO4	3	3	3	3	2	-	-	1	-	-	2	-	-
CO5	3	3	3	3	2	-	-	1	-	-	2	-	-
Avg.	3	3	3	3	2	0	0	1	0	0	2	0	0
1-low, 2-medium, 3-high													


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24PHI07	ENGINEERING PHYSICS	Category	L	T	P	SL	C
		BSc	45	-	30	45	4
(Common to AIDS, BME,CSE,CSE(IoT),CS,ECE,EEE &IT)							
PREREQUISITE: The students must have knowledge about basic concepts of light sources, dual nature of radiation, conductivity of metals, semiconducting materials, different types of magnetic materials, super conducting materials and their applications.							
OBJECTIVES: To provide a comprehensive understanding of the fundamental principles, mechanisms, applications of lasers, fiber optics, quantum physics, semiconductors, magnetic materials and superconductors in modern Science and technology.							
UNIT – I	LASER AND FIBRE OPTICS						(9)
<p>Lasers: Principles of spontaneous emission and stimulated emission - Einstein's co-efficient A & B- population inversion – CO₂ laser – semiconductor diode laser – homo – junction & hetero – junction (qualitative analysis only) – applications.</p> <p>Fibre Optics: propagation of light in optical fibre– numerical aperture and acceptance angle – types of optical fibre (materials, refractive index profile and modes of propagation) – applications -fibre optic sensors: pressure and displacement sensors.</p>							
UNIT – II	QUANTUM MECHANICS						(9)
Introduction – black body radiation– Planck's theory (derivation) – deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory– Compton effect (derivation) – de-Broglie concept of matter waves – physical significance of a wave function – Schrödinger wave equations (Time dependent & time independent) – particle in a box (one dimensional).							
UNIT – III	CONDUCTING MATERIALS						(9)
Classical free electron theory – expression for electrical conductivity – thermal conductivity – Wiedemann-Franz law – drawbacks of classical free electron theory – quantum theory – Fermi energy – Fermi -Dirac distribution function – density of states and carrier concentration of metals.							
UNIT – IV	SEMICONDUCTING MATERIALS						(9)
Introduction – Intrinsic semiconductor: carrier concentration in an intrinsic semiconductor– Fermi level of an intrinsic semiconductor– variation of Fermi energy level with temperature – Extrinsic semiconductors: carrier concentration in n– type and p-type semiconductors (qualitative analysis only)– Fermi level of extrinsic semiconductors– variation of Fermi energy level with temperature and carrier concentration in an extrinsic semiconductors – Hall effect – determination of Hall co-efficient for n – and p – type semiconductors– applications.							
UNIT – V	MAGNETIC AND SUPERCONDUCTING MATERIALS						(9)
<p>Magnetic Materials: Introduction – origin of magnetic moment – dia, para and ferromagnetic materials– domain theory of ferro-magnetism – Hysteresis – soft and hard magnetic materials.</p> <p>Superconducting Materials: Introduction to superconductivity – properties and types of superconductor – application of superconductors: magnetic levitation– SQUIDS– cryotron.</p>							
<p>List of exercises/experiments:</p> <ol style="list-style-type: none"> Determine the thickness of the given thin paper using Air wedge method. Find the acceptance angle and numerical aperture of a given optical fibre. Evaluate the wavelength of semiconductor laser. Estimate the particle size of the lycopodium powder using semiconductor laser Enumerate the thermal conductivity of a bad conductor by Lee's disc method. Compute the band gap of an intrinsic semiconductor. Calculate the width of the CD groove with a help of semiconductor laser. Assess the Hysteresis loss of magnetic materials using B-H curve. 							
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Course Outcomes:

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

COs	Course Outcome	Cognitive level
CO1	Elucidate laser principles, types, light propagation and the applications of optical fibers.	Understand
CO2	Apply quantum theory for Planck's theory, Compton Effect and Schrödinger's equation of matter waves.	Apply
CO3	Calculate electrical conductivity and Fermi energy by considering quantum free electron theory.	Apply
CO4	Infer charge carrier behavior in intrinsic, extrinsic semiconductors and Hall effect.	Understand
CO5	Describe principles, classifications, applications of magnetic materials and superconductors.	Understand

Text Books :

1. M.N. Avadhanulu and P.G. Kshirsagar, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 11th Edition, 2018.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics", Dhanpat Rai Publication, New Delhi, 7th Edition, 2014.

Reference Books :

1. R. Murugesan and Kiruthiga Sivaprasath, "Modern Physics", S. Chand & Company, New Delhi, 17th Edition, 2014.
2. V. Rajendran, "Engineering Physics", Tata McGraw-Hill, New Delhi, 1st Edition, 2011.
3. S.O. Pillai, "Solid State Physics", New Age Publication, Chennai, 10th Edition, 2023.
4. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill, New Delhi, 7th Edition, 2015.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	-	-	-	-	1	2	2	-	2	-	-
CO2	3	3	2	-	-	-	1	2	2	-	2	-	-
CO3	3	3	2	-	-	-	1	2	2	-	2	-	-
CO4	3	2	-	-	-	-	1	2	2	-	2	-	-
CO5	3	2	-	-	-	-	1	2	2	-	2	-	-
Avg.	3	2	-	-	-	-	1	2	2	-	2	-	-

1-low, 2-medium, 3-high


BoS chairman

Chairman (BoS)



24PHI07 - ENGINEERING PHYSICS
I Year B.E (AIDS, BME, CSE, CSE (IOT), CS, ECE, EEE & B.Tech IT)
Requirements for a batch of 30 students
Regulation (2024)

S.No.	Description of Equipment	Quantity required
1.	Air wedge apparatus. (with traveling microscope and accessories)	5 Nos
2.	Acceptance angle and numerical aperture of an optical fibre. (with accessories)	5 Nos
3.	Wavelength of semiconductor laser beam. (with accessories)	5 Nos
4.	Particle size of Lycopodium powder. (with accessories)	5 Nos
5.	Lee's disc apparatus. (with accessories)	5 Nos
6.	Band gap apparatus. (with accessories)	5 Nos
7.	Width of the groove of CD using laser. (with accessories)	5 Nos
8.	B-H curve apparatus. (with accessories)	5 Nos

BoS chairman

Chairman (BoS)



24ITP16	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1

(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), IT, ECE, EEE)

PREREQUISITE:

Students are expected to have foundational knowledge of basic programming principles. This includes an understanding of variables and data types such as integers, floats, and characters, as well as familiarity with fundamental control structures like conditional statements (if-else) and loops (for, while).

OBJECTIVES:

The lab is designed to provide hands-on experience with fundamental computer applications like MS Word, Excel, PowerPoint, and MS Access. It also aims to develop practical programming skills in C, enabling students to write, debug, and execute programs that incorporate core concepts such as control flow, functions, strings, pointers, and file handling. The lab will help students apply theoretical knowledge to real-world problems, enhancing their problem-solving and programming proficiency.

List of Experiments:

1. Prepare a Bio-data using MS Word with appropriate page, text and table formatting options and send the same to too many recipients using mail merge.
2. Prepare a mark sheet with five subjects for five students in MS Excel File using Formulas, Functions and charts.
3. i) Prepare a Power Point presentation for your organization with varying animation effects using timer.
ii) Prepare a Student Database in MS Access, manipulate the data and generate report.
4. Design an algorithm and flowchart with example.
5. Program using I/O statements and expressions.
6. Programs using decision-making constructs: if-else, goto, switch-case, break-continue.
7. Loops: for, while, do-while.
8. Arrays: 1D and 2D
9. Functions: passing parameters by (value, reference), Recursion.
10. Strings: operations.
11. Pointers.
12. Structures and File operations.



L=0, T=0, P=30, SL=0, TOTAL: 30 PERIODS

S. [Signature]
Chairman (BoS)

COURSE OUTCOMES:

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

COs	Course Outcome	Experiment	Cognitive Level
CO1	Apply the basic concept of MS word, Excel, Power Point presentation and MS Access.	1,2,3,4	Apply
CO2	Develop the program using the concept of control statements.	5,6,7	Apply
CO3	Demonstrate the use of functions and arrays in Programming.	8,9	Apply
CO4	Apply the concepts of pointers and strings.	10,11	Apply
CO5	Develop the program using the files and structure operations.	12	Apply

REFERENCES:

- 1.Jeff Szuha, "Learn C Programming", Packt Publishing, United Kingdom, Second Edition, 2022.
- 2.E Balagurusamy, "Programming In Ansi C", McGraw Hill Education, Eighth Edition, 2019.

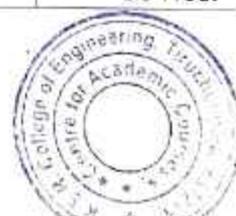
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	1	1	-	-	-	-
CO2	3	3	2	-	-	-	-	1	1	-	-	-	-
CO3	3	3	2	-	-	-	-	1	1	-	-	-	-
CO4	3	3	2	-	-	-	-	1	1	-	-	-	-
CO5	3	3	2	-	-	-	-	1	1	-	-	-	-

1-low, 2-medium, 3-high

LIST OF EQUIPMENTS (For a Batch of 30 Students)

Sl. No	Name of the Equipment's	Qty.
1.	A computer with a modern processor and sufficient RAM.	30 Nos.
2.	Microsoft Office Suite (preferably MS Office 2016 or later) including: <ul style="list-style-type: none"> • MS Word (for document preparation and mail merge) • MS Excel (for mark sheet creation, formulas, functions, and charts). • MS PowerPoint (for presentations with animations and timers). • MS Access (for database creation, data manipulation, and report generation). • Email Client (e.g., Outlook or any configured email system) for sending mail merge outputs. 	30 Nos.
3.	Turbo C software or any standard C Compiler (e.g., GCC, Code Blocks)	30 Nos.

S. Gopix
Chairman (BoS)

24MEP16	ENGINEERING GRAPHICS LABORATORY	Category	L	T	P	SL	C
		ESC	15	0	30	15	2

(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), IT, ECE, EEE)

PREREQUISITE

Engineering Graphics Laboratory requires a good understanding of geometry. This includes knowledge of shapes, angles, dimensions, and spatial reasoning. The ability to visualize and interpret three-dimensional objects from two-dimensional drawings is crucial.

OBJECTIVES:

Instruct the utility of drafting & modeling packages in orthographic and isometric drawings and train the usage of 2D and 3D modeling

List of Exercise/Experiments:

1. Study of drawing tools, commands and coordinate systems in 2D software.
2. Cycloid and Conic curves.
3. Orthographic projections of pictorial views.
4. Orthographic views of straight lines.
5. Orthographic views of planes.
6. Orthographic views of simple solids.
7. The sectional view and the true shape of simple solids.
8. Development of lateral surfaces of simple solids.
9. Isometric projection of simple solids.
10. Drafting the 2D multi-view drawings from 3D model.

LIST OF EQUIPMENT (for a batch of 30 Students)

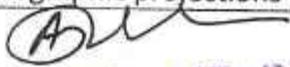
S.No.	Name of the Equipment	Quantity
1.	Intel i3 Processor, 8 GB RAM with 2 GB Graphics Card	30 Nos
2.	Licensed software for drafting and modeling	30 Nos

L:15 P:30 SL:15 TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

COs	Course Outcome	Exp. No.	Cognitive Level
CO1	Explain the fundamentals of engineering drawing and AutoCAD tool.	1	Understand
CO2	Construct projections of points, lines, and planes, then develop a virtual drawing using AutoCAD tool.	2,3 & 4	Apply
CO3	Apply projection principles to convert pictorial views into orthographic drawings	5,6	Apply
CO4	Model the Solid Projections and Sectioning of the solids by the AutoCAD tool.	7,8	Apply
CO5	Develop isometric drawings of simple objects reading the orthographic projections of those objects.		Apply


Chairman (BOS)

REFERENCES:

1. Bhatt. N. D., Engineering Drawing, Charotar Publishing House, Fifty Third Edition, 2014.
2. Basant Agarwal and Agarwal. C. M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, 2018.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	-	-	-	-	-
CO2	3	3	2	-	3	-	-	-	-	-	-	-	-
CO3	3	3	2	-	3	-	-	-	-	-	-	-	-
CO4	3	3	2	-	3	-	-	-	-	-	-	-	-
CO5	3	3	2	-	3	-	-	-	-	-	-	-	-

1-low, 2-medium, 3-high


Chairman (BoS)



24GEP16	ENGINEERING EXPERIENCE LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), ECE, EEE, IT)							
PREREQUISITE:							
A solid foundation in basic electrical components such as switches, wires, fuses, and light bulbs, including the roles of line, neutral, and ground wires. Basic understanding of physics and core principles of electrical and mechanical engineering.							
OBJECTIVE:							
To develop practical skills in basic electrical wiring, electronic interfacing with Arduino and IoT, and fundamental mechanical tools and systems.							
LIST OF EXPERIMENTS							
GROUP - A (ELECTRICAL)							
<ol style="list-style-type: none"> 1. Fluorescent lamp wiring. 2. Stair-case wiring. 3. Residential house wiring using switches, fuse, indicator and lamp. 4. Measurement of Energy in single phase system. 							
GROUP - B (ELECTRONICS)							
<ol style="list-style-type: none"> 1. Study of Electronic Components, Instruments, Internet of Things (IoT) and Arduino IDE. 2. Controlling the Light Emitting Diode (LED) with a push button using Arduino. 3. Interfacing of a Sensor (Ultrasonic, Rain, Voltage, Current & PIR) with Arduino Uno. 4. Controlling of LED through Wi-Fi using ESP8266. 							
GROUP - C (MECHANICAL)							
<ol style="list-style-type: none"> 1. Study of plumbing line sketches for water supply and carpentry tools. 2. Study of welding tools and centrifugal pump. 							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome						Bloom's Taxonomy Level
CO1	Construct different types of wiring used in residential houses.						Apply
CO2	Measure the energy in single-phase system.						Apply
CO3	Demonstrate different electronic components, instruments, IoT and Arduino IDE.						Apply
CO4	Construct the control circuit with the help of Arduino and sensors.						Apply
CO5	Describe the plumbing, carpentry, welding components and centrifugal pump works for engineering practices and applications.						Understand


Chairman (BoS)



REFERENCES:

1. Gupta J.P., "A Course in Electrical Installation Estimating and Costing", S.K. Kataria and Sons, Delhi, Reprint 2013 Edition, 2013.
2. Mike Cheich, "Arduino Book for Beginners", Programming Electronics Academy, 2021.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	2	2	3	2	-	3	-	-
CO2	3	3	2	-	-	2	2	3	2	-	3	-	-
CO3	3	3	2	-	-	-	2	3	2	-	3	-	-
CO4	3	3	2	-	-	-	2	3	2	-	3	-	-
CO5	3	3	2	-	-	-	2	3	2	-	3	-	-

LIST OF EQUIPMENT (For a Batch of 30 Students)

S.No.	Name of the Equipment	Qty.
1.	Single-phase house wiring setup	2 Nos.
2.	Staircase wiring setup	2 Nos.
3.	Fluorescent lamp wiring setup	2 Nos.
4.	Energy Meter	5 Nos.
5.	Electrical Measuring Instruments	10 Nos.
6.	Ultrasonic Sensor	5 Nos.
7.	Rain Sensor	5 Nos.
8.	Voltage Sensor	5 Nos.
9.	Current Sensor	5 Nos.
10.	PIR Sensor	5 Nos.
11.	ESP8266 & Cable	15 Nos.
12.	Arduino UNO & Cable	15 Nos.
13.	DHT 11	5 Nos.
14.	Temperature sensor	5 Nos.
15.	Red LED	15 Nos.
16.	2-leg push Button	15 Nos.
17.	4-leg push Button	15 Nos.
18.	Personal Computer	15 Nos.


Chairman (BoS)



24SSP19	APTITUDE AND CODING SKILLS – I	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES:							
The course aims to introduce students to the fundamentals of aptitude, highlighting its importance and real-world applications. It is designed to build proficiency in verbal reasoning, thereby enhancing analytical and problem-solving skills. The curriculum also focuses on developing a strong foundation in English grammar, essential for effective communication.							
UNIT - I	BASIC OF NUMBER SYSTEMS & FOUNDATION	(6)					
Introduction to Number System and its Classification - Divisibility Rules and Problems –Place Value & Face Value - HCF & LCM and its properties.							
UNIT - II	BASICS OF SHARE BASED CONCEPTS	(6)					
Introduction to Average – Basics of Ratio and proportion – Basics of Partnership–Introduction to Percentage							
UNIT - III	LOGICAL REASONING	(4)					
Analogies - Alpha and numeric series - Number Series - Coding and Decoding - Direction and distance							
UNIT - IV	VERBAL ABILITY	(7)					
Introduction to Grammar – Tenses – Parts of Speech – Preposition – Articles – Modal Verbs							
UNIT - V	C PROGRAMMING	(7)					
C Basics-Control Statements Decision making – Functions – Arrays & Strings – Pointers - User Defined Data Types - Storage Classes - Memory Management - Preprocessor.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Explain the classification of number systems, apply divisibility rules to identify number properties	Understand					
CO2	Apply the concepts of averages, ratios, and proportions to solve real-life problems and interpret data effectively.	Apply					
CO3	Solve number series problems by identifying and applying suitable numerical patterns or rules.	Apply					
CO4	Apply the rules of grammar to enhance written and spoken communication.	Apply					
CO5	Apply the fundamental concepts of C programming to develop efficient and structured programs.	Apply					

Anupama
Chairman (BoS)



TEXT BOOKS:													
1. R S Aggarwal, Quantitative Aptitude for Competitive Examinations.													
2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning													
3. Wren & Martin, High School English Grammar & Composition													
4. Brian W. Kernighan and Dennis Ritchie, The C Programming Language 2e, Pearson Education, 2015.													
5. Yashavant Kanetkar, The C Programming Language 2e, BPB publications, 15 th Edition, 2016													
REFERENCES:													
1. https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm													
2. Stephen G. Kochana, Programming in C, 3 rd Edition.													
3. K. N. King, C Programming: A Modern Approach, 2e, 2008.													
4. Aaron M. Tenenbaum, Yedidyah Langsam, and Moshe J. Augenstein, Data Structures Using C, Pearson Education-India, 1990.													
5. Robert L. Kruse and Bruce P. Leung, Data Structures and Program Design in C, Pearson Education 2007.													
6. https://www.geeksforgeeks.org/c-programming-language/													
7. https://www.geeksforgeeks.org/data-structures/													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	2	-	-	2	-	-	3	-	-
CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	3	2	-	2	-	-	2	-	-	3	-	-
Avg.	3	3	3	-	2	-	-	2	-	-	3	-	-


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24CST29	PYTHON PROGRAMMING	Category	L	T	P	SL	C
		ESC	45	0	0	45	3

(Common to All Branches)

PREREQUISITE:

A basic understanding of programming principles such as variables and loops, paired with good problem-solving abilities is required. Logical thinking and analytical skills are critical for effective programming.

OBJECTIVES:

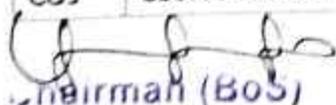
To provide a comprehensive foundation in Python programming, covering core concepts, data structures, OOP principles, file and database handling as well as web and GUI development using frameworks like Django and Tkinter.

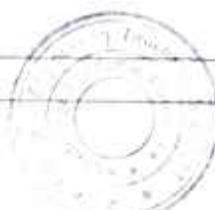
UNIT – I	FUNDAMENTALS OF PYTHON	(9)
Introduction to Python – Advantages of Python programming – Variables and Data types – Comments – Indentation – I/O function – Operators – Selection control structures – Looping control structures – Functions: Declaration – Types of arguments – Anonymous functions: Lambda.		
UNIT – II	HANDLING STRINGS AND EXCEPTIONS	(9)
Strings – List – Tuples – Dictionaries – Sets – Exception Handling: Built-in Exceptions – User-defined exception – Modules and Packages.		
UNIT – III	OBJECT ORIENTED PROGRAMMING CONCEPTS	(9)
Object Oriented Programming basics – Inheritance and Polymorphism – Operator Overloading and Overriding – Get and Set Attribute Values – Name Mangling – Duck Typing – Relationships.		
UNIT – IV	FILES AND DATABASES	(9)
File I/O operations – Directory Operations – Reading and Writing in Structured Files: CSV and JSON – Data manipulation using MySQL.		
UNIT – V	WEBPROGRAMINGAND GUI USING PYTHON	(9)
Frameworks: Introduction to Django – Django CRUD – Socket Programming – Sending email – UI design: Tkinter – Events – CGI: Introduction to CGI Programming, GET and POST Methods.		
L=45, SL=45, TOTAL: 90 PERIODS		

COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
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CO1	Describe Python syntax to write code using data types, operators, loops and conditionals.	Understand
CO2	Interpret string manipulation, data structures and exception handling to build robust applications.	Understand
CO3	Implement object-oriented programming principles including inheritance and polymorphism to design effective solutions.	Apply
CO4	Apply file I/O operations and database management techniques to efficiently manage and manipulate data.	Apply
CO5	Develop web applications and graphical user interfaces using Python frameworks and libraries.	Apply

TEXT BOOKS:

1. Yashwant Kanetkar, Aditya Kanetkar, "Let Us Python", BPB Publications, 5th Edition, 2023.
2. Wesley J.Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2017.

REFERENCES:

1. Robert Oliver, "Python Quick Start Guide: The Simplified Beginner's Guide to Python Programming Using Hands-On Projects and Real-World Applications", Clyde Bank Media LLC,1st Edition, 2023
2. Allen B. Downey, "Think Python", O'Reilly Media, 2nd Edition, 2016.
3. David Beazley, Brian K. Jones, "Python Cookbook", O'Reilly Media, 3rd Edition, 2013
4. Mark Lutz, "Python Pocket Reference", O'Reilly Media,5th Edition, 2014
5. www.python.org
6. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	2		
CO2	3	2	-	-	-	-	-	1	1	-	2		
CO3	3	3	2	-	-	-	-	1	1	-	2		
CO4	3	3	2	-	-	-	-	1	1	-	2		
CO5	3	3	2	-	-	-	-	1	1	-	2		

1-low, 2-medium, 3-high



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24ECT21	DESIGN THINKING	Category	L	T	P	SL	C	
		PCC	30	0	0	30	2	
(COMMON TO BME, EEE & ECE)								
PRE-REQUISITE: Nil								
OBJECTIVE: To equip learners with a structured, human-centered approach to problem-solving using the principles and stages of Design Thinking, including empathy, problem definition, ideation, prototyping, and effective communication.								
UNIT - I	FUNDAMENTALS OF DESIGN THINKING						(6)	
What is Design Thinking? - When to use Design Thinking? - How to do it? - Who are involved in this? - Design Thinking™- Personal Visualization, The Wheel of Life & Balancing Priorities – Appreciating ‘Design’ – The 3 Laws of Design Thinking.								
UNIT - II	STEP 1: THE ‘FEEL’ STAGE						(6)	
What is this stage about? – What role does a Design Thinker play in this stage? Tools – What is the purpose in this stage? – Persona – Journey Mapping – Stakeholder Mapping & CATWOE Analysis - Cartographic Perspective (I0) – Empathy Map – Case Study: Understanding the Stakeholders.								
UNIT - III	STEP 2: THE ‘DEFINE’ STAGE						(6)	
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – Five-Whys – Anti-Pattern – Paraphrasing the Problem – Challenge Mapping – LORD: Definitive skill set for a Design Thinker – Case Study: Relooking at the Problem.								
UNIT - IV	STEP 3: THE ‘DIVERGENCE’ & ‘CONVERGENCE’ STAGE						(6)	
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – Brainstorming – Metaphor – Random Association Technique – End-State Visualization - 10gm-100gm-1000gm – Prototyping – Wire framing for digital products – Case Study: Prototyping and Communicating for Effective Outcome.								
UNIT - V	STEP 5: THE ‘COMMUNICATION’ STAGE						(6)	
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – The 4Cs Framework – Naming – Packaging – Story boarding – Presentation – Distribution.								
TOTAL (L:30, SL:30): 60 PERIODS								
COURSE OUTCOMES:								
At the end of the course, the students will be able to:								
COs	Course Outcome						Cognitive Level	
CO1	Demonstrate an understanding of Design Thinking concepts and principles by explaining their relevance in real-world contexts.						Understand	
CO2	Articulate the significance of a Design Mindset and its impact on creative problem-solving.						Understand	
CO3	Apply Design Thinking methods effectively at each stage of the problem-solving process.						Apply	

C. Guha
Chairman (BoS)



CO4	Identify and implement the phases of Design Thinking to address complex challenges systematically.											Apply	
CO5	Use a variety of Design Thinking tools to develop innovative solutions and refine ideas through iteration.											Apply	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. UnMukt – The Science & Art of Design Thinking, Arun Jain 2. Don Norman ,The Design of Everyday Things, MIT Press, 2013 3. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and inspires innovation, Harper Collins Publishers Ltd, New York, First Edition, 2009. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Chrisitan Mueller-Roterberg, Handbook of Design Thinking – Tips & Tools for how to design thinking, kindle Direct Publishing, First Edition, 2018. 2. Johnny Schneider, Understanding Design Thinking, Lean and Agile, O'Reilly Media, California, First Edition, 2017 3. Roger Martin, The Design of Business, Why Design Thinking is the next competitive advantage, Harvard Business Press, United States, First Edition, 2009. 4. Idris Mootee, Design Thinking for Strategic Innovation, John Wiley & Sons Inc, New Jersey, First Edition, 2013. 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO2	3	3	2	2	2	2	2	3	2	3	3	-	-
CO3	3	3	3	3	3	2	2	3	2	3	3	-	-
CO4	3	3	3	3	3	2	2	3	2	3	3	-	-
CO5	3	3	3	3	3	2	2	3	2	3	3	-	-
1-low, 2-medium, 3-high													

C. Srinivas
Chairman (BoS)



24BMT21	MEDICAL PHYSICS	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE							
Students should have a foundational understanding of basic physics, including concepts of mechanics, electromagnetism, and atomic structure. Basic knowledge of human anatomy and physiology is also essential to relate physical principles to biological systems.							
OBJECTIVES:							
To provide foundational knowledge of atomic and radiation physics and also aims to explore radiation interaction with matter, sensory principles, and techniques for radiation detection and measurement.							
UNIT - I	ATOMIC PHYSICS AND IONIZING AND NON-IONIZING RADIATION						(9)
Atomic Physics: Electronic Structure of atom, Structure of the Nucleus, Nuclear Binding energy; Ionizing radiation: Absorption, scattering and attenuation of gamma-rays, Biological effects and protection from them; Non-Ionizing radiation: Tissue as a leaky dielectric, overview of non-ionizing radiation effects, Low Frequency Effects- Higher frequency effects, Ultraviolet.							
UNIT - II	PHYSICS OF SENSES						(9)
Introduction and objectives, Cutaneous sensation-Mechanoreceptors, Thermoreceptors, Nociceptors; Chemical senses-Gustation(taste), Olfaction(smell); Audition- Physics of sound, Normal sound levels, Anatomy and physiology of the ear, Theories of hearing, Measurement of hearing; Vision- Physics of light, Anatomy and physiology of the eye, Intensity of light, Limits of vision, Colour vision; Psychophysics-Weber and Fechner laws, Power law.							
UNIT - III	PRINCIPLES OF RADIONUCLEIDES						(9)
Radioactive Decay: Spontaneous Emission, Isometric Transition, Gamma ray emission, alpha, beta, Positron decay, electron capture; Production of Radioisotopes: Naturally occurring radioactivity, Man-made background radiation, Induced background radiation, Neutron reactions and man-made radioisotopes, Units of activity, Isotope generators, Medical applications; Production of radionuclides: Cyclotron produced Radionuclide; Reactor produced Radionuclide-fission and neutron capture reaction, radionuclide Generator-Techetium generator.							
UNIT - IV	INTERACTION OF RADIATION WITH MATTER						(9)
Interaction of charged particles with matter –Specific ionization, Linear energy transfer, range, Bremsstrahlung, Annihilation; Interaction of Gamma radiation with matter- Photoelectric effect, Compton Scattering , Pair production, Attenuation of Gamma Radiation; Interaction of neutron with matter and their clinical significance (Radiation Dosimetry).							
UNIT - V	PRINCIPLES OF RADIATION DETECTION AND DOSIMETERS						(9)
Principles of Radiation Detection: Gas filled detectors, Ionization Chambers, Geiger-Muller Counters; Dose and exposure measurement, Maximum permissible levels, Measurement methods: Ionization chambers, G-Mcounters, Scintillation counters, Film dosimeters, Thermoluminescent dosimetry(TLD).							
L = 45, SL = 45, TOTAL: 90 PERIODS							


Chairman (BoS)



COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Explain the basics of atomic Physics, ionizing and non-ionizing radiations.	Understand
CO2	Classify the human senses and describe the mechanisms of vision and auditory perception.	Understand
CO3	Illustrate the process of radionuclide production and outline their uses in medical applications.	Understand
CO4	Interpret the interaction of radiation with matter and its relevance in clinical contexts.	Understand
CO5	Describe the radiation exposure, dosage effects and prevention measures.	Understand

TEXT BOOKS:

1. B.H. Brown, R.H. Smallwood, D.C. Barber, P.V. Lawford, D.R. Hose, —Medical Physics and Biomedical Engineering||, Institute of physics publishing, Bristol and Philadelphia, 1999.
2. Gopal B. Saha —Physics and Radiobiology of Nuclear Medicine|| Fourth edition Springer, 2006.

REFERENCES:

1. W.J. Meredith and J.B. Massey "Fundamental Physics of Radiology" Varghese Publishing house, Third Edition, 2013.
2. Steve Webb, The Physics of Medical Imaging, Taylor & Francis, Newyork, Second Edition, 2012.
3. R.S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
4. Ervin B. Podgorsak, "Radiation Physics for Medical Physicists", Springer International Publishing, 2018.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	1	-
CO2	3	2	-	-	-	-	-	1	1	-	1	1	-
CO3	3	2	-	-	-	-	-	1	1	-	1	1	-
CO4	3	2	-	-	-	-	-	1	1	-	1	1	-
CO5	3	2	-	-	-	-	-	1	1	-	1	1	-

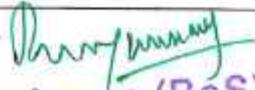
1-Low, 2-Medium, 3-High


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24GET29	தமிழரும் தொழில் நுட்பமும்	CATEGORY					
		L	T	P	SL	C	
		HSMC	15	0	0	15	1
(அனைத்து துறைகளுக்கும் பொதுவானது)							
முன் கூட்டிய துறைசார் அறிவு : தேவை இல்லை							
அலகு -I	நெசவு மற்றும் பாணைத் தொழில்நுட்பம்						[03]
சங்ககாலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள்-பாண்டுகளில் கீறல் குறியீடுகள்							
அலகு -II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						[03]
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும்-சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்-மாமல்லபுரச் சிற்பங்களும், கோவில்களும்-சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள்-நாயக்கர் காலக்கோயில்கள்-மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன்ஆலயம் மற்றும் திருமலைநாயக்கர்மஹால் - செட்டிநாட்டுவீடுகள்-பிரிட்டிஷ்காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக்கலை.							
அலகு -III	உற்பத்தித் தொழில்நுட்பம்						[03]
கப்பல் கட்டும் கலை-உலோகவியல்-இரும்புத்தொழிற்சாலை-இரும்பை உருக்குதல், எஃகு-வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள்-நாணயங்கள் அச்சடித்தல்-மணி உருவாக்கும் தொழிற்சாலைகள்-கல் மணிகள்-கண்ணாடி மணிகள்-சுடு மண்மணிகள்-சங்குமணிகள்-எலும்புத்துண்டுகள்-தொல்லியல் சான்றுகள்-சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.							
அலகு -IV	வேளாண்மை மற்றும் நீர்ப் பாசனத் தொழில்நுட்பம்						[03]
அணை, ஏரி, குளங்கள், மதகு-சோழர்காலகுமிழித்தாம்பின் முக்கியத்துவம்-கால்நடை பராமரிப்பு-கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்-வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள்-கடல்சார் அறிவு - மீன் வளம்-முத்து மற்றும் முத்துக் குளித்தல்-பெருங்கடல் குறித்த பண்டைய அறிவு-அறிவுசார் சமூகம்.							
அலகு -V	அறிவியல் தமிழ் மற்றும் கணிவித்தமிழ்						[03]
அறிவியல் தமிழின் வளர்ச்சி- கணிவித்தமிழ் வளர்ச்சி-தமிழ் நூல்களை மின்பதிப்பு செய்தல்-தமிழ் மென் பொருட்கள் உருவாக்கம்-தமிழ் இணையக்கல்விக் கழகம்-தமிழ் மின்நூலகம்-இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.							
Total (L= 15, SL=15) =30 Periods							

பாடம் கற்றத்தின் விளைவுகள் : பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்		அறிவாற்றல் நிலை
CO1	சங்ககாலத் தமிழிர்களின் நெசவு மற்றும் பாணைவனைதல் தொழில் நுட்பம் குறித்து கற்றுணர்தல்.	புரிதல்
CO2	சங்ககாலத் தமிழிர்களின் கட்டிட தொழில் நுட்பம் கட்டுமான பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்து அறிவு.	புரிதல்
CO3	சங்ககாலத் தமிழிர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு.	புரிதல்
CO4	சங்ககாலத் தமிழிர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு.	புரிதல்
CO5	நவீன அறிவியல் தமிழ் மற்றும் கன்னி தமிழ் குறித்த புரிந்துகொள்ளும் மற்றும் பயன்படுத்தலும்.	பகுப்பாய்வு


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Text Books :	
1	தமிழகவரலாறு- மக்களும் பண்பாடும்- கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2	கணினித்தமிழ்- முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
Reference Books :	
1	கீழடி- வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல் துறை வெளியீடு)
2	பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
3	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by : The Author)
4	Porunai Civilization (Jointly Published by: Department of Archaeology &Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)													

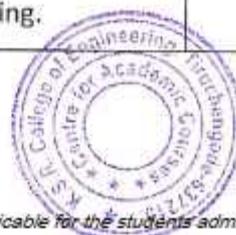
Aravindan

Chairman (BoS)



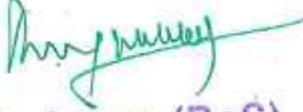
24GET29	TAMILS AND TECHNOLOGY	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(Common to All Branches)							
<i>Prerequisite(s): No prerequisites are needed for enrolling into the course</i>							
UNIT - I	WEAVING AND CERAMIC TECHNOLOGY						[03]
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.							
UNIT - II	DESIGN AND CONSTRUCTION TECHNOLOGY						[03]
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) – ThirumalaiNayakar Mahal –Chetti Nadu Houses, Indo –Saracenic architecture at Madras during British Period.							
UNIT - III	MANUFACTURING TECHNOLOGY						[03]
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						[03]
Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu 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						[03]
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 (L= 15, SL=15) =30 Periods							
Course Outcomes:							
At the end of the course, the student will be able to							Cognitive Level
CO1	Understand the weaving and ceramic technology of ancient Tamil People nature.						Understand
CO2	Comprehend the construction technology, building materials in sangam Period and case studies.						Understand
CO3	Infer the metal process, coin and beads manufacturing with relevant archeological evidence						Understand
CO4	Realize the agriculture methods, irrigation technology and pearl diving.						Understand
CO5	Apply the knowledge of scientific Tamil and Tamil computing.						Apply

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Text Books:	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
Reference Books:	
1	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
2	The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished by International Institute of Tamil Studies).
3	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology &Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4	Studies in the History of India with Special Reference to Tamilnadu (dr.K.K.Pillay) (Published by.: The Author)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)													


Chairman (BoS)



24MAI29	PROBABILITY AND STATISTICS	Category	L	T	P	SL	C
		BSC	30	15	30	45	4
SEMESTER II - B.E / B.TECH (Common to All Branches)							
PREREQUISITE: A basic understanding of algebra, calculus, and introductory statistics is required to grasp the concepts of probability, hypothesis testing, and statistical methods used in engineering and quality control.							
OBJECTIVES: To build a foundational understanding of probability and random variables, enable the application of two-dimensional random variables in engineering contexts, develop the ability to perform hypothesis testing for both small and large samples, introduce the principles of experimental design in agricultural studies, and provide knowledge of statistical quality control techniques.							
UNIT - I	ONE DIMENSIONAL RANDOM VARIABLES						(9)
One dimensional Random Variable - Discrete and continuous random Variables -Expectations - Moment generating functions and their properties - Binomial, Poisson, Uniform and Normal distributions.							
UNIT - II	TWO - DIMENSIONAL RANDOM VARIABLES						(9)
Joint distributions – Marginal and conditional distributions – Covariance – Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation - Regression Analysis.							
UNIT - III	TESTING OF HYPOTHESIS						(9)
One sample and two sample test for means of large samples (Z- test), One sample and two sample test for means of small samples (t-test), Chi-square - Independent of Attributes - F test for equality of variances.							
UNIT - IV	DESIGN OF EXPERIMENTS						(9)
Analysis of variance - One way and two way classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design.							
UNIT - V	STATISTICAL QUALITY CONTROL						(9)
Control charts for measurements (\bar{X} and R charts) – Control charts for C and P charts – Acceptance sampling for construction of an OC curve.							
List of Exercise/Experiments (R Software):							
<ol style="list-style-type: none"> Determine the probability by using binomial distribution. Find the probability with the help of normal distribution. Determine the correlation co-efficient between X and Y. Calculate and plot the regression lines. Test the significance of difference between experimental and theoretical values of the data by using chi-square test. Examine the small samples using F distribution. Analyze the data using Randomized Block Design (RBD). Inspect the data using Latin Square Design (LSD). Find the \bar{X} and R charts. Compute c and p charts. 							
L = 30 , T = 15 & P = 30 & SL = 45, TOTAL: 120 PERIODS							



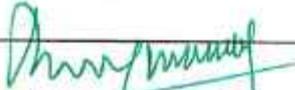
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Chairman (BoS)

COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply the concepts of one dimensional random variables to compute expectations and analyze the standard distributions.											Apply	
CO2	Apply statistical methods to compute marginal and conditional distributions, and perform correlation and regression analysis.											Apply	
CO3	Apply Z-test, t-test, Chi-square test, and F-test to analyze sample data and draw inferences on independence of attributes.											Apply	
CO4	Apply analysis of variance techniques for one-way and two-way classifications, and implement experimental designs using CRD, RBD and LSD.											Apply	
CO5	Construct control charts for measurements Mean and Range charts and attributes charts to assess process control and product quality.											Apply	
TEXT BOOKS:													
1. S.P. Gupta, "Statistical Methods", Sulthan Chand & Sons, 46 th Edition ,2021.													
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4 th edition, 2007.													
REFERENCES:													
1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8 th Edition, 2014.													
2. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.													
3. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9 th Edition, 2010.													
4. R.C.Gupta, "Statistical Quality Controls", Khanna Publishers, Delhi, 8 th Edition , 2008.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	-	-	1	-	-	2	-	-
CO2	3	3	3	3	2	-	-	1	-	-	2	-	-
CO3	3	3	3	3	2	-	-	1	-	-	2	-	-
CO4	3	3	3	3	2	-	-	1	-	-	2	-	-
CO5	3	3	3	3	2	-	-	1	-	-	2	-	-
Avg.	3	3	3	3	2	-	-	1	-	-	2	-	-
1-low, 2-medium, 3-high													

Dr. Anurag
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24CHI06	CHEMISTRY FOR ENGINEERS	Category	L	T	P	SL	C
		BSC	45	0	30	45	4
(Common to AI&DS, BME, CSE, CSE(CS), CSE(CSD), CSE(IoT), ECE, EEE and IT)							
PREREQUISITE							
The students must have knowledge about the basic concepts of water parameters, electro chemistry, organic reactions and their applications.							
OBJECTIVES:							
To equip the learners to apply the chemical principles and their applications in the engineering fields.							
UNIT - I	WATER TREATMENT						(9)
Hardness – types, units – estimation of hardness by EDTA method; Boiler feed water – requirements, disadvantages of using hard water in boilers – scale and sludge – priming and foaming – caustic embrittlement – boiler corrosion. Softening methods – internal conditioning – calgon, phosphate – external conditioning – zeolite process and ion exchange process; Desalination – reverse osmosis. Domestic water treatment (Sterilisation process Only).							
UNIT - II	ELECTROCHEMISTRY AND CORROSION						(9)
Introduction – electrode potential – Nernst equation – EMF series and its significance; E – Vehicles - Need - Types – Advantages and Disadvantages; Corrosion – causes, consequences – classification – chemical corrosion – electro chemical corrosion – mechanism; Galvanic & differential aeration corrosion – factors influencing corrosion – corrosion control (Sacrificial anode and Impressed Current Cathodic protection method).							
UNIT - III	ENERGY STORAGE DEVICES						(9)
Batteries – primary battery – Dry cell, secondary batteries – lead-acid and lithium-ion batteries. Fuel cells – H ₂ -O ₂ fuel cell, solar cells – principle, applications and advantages; Nuclear energy: Light water Nuclear power plant - breeder reactor.							
UNIT - IV	POLYMER CHEMISTRY						(9)
Polymer – definition – degree of polymerization – functionality. Polymerization – addition, condensation and co-polymerization – free radical mechanism of addition polymerization; Preparation properties & uses of PVC, Nylon – 6,6 & Teflon. Plastics – classification – thermosetting and thermoplastics. Fabrication of polymers – compression and Injection moulding.							
UNIT - V	NANO CHEMISTRY AND COMPOSITES						(9)
Introduction – basics of nanochemistry – distinction between nanoparticles, molecules and bulk materials - synthesis of nanomaterials [CVD, laser evaporation, pyrolysis] - applications of nanomaterials. Composite – Introduction: Definition and need for composite – Types of composites: Properties and application of FRP and MMC.							
List of Exercise/Experiments:							
1. Estimation of total, permanent and temporary hardness of water sample By EDTA method							
2. Estimation of chloride content in water by Argentometric method [Mohr's Method]							
3. Conductometric titration of strong acid with strong base (HCl Vs NaOH)							
4. Estimation of dissolved oxygen in water (Winkler's Method)							
5. Conductometric titration of mixture of acids (HCl & CH ₃ COOH) with strong base							
6. Estimation of Fe ²⁺ ion by potentiometric titration							
7. Estimation of HCl by pH- Metry							
8. Conductometric precipitation titration using BaCl ₂ -Na ₂ SO ₄							
L = 45, P = 30, SL = 45, TOTAL = 120 PERIODS							


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COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Interpret the treatment solutions for drinking water, boiler feed water, and wastewater reuse.											Understand	
CO2	Describe different types of electrochemical cells, including galvanic and electrolytic cells.											Understand	
CO3	Categorize different energy storage methods, such batteries, fuel cell and solar cell for the production of electricity.											Understand	
CO4	Summarize the basics concepts of polymer chemistry in designing the materials for engineering and technology.											Understand	
CO5	Illustrate the nano materials and composites for engineering and technology.											Understand	
TEXT BOOKS:													
1. S S. Dara and S. S. Umare, "A Text book of Engineering Chemistry", S.Chand & Co.Ltd., 12 th Edition, 2015.													
2. P.C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub. Co., 16 th Edition, 2013.													
3. Wiley, "Engineering Chemistry", Wiley India Pvt. Ltd., 2 nd Edition, 2013.													
REFERENCES:													
1. Dr. A. Ravikrishnan, "Engineering Chemistry", Srikrishna Hi-tech Publishing Company Pvt. Ltd., 21 st Edition, 2022.													
2. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Text book of Quantitative Chemical Analysis", Pearson Education Pvt., Ltd., 6 th Edition, 2019.													
3. Shashi Chala, "A Text book of Engineering Chemistry", Dhanpat Rai Pub. Co., 2015.													
4. S. K. Bhasin and Sudha Rani, "Laboratory Manual of Engineering Chemistry", Dhanpat Rai Publishing Company Private Limited, 3 rd Edition, 2012.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	-	-	-	1	-	2	1	-	1	-	-
CO2	3	2	-	-	-	1	-	2	1	-	1	-	-
CO3	3	2	-	-	-	1	-	2	1	-	1	-	-
CO4	3	2	-	-	-	1	-	2	1	-	1	-	-
CO5	3	2	-	-	-	1	-	2	1	-	1	-	-
1-low, 2-medium, 3-high													

Laboratory Equipment Details
(Requirements for a batch of 30 students)

S.No.	Description of Equipment	Quantity required
1.	Electronic balance	1 No.
2.	pH meter	6 Nos.
3.	Conductivity meter	6 Nos.
4.	Potentiometer	6 Nos.

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24ENP29	PROFESSIONAL COMMUNICATION LABORATORY	Category	L	T	P	SL	C	
		HSMC	0	0	30	0	1	
(Common to All Branches)								
OBJECTIVE: To enhance learners' proficiency in listening, speaking, reading, and writing through structured activities and professional communication practices relevant to academic and workplace settings.								
UNIT - I	VERBAL AND CRITICAL REASONING							(6)
Syllogism – Drawing conclusions from given logical statements, Assertion and Reason – Judging the link between a claim and its reason, Verbal Analogies – Completing word pairs based on relationships, Statement and Assumption – Identifying hidden assumptions in statements, Statement and Conclusion – Choosing valid conclusions from given data, Critical Reasoning – Evaluating arguments for logic and consistency.								
UNIT - II	LISTENING							(6)
Listening to Announcement – Understanding key details and context from public messages, Short Conversation – Extracting specific information from brief dialogues, Motivational Speech – Grasping main ideas, tone, and speaker's intent, Telephone Conversation – Comprehending spoken exchanges over the phone.								
UNIT - III	SPEAKING							(6)
Talking about Oneself – Sharing personal details clearly and confidently, Oral-presentation on a General Topic – Presenting ideas briefly with clarity and structure, Group Discussion on Current Affairs – Expressing and support opinions in group settings, Role Play – Performing situational conversations using appropriate language, Mock & HR Interview – Answering common interview questions with clarity and confidence.								
UNIT - IV	READING							(6)
Reading Short Texts – Understanding the main message and key ideas, Reading for General and Specific Information – Locating relevant details in various texts, Case Studies on Problem Solving – Analyzing real-life scenarios to identify issues and solutions.								
UNIT - V	WRITING							(6)
Written communication: Letters (Apology & Complaint) – Writing formal letters using appropriate tone and structure, E-mails (Appreciation & Permission) – Composing clear and courteous emails, Technical Report – Using standard format for preparing structured technical report, Agenda / Minutes – Preparing format for meeting agendas and recording minutes.								
TOTAL (P:30) = 30 PERIODS								

Shreejany
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List of Experiments:

1. Syllogism, Assertion & Reason and Verbal Analogies
2. Statement & Assumption, Statement & Conclusion and Critical Reasoning
3. Listening: Announcement and Short Conversation
4. Listening: Motivational Speech and Telephone Conversation
5. Speaking: Taking about oneself, Mock & HR Interview and Mini-presentation
6. Speaking: Group Discussion and Role Play
7. Reading: Multiple Choice & Fill in the Blanks
8. Reading: Analyzing Case Studies on Problem Solving
9. Writing: Complaint/Apology Letter and Appreciation/Permission Email
10. Writing: Format of Technical Report and Format of Agenda/Minutes

COURSE OUTCOMES:

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

COs	Description	Ex. No.	Cognitive Level
CO1	Comprehend assumptions and draw conclusions from verbal reasoning tasks.	1 & 2	Understand
CO2	Understand spoken texts to identify key points and the speaker's intent.	3 & 4	Understand
CO3	Use appropriate language and tone in personal, group, and interview conversations.	5 & 6	Understand
CO4	Recognize main ideas and supporting points in short texts and case studies.	7 & 8	Understand
CO5	Draft formal letters, emails, reports, and meeting notes in the correct format.	9 & 10	Understand

TEXT BOOKS:

1. Bhatnagar Nitin, Communicative English for Engineers and Professionals, Pearson India, 2010.
2. Kulbhusan Kumar, RS Salaria, Effective Communication Skill, Khanna Publishing House, 2018.

REFERENCES:

1. Jack C Richards, Interchange, Cambridge University Press, 2022.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S Chand, 2024.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	-	-	-	-	-	-	2	3	-	-	-	-
CO3	2	-	-	-	-	-	1	2	3	-	-	-	-
CO4	2	-	-	-	-	-	1	-	3	-	-	-	-
CO5	2	-	-	-	-	-	1	-	3	-	-	-	-

1-Low, 2-Medium, 3-High

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Lab Requirement for a batch of 30 Students

Sl. No.	Description of Equipment / Software	Quantity required
1.	Server	1
	Intel core i3 - 2120	
	4 GB RAM / 240 GB SSD	
	OS: Windows 2011	
	Headphones with mike	
2.	Client Systems	30
	Intel core i3 - 2120	
	4 GB RAM / 240 GB SSD	
	OS: Windows 2011	
	Headphones with mike	
3.	Software	1
	a) Interactive Teacher control software	
	b) English Language Lab Software	
	c) Career Lab Software	

Murugan
Chairman (BoS)



24CSP29	PYTHON PROGRAMMING LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1

(Common to All Branches)

PREREQUISITE:

Students must have basic knowledge on programming principles, such as variables, simple data types, control structures, problem solving and logical thinking skills.

OBJECTIVES:

To develop programming skills in Python by performing string operations using functions for mathematical problem-solving, applying conditionals and loops, exploring sets and dictionaries for data handling and gaining foundational knowledge in polymorphism, exception handling, GUI design and web development.

List of Exercise/Experiments:

1. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
2. Implementing programs using Functions (GCD of two numbers, Factorial)
3. Scientific problems using conditional statements and loops. (Largest among three numbers, Number series, Number Patterns)
4. Implementing real-time applications using Sets, Dictionaries (Sorting, Searching, Remove Duplicates)
5. Implementing real-time/technical applications using Lists, Tuples. (Swapping two elements, Reversing a List / Sorting Tuples)
6. Create a Python program to demonstrate polymorphism with inheritance. (Single, Multilevel Inheritance, Hierarchical)
7. Implement a simple calendar in python program without using the calendar module using string array or list.
8. Write a program to demonstrate the user-defined exception handling mechanism in Python.
9. Design and implement a graphical user interface to perform any arithmetic operation.
10. Implementing a web application with MySQL database integration for CRUD operations (Flask / Django Framework)

L=0, T=0, P=30, TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

[Signature]
 Chairman (BoS)



COs	Course Outcome	Experi ments	Cognitive Level
CO1	Apply string operations and functions to solve problems like reversing text, palindrome check, GCD, and factorial.	1,2	Apply
CO2	Solve problems and manage data efficiently using conditionals, loops, sets, and dictionaries.	3,4	Apply
CO3	Develop applications using lists, tuples, and demonstrate polymorphism through inheritance in Python.	5,6	Apply
CO4	Build programs in Python that effectively use arrays or lists along with custom exception handling.	7,8	Apply
CO5	Implement GUI applications and web-based systems with MySQL integration to perform CRUD operations.	9,10	Apply

REFERENCES:

1. Yashwant Kanetkar, Aditya Kanetkar, "Let Us Python", BPB Publications, 5th Edition, 2023.
2. Wesley J.Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2017.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	1	-	1	-	2		
CO2	3	3	2	-	-	-	1	-	1	-	2		
CO3	3	3	2	-	-	-	1	-	1	-	2		
CO4	3	3	2	-	-	-	1	-	1	-	2		
CO5	3	3	2	-	-	-	1	-	1	-	2		

1-low, 2-medium, 3-high

LIST OF EQUIPMENTS (For a Batch of 30 Students)

Sl.No	Name of the Equipment's	Qty.
1.	A computer with a modern processor, RAM and Windows or Linux.	30 Nos.
2.	Programming Tools: Python 2.7.11 / 3.x with IDLE	30 Nos.
3.	IDEs: Eclipse (PyDev), VS Code, Jupyter Notebook	30 Nos.


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24SSP29	APTITUDE AND CODING SKILLS –II		Category					
			L	T	P	SL	C	
			EEC	0	0	30	0	1
(Common to All Branches)								
OBJECTIVES:								
This course aims to expose students to various concepts of aptitude problem solving, enabling them to tackle problems effectively and enhance their analytical skills in alignment with company-specific requirements. It also focuses on developing proficiency in verbal reasoning to strengthen critical thinking abilities.								
UNIT - I	NUMBERS AND SHARE BASED CONCEPTS						(6)	
Problems on Numbers – Unit Digits – Squares and Cubes – Remainder Theorem – Averages - Ratio Proportions and Partnership – Percentage – Profit and Loss.								
UNIT - II	BASICS OF WORK BASED CONCEPTS						(6)	
Introduction to time and work –Introduction to Time, Speed and Distance, Problems on Trains.								
UNIT - III	LOGICAL REASONING						(4)	
Blood Relations – Ranking and Ordering – Inequalities – Cause and Effect.								
UNIT - IV	VERBAL ABILITY						(7)	
Yes or No and “WH” Questions – Conjunctions – Count / Uncounted Nouns – Direct and Indirect Speech – Active and Passive Voice.								
UNIT - V	PYTHON PROGRAMMING FUNDAMENTALS						(7)	
Introduction-Features-Environment setup; Basic syntax: variable-data types-operators-control statements-if-if-else- loop-break-continue, etc. List- operations on list; String operations- access; Tuple: operations on tuple; Dictionaries: Accessing dictionaries, working with dictionaries; Functions- Exception Handling-Input & Output-Modules-OOPs concepts-Numerical Programming.								
TOTAL: 30 PERIODS								
COURSE OUTCOMES:								
At the end of the course, the students will be able to:								
COs	Course Outcome						Cognitive Level	
CO1	Interpret fundamental concepts to analyse and approach basic quantitative problems effectively.						Understand	
CO2	Apply the concepts of time and work, time, speed and distance, to solve real-time quantitative aptitude problems effectively.						Apply	
CO3	Apply logical reasoning techniques to solve problems related to ranking and ordering, decision-making and analytical skills.						Apply	
CO4	Apply grammatical concepts to construct grammatically correct and contextually appropriate sentences.						Apply	
CO5	Apply fundamental Python programming concepts to develop and implement basic computational solutions.						Apply	


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TEXT BOOKS:													
<ol style="list-style-type: none"> 1. R S Aggarwal, Quantitative Aptitude for Competitive Examinations. 2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning. 3. Wren & Martin, High School English Grammar & Composition 4. Allen B. Downey, Think Python: How to Think like a Computer Scientist, 2nd Edition, O’Reilly Publishers, 2016 5. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, 1st Edition, BCS Learning & Development Limited, 2017. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Paul Deitel and Harvey Deitel, Python for Programmers, Pearson Education, 1st Edition, 2021. 2. Martin C. Brown, Python: The Complete Reference, 4th Edition, Mc-Graw Hill, 2018. 3. https://www.python.org/ 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	2	-	-	2	-	-	3	-	-
CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	3	2	-	2	-	-	2	-	-	3	-	-
Avg.	3	3	3	-	2	-	-	2	-	-	3	-	-

Shreyas
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24MAT38	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	Category	L	T	P	SL	C
		BSC	45	15	0	60	4
SEMESTER III - (Common to Bio-Medical and EEE Branches)							
PREREQUISITE The students must have the knowledge on the basic concepts of differentiation, integration and partial derivatives.							
OBJECTIVES: To equip students with the knowledge of Fourier series, Laplace and Z-transforms, build a strong understanding of the underlying mathematics, and develop the skills to apply these methods in solving engineering problems such as heat transfer and wave motion.							
UNIT - I	FOURIER SERIES						(12)
Dirichlet's conditions – General Fourier series - Odd and even functions – Half range sine and cosine series - Parseval's theorem – Harmonic analysis.							
UNIT - II	LAPLACE TRANSFORMS						(12)
Laplace transforms – Conditions for existence – Transform of elementary functions – Basic properties– Transform of Derivatives – Transform of periodic functions. Inverse Laplace transforms – Partial fraction method – Solution of linear ordinary differential equations of second order with constant coefficients.							
UNIT - III	Z - TRANSFORMS						(12)
Z transform – Elementary properties – Initial and final value theorem – Inverse Z transform (Partial fraction method) – Convolution theorem – Solution of difference equation by using Z transform.							
UNIT - IV	PARTIAL DIFFERENTIAL EQUATIONS						(12)
Formation of partial differential equations by eliminating of arbitrary constants and arbitrary functions - Lagrange's linear equation – Solutions of linear partial differential equations of the second and higher order with constant coefficient.							
UNIT - V	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS						(12)
Classification of second order partial differential equations – Solutions of One dimensional wave equation – One dimensional heat equation – Two dimensional heat equation (insulated edges only).							
L = 45, T = 15, SL = 60, TOTAL = 120 PERIODS							

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COURSE OUTCOMES:At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply Fourier Series concepts to solve practical engineering problems in signal processing, communication, and control systems.											Apply	
CO2	Solve the linear differential equations using Laplace Transforms for circuit and system analysis.											Apply	
CO3	Apply Z-transform techniques to solve partial differential equations in discrete-time systems.											Apply	
CO4	Apply methods to form partial differential equations and solve Lagrange's linear equation and higher-order linear PDE's with constant coefficients.											Apply	
CO5	Apply analytical techniques to solve one-dimensional wave and heat equations and the two-dimensional heat equations.											Apply	
TEXT BOOKS:													
1. Grewal B.S., "Higher Engineering Mathematics", 44 th Edition, Khanna Publishers, New Delhi, 2018.													
2. Kreyszig E, "Advanced Engineering Mathematics ", 10 th Edition, John Wiley, New Delhi, India, 2016.													
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", 10 th Edition, Laxmi Publications Pvt. Ltd, 2015.													
3. James. G., "Advanced Modern Engineering Mathematics", 4 th Edition, Pearson Education, New Delhi, 2016.													
4. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.													
5. Ramana. B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 2018.													
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics" Tata Mc Graw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	2	-	-
CO2	3	3	3	3	-	-	-	1	-	-	2	-	-
CO3	3	3	3	3	-	-	-	1	-	-	2	-	-
CO4	3	3	3	3	-	-	-	1	-	-	2	-	-
CO5	3	3	3	3	-	-	-	1	-	-	2	-	-
1-Low, 2-Medium, 3-High													

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24BMT31	ANATOMY AND HUMAN PHYSIOLOGY	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Students should know the fundamentals of basic biology, chemistry and mathematics. A basic understanding of the human body and human body concepts will be beneficial.							
OBJECTIVES: To provide foundational knowledge of human body structure and function, covering cells and major organ systems. Emphasis is on physiological mechanisms that regulate, integrate, and maintain homeostasis, nervous systems and understand how nerve impulses are generated and transmitted.							
UNIT - I	INTRODUCTION TO HUMAN BODY	(9)					
Cell: Structure and organelles - Functions of each component in the cell. Cell membrane –transport across membrane – Origin of cell membrane potential – Action potential - Recording of Membrane Potential. Homeostasis - Body Cavities -Tissue: Epithelial, Connective, Muscular and Nervous tissue. Physiology of GI tract and Endocrine system.							
UNIT - II	RESPIRATORY SYSTEM AND URINARY SYSTEM	(9)					
Respiratory System: Organization of respiratory system – Respiratory organs - Respiratory Mechanism. Types of respiration - Respiratory volumes and Recording of respiratory volume. Oxygen and carbon dioxide transport and acid base regulation. Urinary system: Basic Structure of Kidney and Nephron. Mechanism of Urine formation – JXT apparatus - Urinary reflex – Water and blood pressure regulation by urinary system.							
UNIT - III	CARDIOVASCULAR, BLOOD AND LYMPHATIC SYSTEM	(9)					
Composition of Blood - functions of blood – Blood Cells: RBC - Functions - WBC - Types and functions - Platelet. Blood groups – importance of identification. Blood vessels: Vein, Artery and Capillaries - Structure of heart – Properties of Cardiac muscle – Conducting system of heart – Cardiac cycle – Heart sound -Volume and pressure changes and regulation of heart rate – Coronary Circulation. Lymph - Lymphatic vessels - Lymph nodes and Lymphatic Channel.							
UNIT - IV	SKELETAL AND SPECIAL SENSORY SYSTEM	(9)					
Skeletal system: Bone types and functions – Axial Skeleton and Appendicular Skeleton. Joint - Types of Joint – Cartilage structure, types and functions. Special Sensory system- Eye: Layers of Eye- Mechanism of Vision - Errors of Refraction. Ear: Ear Divisions - Mechanism of Hearing - Hearing Conditions – Skin: Layers of Skin - Functions of Skin.							
UNIT - V	NERVOUS SYSTEM	(9)					
Structure of a Neuron – Types of Neuron. Neuroglia Cells - Synapses and types. Brain – Divisions of brain lobes – Cross Sectional Anatomy of Brain - Cortical localizations and functions - Methods to Record Cortical Functions. Spinal cord – Tracts of spinal cord – Spinal Nerve - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.							
L = 45, SL = 45, TOTAL: 90 PERIODS							



COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Explain the basic structural and functional elements of the human body.	Understand
CO2	Describe the gaseous exchange and fluid maintenance in the human body.	Understand
CO3	Outline the structure and function of the cardiovascular and Lymphatic systems.	Understand
CO4	Comprehend the roles and interactions of the skeletal and sensory systems in body support and perception.	Understand
CO5	Explain the functional organization and physiological processes of the human nervous system.	Understand

TEXT BOOKS:

1. Elaine N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.
2. Gillian Pocock, Christopher D. Richards, "The Human Body an introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2009.

REFERENCES:

1. William F. Ganong, "Review of Medical Physiology", Mc Graw Hill, New Delhi, 25th Edition, 2015.
2. Eldra Pearl Solomon. "Introduction to Human Anatomy and Physiology", W.B.Saunders Company, 2003.
3. Arthur C. Guyton, "Text book of Medical Physiology", Elsevier Saunders, 11th Edition, 2006.
4. Ranganathan T S, "Text book of Human Anatomy", S.Chand & Co. Ltd., New Delhi, 2012.
5. SaradaSubramanyam, K MadhavanKutty, Singh H D, "Textbook of Human Physiology", S. Chand and Company Ltd, New Delhi, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	1	-
CO2	3	2	-	-	-	-	-	1	1	-	1	1	-
CO3	3	2	-	-	-	-	-	1	1	-	1	1	-
CO4	3	2	-	-	-	-	-	1	1	-	1	1	-
CO5	3	2	-	-	-	-	-	1	1	-	1	1	-

1-Low, 2-Medium, 3-High



24BMT32	BIOCONTROL SYSTEMS	Category	L	T	P	SL	C
		PCC	45	15	0	60	4
PREREQUISITE:							
Students should have a basic understanding of differential equations, linear system theory, and fundamental concepts of human physiology.							
OBJECTIVES:							
To equip students with the knowledge and skills to analyze and model control systems, including physiological systems, using time and frequency domain methods for assessing system behavior and stability.							
UNIT - I	INTRODUCTION	(9+3)					
Open and Closed loop Systems, Mathematical Modeling of systems, Block diagram and signal flow graph representation of systems - reduction of block diagram and signal flow graph, Introduction to Physiological control systems- Illustration, Linear models of physiological systems, Difference between engineering and physiological control systems							
UNIT - II	TIME RESPONSE ANALYSIS	(9+3)					
Step and impulse responses of first order and second order systems - time domain specifications of first and second order systems - steady state error constants.							
UNIT - III	STABILITY ANALYSIS	(9+3)					
Definition of stability, Routh- Hurwitz criteria of stability, Root locus technique - construction of root locus and study of stability							
UNIT - IV	FREQUENCY RESPONSE ANALYSIS	(9+6)					
Frequency domain specifications - Polar plots - Bode plots - Nyquist plot - Nyquist stability criterion, closed loop stability - Constant M and N circles - Nichol's chart.							
UNIT - V	BIOLOGICAL CONTROL SYSTEM ANALYSIS	(9)					
Simple models of muscle stretch reflex action - steady state analysis of muscle stretch reflex action, transient response analysis of neuromuscular reflex model action, frequency response of circulatory control model, Stability analysis of Pupillary light reflex.							
L = 45, T = 15, SL = 60, TOTAL: 120 PERIODS							



COURSE OUTCOMES:

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

Course Outcome	Description	Bloom's Taxonomy Level
CO1	Apply mathematical modeling, block diagram and signal flow graph representations to analyze engineering and biological control systems.	Apply
CO2	Analyze the time-domain behavior of dynamic systems using time domain specifications.	Analyze
CO3	Examine the system stability through Routh Hurwitz and Root Locus techniques.	Analyze
CO4	Analyze the frequency response of systems using Bode, Nyquist, and Nichols plots.	Analyze
CO5	Interpret fundamental modeling techniques used for basic physiological control systems.	Understand

TEXT BOOKS:

1	I.J. Nagarath and M. Gopal, Control Systems Engineering, New Age International Publishers, 1st September, 2018
2	Michael C K Khoo, Physiological Control Systems, IEEE Press, Prentice Hall India, 2005

REFERENCES:

1	Salivahanan S. Rengaraj R. and Venkatakrishnan G. R., Control Systems Engineering, Pearson Education India, 2015
2	Benjamin C. Kuo, Automatic Control Systems, Prentice Hall of India, 1995
3	Ogata, Katsuhiko and Yanjuan Yang, Modern control engineering, Vol 4, Prentice-Hall, 2002.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	1	-	1	2	-
CO2	3	3	3	2	-	-	-	2	1	-	1	2	-
CO3	3	3	3	2	-	-	-	2	1	-	1	2	-
CO4	3	3	3	2	-	-	-	2	1	-	1	2	-
CO5	3	2	-	-	-	-	-	2	1	-	1	2	-

1-Low, 2-Medium, 3-High



24BMI31	ELECTRONIC DEVICES AND CIRCUITS	Category	L	T	P	SL	C
		PCC	45	0	30	45	4
PREREQUISITE: Students should have a fundamental knowledge of electrical circuit theory and basic electronic components.							
OBJECTIVES: To equip students with a thorough understanding of semiconductor devices and their applications in analog circuits, including rectifiers, amplifiers, oscillators, and voltage regulators, along with an introduction to PCB design.							
UNIT – I	PNJUNCTION DEVICES						(9)
PN junction diode–structure, operation and V-I characteristics, diffusion and transient Capacitance-Rectifiers–Half Wave and Full Wave Rectifier, Zener diode-characteristics- Zener Reverse characteristics–Zener as regulator.							
UNIT - II	TRANSISTORS						(9)
BJT, JFET, MOSFET structure, operation, characteristics and biasing UJT, Thyristor - SCR Structure and characteristics.							
UNIT - III	AMPLIFIERS						(9)
BJT small signal model – Analysis of CE, CB, CC amplifiers - Gain and frequency response. MOSFET small signal model – Analysis of CS and Source follower – Gain and frequency Response - High frequency analysis of CE amplifier.							
UNIT - IV	MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER						(9)
Differential amplifier – Common mode and Differential mode analysis, Single tuned amplifiers – Gain and frequency response – Neutralization methods. Cascade Amplifier, Introduction to Power amplifiers–Class A, Class B and Class AB.							
UNIT - V	FEEDBACK AMPLIFIERS AND OSCILLATORS						(9)
Basic concepts of feedback-Properties of negative feedback, series, and Shunt feedback – Positive feedback – Condition for oscillations – RC phase shift –Wien bridge, Hartley, Colpitts and Crystal oscillators. Introduction to PCB Design.							
Lecture: 45 Periods							



List of Experiments:

1. Study of V-I Characteristics of PN Junction Diode and Zener Diode and their Applications in Biomedical Instrumentation.
2. Design and Analysis of Voltage Divider Bias – BJT Circuit for Low-Level Biomedical Signal Amplification.
3. Study of the Characteristics of Field Effect Transistor (FET).
4. Study of Frequency Response of Common Base (CB) Amplifier.
5. Study of Frequency Response of Common Emitter (CE) and Common Collector (CC) Amplifiers.
6. Innovative Study of Common Mode and Differential Mode Characteristics of a Differential Amplifier.
7. Design and Analysis of RC Oscillators Using Bipolar Junction Transistors (BJT).
8. Design and Simulation of Amplifier Circuits using Open Source simulation Tools like LTspice, Falstad, or KiCad.
9. Design and Analysis of Feedback Amplifiers.
10. Design and Analysis of a Biomedical Signal Conditioning Circuit using Zener Diode, FET, and Common Emitter Amplifier.

Laboratory: 30 Periods**L = 45, P = 30, SL = 45, TOTAL: 120 PERIODS****COURSE OUTCOMES:****At the end of the course, the students will be able to:**

COs	Course Outcome	Ex. No	Cognitive Level
CO1	Analyze the V-I characteristics and functional behavior of semiconductor diodes used in analog circuits.	1	Analyze
CO2	Classify and demonstrate the working principles and configurations of transistors.	2,3	Apply
CO3	Determine gain and frequency response characteristics of amplifiers.	4,5	Apply
CO4	Analyze and construct multistage and differential amplifier circuits based on signal requirements.	6,7	Analyze
CO5	Construct feedback amplifier and oscillator circuits, and simulate their performance using Pspice tools.	8,9,10	Apply



TEXT BOOKS:													
<ol style="list-style-type: none"> David A .Bell, “Electronic Devices and Circuits”, Prentice Hall of India, 5th Edition, 2008. Sedra and Smith, “Microelectronic circuits”, Oxford University Press, 7th Edition, 2017. 													
REFERENCES:													
<ol style="list-style-type: none"> Muhammad H. Rashid, “Microelectronic Circuits: Analysis and Design”, Cengage Learning, 6th Edition, 2013. Thomas L .Floyd, “Electronic devices” Prentice Hall”, 10th Edition, 2018. Donald A. Neamen, “Electronic Circuit Analysis and Design”, Tata McGrawHill, 4th Edition, 2009. Robert L .Boylestad, “Electronic Devices and Circuit Theory”, 11thEdition, 2021. Robert B.Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2NDEdition, 2012. 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	-	2	1	-	1	2	-
CO2	3	3	2	-	-	-	-	2	1	-	1	2	-
CO3	3	3	2	-	-	-	-	2	1	-	1	2	-
CO4	3	3	3	2	-	-	-	2	1	-	1	2	-
CO5	3	3	2	-	1	-	-	2	1	-	1	2	-
1-Low, 2-Medium, 3-High													

Laboratory Equipment Details

Requirements for a batch of 30 students

S.No.	Description of Equipment	Quantity required
1.	CRO (or) DSO	05
2.	Function Generator	05
3.	Single or Dual Regulated Power supply (0-30) V/2A	10
4.	Analog Ammeter	10
5.	Analog Voltmeter	10
6.	Digital Multimeter	03
7.	Transformer(9-0-9) V	04
8.	IC-BC107 or BC148 or BC547, BFW10 or 2N3819 or BF245.	Each 25
9.	Diodes (IN4007, 1N4742A)	Each 25
10.	Resistor, Capacitor	Each 25
11.	Bread Board	15
12.	Simulation Software (LTspice or Falstad or KiCad)	Open Source



24BMI32	BIOSCIENCES	Category	L	T	P	SL	C	
		PCC	45	0	30	45	4	
PREREQUISITE:								
Students should have a basic understanding of biology and chemistry at the higher secondary level.								
OBJECTIVES:								
To understand the fundamentals of biochemistry, biomolecules, cell injury, hematological and immunological processes, and microbial structure. Gain practical skills through experiments in solution preparation, spectroscopy, biochemical estimations, microscopy, and staining techniques.								
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, Energy in living organism. Properties of water and their applications in biological systems. Introduction to Biomolecules, Biological membrane, Clinical application of Electrolytes and radioisotopes.								
UNIT - II	CARBOHYDRATES, LIPIDS, PROTEIN						(9)	
Classification of carbohydrates. Structure, physical and chemical properties of carbohydrates - Classification of lipids. Nomenclature of fatty acid - Structure and properties of proteins, structural organization of proteins, classification and properties of amino acids. Nucleic acid: Structural aspects –Components of DNA and RNA, Nucleosides & Nucleotides (introduction, structure & bonding), Double helical structure of DNA (Watson-Crick model), various forms of DNA.								
UNIT - III	CELL DEGENERATION, REPAIR AND NEOPLASIA						(9)	
Cell injury - Reversible cell injury and Irreversible cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, Autopsy and biopsy.								
UNIT - IV	FLUID AND HEMODYNAMIC DERANGEMENTS						(9)	
Edema, Hyperemia/Ischemia, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock, Chronic venous congestion. Hematological disorders- Bleeding disorders, Leukemias and Lymphomas.								
UNIT - V	SMART MATERIALS FOR ENGINEERING APPLICATIONS						(9)	
Structure of Bacteria and Virus - Morphological features and structural organization of bacteria and virus. Basics of Microscopes: Light microscope, Electron microscope (TEM & SEM)- Natural and artificial immunity, types of Hypersensitivity, antibody and cell mediated tissue injury, Immunological techniques: immuno-diffusion, immune-electrophoresis, RIA and ELISA, monoclonal antibodies.								
Lecture: 45 Periods								


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List of Experiments:

1. Preparation of solutions: 1) percentage solutions, 2) molar solutions, 3) normal solutions.
2. Standardization of pH meter, preparation of buffers, emulsions.
3. Spectroscopy: Determination of absorption maxima (λ_{max}) of a given solution.
4. General tests for carbohydrates, proteins and lipids
5. Estimation of glucose.
6. Estimation of Creatinine and Uric acid.
7. Study of Histopathological slides of benign and malignant tumors.
8. Study of Hematology slides of anemia and leukemia.
9. Study of parts of compound microscope.
10. Types of Staining: Simple stain, Gram stain.

Laboratory: 30 Periods**SL = 45, P = 30, SL = 45, TOTAL: 120 PERIODS****COURSE OUTCOMES:****At the end of the course, the students will be able to:**

Course Outcome	Description	Ex. No	Bloom's Taxonomy Level
CO1	Explain biochemical principles and demonstrate understanding of biomolecular structures and functions.	1,2	Understand
CO2	Demonstrate the biochemical structures and functions of major biomolecules in cellular and metabolic processes.	3,4	Apply
CO3	Classify diseases and apply pathological knowledge to diagnose, stage, and manage clinical cases effectively.	5,6	Apply
CO4	Apply concepts of circulatory and hematological disorders to analyze and manage patient conditions in clinical settings.	7,8	Apply
CO5	Apply fundamental concepts of microbiology and immunology in the use of immunotechniques for disease detection.	9,10	Apply

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", 10 th edition: South Asia Edition Elsevier India, 2020. (Units III & IV).
3	Ananthanarayanan & Panicker, "Microbiology" Orientblackswan, 2017 10th edition. (Units III, 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 Textbook of Microbiology" Chand & Company Ltd, 2007.												
4.	Prescott, Harley and Klein, "Microbiology", 10th edition, McGraw Hill, 2017.												
5.	Ramnik Sood, Textbook of Medical Laboratory Technology, 6th Edition, Jaypee Brothers Medical Publishers, 2009.												
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	1	1	2	1	-	1	2	-
CO2	3	3	2	-	-	1	1	2	1	-	1	2	-
CO3	3	3	2	-	-	1	1	2	1	-	1	2	-
CO4	3	3	2	-	-	1	1	2	1	-	1	2	-
CO5	3	3	2	-	-	1	1	2	1	-	1	2	-
1-Low, 2-Medium, 3-High													

Laboratory Equipment Details
Requirements for a batch of 30 students

S.No.	Description of Equipment	Quantity required
1.	Colorimeter	2
2.	Spectrophotometer	1
3.	PH meter	1
4.	Weighing balance	1
5.	SDS gel electrophoresis	1
6.	Centrifuge Normal	1
7.	Microscope	1


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24BMP31	ANATOMY AND HUMAN PHYSIOLOGY LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	45	0	1.5
<p>PREREQUISITE: Students should know the fundamentals of basic biology, chemistry and mathematics. A basic understanding of the human body and human body concepts will be beneficial.</p>							
<p>OBJECTIVES: To understand and perform basic diagnostic tests including blood analysis, respiratory assessment, and hematological estimations. Gain practical skills in evaluating heart, eye, ear, and brain functions using ECG, EEG, and other clinical tools.</p>							
<p>List of Experiments:</p> <ol style="list-style-type: none"> 1. Identification of Blood Groups (Forward and Reverse). 2. Blood testing: Total RBC count, WBC count, Differential count of blood cells. 3. Estimation of Bleeding Time and Clotting Time. 4. Spirometry-Testing Respiratory Volumes. 5. Estimation of Hemoglobin (Hb) in blood. 6. Estimation of ESR, PCV, MCH, MCV, MCHC. 7. Assessment of Visual Acuity Using Snellen's Chart 8. Evaluation of Hearing Ability Using Tuning Fork Tests 9. Study of Heart Conduction System-ECG. 10. Study of Brain Waves-EEG. 							
P = 45, TOTAL: 45 PERIODS							
<p>COURSE OUTCOMES: At the end of the course, the students will be able to:</p>							
COs	Course Outcome	Ex. No	Cognitive Level				
CO1	Apply standard methods to identify and count various types of blood cells.	1,2,3	Apply				
CO2	Measure and record respiratory parameters using appropriate clinical tools.	4	Apply				
CO3	Apply procedures to enumerate and interpret hematological parameters in diagnostic tests.	5,6	Apply				
CO4	Predict the outcomes of sensory organ assessments using specific testing techniques.	7,8	Apply				
CO5	Analyze biosignals by applying relevant tools and techniques for biomedical interpretation.	9,10	Analyze				



REFERENCES:

1. Elaine N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.
2. William F. Ganong, "Review of Medical Physiology", Mc Graw Hill, New Delhi, 25th Edition, 2015.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	1	1	1	-	1	1	-
CO2	3	3	2	-	1	-	1	1	1	-	1	1	-
CO3	3	3	2	-	1	-	1	1	1	-	1	1	-
CO4	3	3	2	-	-	-	1	1	1	-	1	1	-
CO5	3	3	3	2	1	-	1	1	1	-	1	1	-

1-Low, 2-Medium, 3-High

Laboratory Equipment Details

Requirements for a batch of 30 students

S.No.	Description of Equipment	Quantity required
1.	Blood grouping kit	1
2.	Neubaur's Chamber	1
3.	Microscope	1
4.	Capillary tubes	1
5.	Spirometer with associated analysis system	1
6.	Haemoglobinometer	1
7.	Centrifuge Normal	1
8.	Win Trobe's tube	1
9.	PCV tube	1
10.	Snellen's Chart	1
11.	Tuning fork	1
12.	ECG	1
13.	EEG Machine	1



24ECP36	DESIGN STUDIO – I	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to BME, CSE (IoT), ECE, EEE)							
PREREQUISITE:							
Basic understanding of design thinking principles, including empathy, problem identification, and user-centered design, is essential for engaging in the Design Studio.							
OBJECTIVE:							
To apply design thinking and system design principles to develop, prototype, and present user-centered electronic solutions through hands-on projects.							
<p>Identification of components</p> <p>Ex: 1 Resistor colour coding, Capacitors etc</p> <p>Ex: 2: Soldering Practice</p> <p>Realizing the functionality of components</p> <p>Ex: 3: Connecting LED with fixed resistor, variable resistors</p> <p>Ex: 4: LED Go- No Go using Diode</p> <p>Ex: 5: Multiple LED Circuit</p> <p>Ex: 6: Switch on LED using Transistor</p> <p>Ex: 7: Electronic LED Lantern</p> <p>Ex: 8: Light Detector</p> <p>Ex: 9: IC555 LED Flasher / Beeper</p> <p>Ex: 10: LED Blinking</p> <p>Ex: 11: Autodesk Fusion - Simulation</p> <p>Prototyping</p> <p>Ex: 11: Mini project</p> <p>(Choose the problem and apply Design Thinking Concepts - empathy, Define, Ideation, Prototype to solve the problem)</p>							
TOTAL(P:30) : 30 PERIODS							

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COURSE OUTCOMES:													
At the end of the course, the students will be able :													
COs	Course Outcome											Cognitive Level	
CO1	To identify and interpret the characteristics of basic electronic components such as resistors, capacitors, diodes, LEDs, transistors, and LDRs through visual inspection and standard coding schemes.											Analyze	
CO2	To experience hands-on training in soldering techniques and assembling electronic circuits using discrete components on breadboards and PCBs.											Apply	
CO3	To understand the working principles of passive and active components by constructing basic circuits and observing their electrical behavior under different conditions.											Apply	
CO4	To design and implement functional circuits including switching, blinking, and multiple output systems using fundamental electronics											Create	
CO5	To document and effectively communicate the design process, implementation, and outcomes of a project through formal reporting and presentations.											Evaluate	
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	3	-	3	3	3	3	3	3	3	3
CO2	-	3	3	3	-	3	3	3	-	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	-	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3
1 - Low, 2 - Medium, 3 - High													

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24SDP39	SOFT SKILLS DEVELOPMENT – III	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES: To the concept of aptitude and its relevance in various fields. It highlights the need for aptitude skills and emphasizes their importance in academic and career development. It also focuses on building a strong foundation in English grammar to improve communication skills.							
UNIT - I	TIME SPEED AND DISTANCE						(6)
Relationship Between Time Speed and Distance Time Conversion – Relative Speed – Chasing – Problems on Late, Early and Usual Time							
UNIT - II	PROBLEMS ON TRAINS						(6)
Crossing a Static objects – Crossing a Moving Object: Same and Opposite Direction – Time Difference based Problems.							
UNIT - III	BOATS AND STREAM						(6)
Introduction to Boat in Still Water and Current – Down Stream Speed – Upstream Speed – Speed in Still Water – Rate of Stream.							
UNIT - IV	LOGICAL REASONING						(6)
Seating Arrangements: Circular and Linear Arrangements – Inequalities – Assertion & reasoning.							
UNIT - V	VERBAL ABILITY						(6)
Parts of Speech – Sentence Completion – Idioms and Phrases – Reading Comprehension.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Apply time, speed, and distance concepts to solve problems involving relative speed, time conversion, and punctuality scenarios.	Apply					
CO2	Solve problems on trains with object crossing and time differences using concepts of relative speed and direction.	Apply					
CO3	Solve problems involving boats and streams using concepts of upstream, downstream, and current speed.	Apply					
CO4	Apply logical reasoning to solve problems on seating arrangements, inequalities, and assertion-reasoning statements.	Apply					
CO5	Demonstrate understanding of grammar, vocabulary, and comprehension to complete sentences and interpret texts effectively.	Understand					


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TEXT BOOKS:

1. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations".
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations".
3. Nishit K. Sinha, "Logical Reasoning and Data Interpretation for CAT".
4. R.S. Agarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning".
5. Wren & Martin, "High School English Grammar & Composition".

REFERENCES:

1. Arun Sharma, Quantitative Aptitude for CAT, 11e, 2025.
2. Arun Sharma, Logical Reasoning for CAT, 7e, 2025.
3. English for Competitive Examinations – by Edgar Thorpe & Showick Thorpe.
4. <https://prepinsta.com/>.
5. <https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm>.
6. <https://www.youtube.com/@FeelFreetoLearn/playlists>.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	2	-	-	3	-	-
CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	2	-	-	2	-	-	3	3	-	3	-	-
AVG.	3	3	2	-	2	-	-	2	3	-	3	-	-



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24MAT46	NUMERICAL AND COMPUTATIONAL TECHNIQUES	Category	L	T	P	SL	C
		BSC	45	15	0	60	4
SEMESTER - IV (COMMON TO II B.E. / B.Tech., - AE, BME, CE, CSE, CSD, CS, EEE, IOT,IT, MECH & SFE)							
PREREQUISITE: A fundamental knowledge of algebra, linear algebra, calculus, and differential equations is required for this course.							
OBJECTIVES: To develop the ability to apply numerical methods for solving algebraic and transcendental equations, systems of linear equations, interpolation, numerical differentiation and integration, and initial and boundary value problems.							
UNIT - I	SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS						(12)
Solutions to polynomial and transcendental equations - Newton Raphson Method - Solutions to simultaneous linear system of equations by Gauss Elimination Method - Gauss Seidel Method - Eigen value of a matrix by power method.							
UNIT - II	INTERPOLATION AND APPROXIMATION						(12)
Interpolation - Newton's Forward and Backward difference Interpolation Techniques (Equal intervals) - Newton's divided difference method - Lagrange's interpolation and Inverse Lagrange's interpolation methods (Unequal intervals).							
UNIT - III	NUMERICAL DIFFERENTIATION AND INTEGRATION						(12)
Numerical differentiation using Newton's Forward and Backward difference interpolation methods - Numerical integration by Trapezoidal rule - Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule- Double integration using Trapezoidal and Simpson's rules.							
UNIT - IV	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS						(12)
Ordinary Differential Equations (for solving first order equations) - Taylor's Series Method - Euler's Method - Modified Euler's Method - Fourth order Runge-Kutta method- Milne's Predictor and Corrector Method.							
UNIT - V	BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS						(12)
Classification of Partial Differential Equations - One dimension heat equation by Crank Nicolson's method - One dimensional wave equation - Two Dimensional Laplace and Poisson equations.							
Lecture = 45, Tutorial = 15, Self Learning = 60; Total = 120 Periods							
COURSE OUTCOMES: At the end of the course, the students will be able to							
COs	Course Outcome						Cognitive Level
CO1	Implement numerical techniques to solve equations, systems of linear equations and Eigen value problems						Apply
CO2	Assess Newton's interpolation methods to select the most suitable technique based on data spacing and the location of the interpolation point.						Analyze
CO3	Apply numerical methods to perform differentiation and integration						Apply
CO4	Apply numerical techniques to obtain approximate solutions of first order ordinary differential equations						Apply
CO5	Analyze and solve partial differential equations of heat and wave equations by using numerical approaches.						Analyze

TEXT BOOKS:

1. Dr. B. S.Grewal, "Numerical Methods in Engineering and Science" Khanna Publishers, New Delhi, 12th edition, 2016.
2. Dr. M.K. Venkataraman," Numerical Methods in Science and Engineering", National Publishing Company, 4th edition, 2012.

REFERENCES:

1. Sukhendu Dey and Shishir Gupta "Numerical Methods", Tata McGraw Hill Publishing Company, 1st edition 2013.
2. V. Gerald 'Applied Numerical Analysis' Pearson Education, 6th edition, 2013.
3. P. Kandasamy, K. Thilagavathy, K. Gunavathy "Numerical Methods", S. Chand Company ,5th Edition.
4. S.R.K. Iyengar, R.K.Jain,"Numerical Methods", New Age International Publishers, 1st edition , 2014.
5. Rajasekaran.S, "Numerical Methods in Science and Engineering A Practical Approach", A.H.Wheeler and Company Private Limited, 2016.

Mapping of COs with POs and PSOs

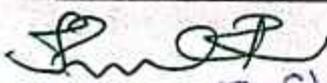
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	2	-	-
CO2	3	3	3	2	-	-	-	2	-	-	2	-	-
CO3	3	3	2	-	-	-	-	2	-	-	2	-	-
CO4	3	3	2	-	-	-	-	2	-	-	2	-	-
CO5	3	3	3	2	-	-	-	2	-	-	2	-	-

1 - Low, 2 - Medium, 3- High.

R.V.M. Rangarajan
 31/11/24
Dr. R.V.M. RANGARAJAN
 CHAIRMAN
 BOARD OF STUDIES (S&H)
 K.S.R. COLLEGE OF ENGINEERING
 TIRUCHENGODE - 637 215.



24BMT41	BIOMEDICAL INSTRUMENTATION	Category	L	T	P	SL	C	
		PCC	45	0	0	45	3	
PREREQUISITE: Students should possess foundational knowledge of human physiology (cardiovascular and nervous systems), electronic circuits, sensors, signal processing, and measurement techniques to effectively understand biomedical instrumentation concepts.								
OBJECTIVES: To enable learners to understand the sources and characteristics of biological signals, electrode configurations, bio-amplifier design, and the measurement of electrical, non-electrical, and biochemical parameters for diagnostic and therapeutic applications.								
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	BIO SIGNAL CHARACTERISTICS							9
Bio signals characteristics – ECG-frequency and amplitude ranges – Einthoven's triangle, standard 12 lead system. EEG - EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode. EMG - Electrode configuration -unipolar and bipolar mode, EOG, ERG.								
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 NON-ELECTRICAL PARAMETERS							9
Temperature, respiration rate and pulse rate measurements. Blood Pressure - indirect methods: auscultatory method, oscillometric method, direct methods: electronic manometer, 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, pO ₂ and pCO ₂ , 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.								
L = 45, SL = 45, TOTAL 90 PERIODS								


 Chairman (BoS)



COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Illustrate the origin of various biological signals and their characteristics.	Understand
CO2	Explain the features and lead systems of major bio-signals such as ECG, EEG, EMG, EOG, and ERG.	Understand
CO3	Interpret the need, structure, and functioning of bio-amplifiers and isolation techniques used in biomedical signal acquisition.	Understand
CO4	Summarize the principles and methods used for measuring non-electrical physiological parameters such as temperature, blood pressure, and blood flow.	Understand
CO5	Outline the operating principles of biochemical sensors and analyzers used for clinical diagnosis and monitoring.	Understand

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, 3rd Edition, 2014.

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, 4 th Edition, 2014.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	2	-
CO2	3	2	-	-	-	-	-	1	1	-	1	2	-
CO3	3	2	-	-	-	-	-	1	1	-	1	2	-
CO4	3	2	-	-	-	-	-	1	1	-	1	2	-
CO5	3	2	-	-	-	-	-	1	1	-	1	2	-

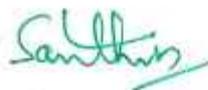
1-Low, 2-Medium, 3-High



Chairman (BoS)



24GET09	UNIVERSAL HUMAN VALUES AND ETHICS	Category	L	T	P	SL	C
		HSMC	45	0	0	45	3
(Common to All Branches)							
OBJECTIVES:							
To understand the concept of Universal Human Values and discuss theoretical and practical implications of UHV. To relate the use of harmony in the family and society and classify the harmony in the nature methods. To construct effective human values in personal and professional in life.							
UNIT - I	INTRODUCTION TO VALUE EDUCATION	(09)					
Right Understanding, Relationship and Physical Facility, Holistic Development and the Role of Education - Understanding Value Education - Sharing about Oneself - Self-exploration as the Process for Value Education- Continuous Happiness and Prosperity – the Basic Human Aspirations - Exploring Human Consciousness - Happiness and Prosperity – Current Scenario - Method to Fulfil the Basic Human Aspirations - Exploring Natural Acceptance.							
UNIT - II	HARMONY IN THE HUMAN BEING	(09)					
Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - Exploring the difference of Needs of Self and Body – The Body as an Instrument of the Self - Understanding Harmony in the Self - Exploring Sources of Imagination in the Self - Harmony of the Self with the Body - Programme to ensure self- regulation and Health - Exploring Harmony of Self with the Body.							
UNIT - III	HARMONY IN THE FAMILY AND SOCIETY	(09)					
Harmony in the Family – the Basic Unit of Human Interaction - 'Trust' – the Foundational Value in Relationship-Exploring the Feeling of Trust - 'Respect' – as the Right Evaluation -Exploring the Feeling of Respect - Other Feelings, Justice in Human-to-Human Relationship- Understanding Harmony in the Society - Vision for the Universal Human Order – Exploring Systems to fulfil Human Goal.							
UNIT - IV	HARMONY IN THE NATURE/EXISTENCE	(09)					
Understanding Harmony in the Nature – Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Exploring the Four Orders of Nature – Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence -Exploring Co-existence in Existence.							
UNIT - V	IMPLICATIONS OF THE HOLISTIC UNDERSTANDING- A LOOK AT PROFESSIONAL ETHICS	(09)					
Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct – Exploring Ethical Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order- Competence in Professional Ethics - Exploring Humanistic Models in Education- Holistic Technologies, Production Systems and Management Models -Typical Case Studies- Strategies for Transition towards Value-based Life and Profession - Exploring Steps of Transition towards Universal Human Order.							
TOTAL (L:45, SL:45): 90PERIODS							


 Santhosh
 Chairman (BoS)



COURSE OUTCOMES:													
At the end of the course, the learners will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Interpret the concepts of Universal Human Values.											Understand	
CO2	Summarize both theoretical and practical implications of Universal Human Values.											Understand	
CO3	Understand how the feeling of trust develops through honesty, care, and consistent behavior.											Understand	
CO4	Explains how viewing existence as a whole helps us understand harmony among humans, nature, and systems.											Understand	
CO5	Relate human values in both personal and professional life.											Understand	
TEXT BOOKS:													
1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2 nd Revised Edition, Excel Books, New Delhi, 2019.													
2. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.													
REFERENCES:													
1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010.													
2. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted 2008.													
3. Frankl, Viktor E. Yes to Life In spite of Everything, Penguin Random House, London, 2019.													
4. Van Zomeren, M., & Dovidio, J. F. The Oxford Handbook of the Human Essence (Eds.), New York Oxford University Press, 2018.													
5. https://fdp-si.aicte-india.org/UHVII.php													
6. https://nptel.ac.in/courses/109104068													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	2	-	-	-	-	2	-	-
CO2	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	3	-	-	-	2	-	-
CO5	-	-	-	-	-	3	-	2	-	-	-	-	-

Santh
V. SANTH
Chairman (BoS)



24CS001	DATA STRUCTURES AND ALGORITHMS USING C	Category	L	T	P	SL	C
		OEC	45	0	30	45	4
PREREQUISITE: Basic knowledge of programming concepts such as variables, data types, loops, conditionals and functions, along with logical thinking and problem-solving skills.							
OBJECTIVES: To provide knowledge of basic data structures and algorithms and their use in searching, sorting, and efficient problem-solving techniques.							
UNIT – I	BASICS OF DATA STRUCTURES						(9)
Abstract Data Types (ADTs) – List ADT – Array-based implementation – Singly linked lists – Doubly linked lists – Circularly linked lists – Applications of lists – Polynomial ADT.							
UNIT – II	STACKS AND QUEUES						(9)
Stack ADT – Implementation of Stack using Linked List – Applications of Stack: Evaluating arithmetic expressions – Conversion of Infix to postfix and prefix expression. Queue ADT – Implementation of Queue using Linked List – Circular Queue – Applications of Queues.							
UNIT – III	TREES AND GRAPHS						(9)
Tree ADT – Binary Tree ADT – Binary Tree Traversal – Binary Search Tree – AVL Trees – Graphs and Types – Prim’s Algorithm – Kruskal’s Algorithm – Dijkstra’s Algorithm – Breadth First Traversal – Depth First Traversal.							
UNIT – IV	SEARCHING, HASHING AND SORTING						(9)
Searching: Linear and Binary Search – Hashing: Hash function – Separate Chaining – Open Addressing: Linear Probing, Quadratic Probing and Double Hashing. Sorting: Merge sort – Quick sort – Insertion Sort – Heap Sort.							
UNIT – V	ALGORITHM DESIGN AND ANALYSIS						(9)
Notion of algorithm – Fundamentals of algorithmic problem solving – Analysis framework – Asymptotic Notations: Big O Notation, Omega Ω Notation and Theta Θ Notation – Mathematical analysis for Recursive and Non-recursive algorithms.							
List of Exercise/Experiments							
<ol style="list-style-type: none"> 1. Apply singly linked list operations for dynamic data insertion and deletion. 2. Develop a program to perform insertion and deletion operations using a doubly linked list. 3. Demonstrate stack functionality using a linked list data structure. 4. Construct a queue using linked list-based enqueue and dequeue operations. 5. Implement binary tree traversal algorithms for node processing. 6. Perform Linear Search to retrieve a specified element from an array. 7. Execute Binary Search on a sorted array and measure its efficiency. 8. Design the Merge Sort algorithm for efficient array sorting. 9. Derive the Minimum Spanning Tree of a graph using Prim’s Algorithm and compute its total minimum cost. 							


Chairman (BoS)



10. Implement Dijkstra's Algorithm to determine the shortest path from a given source vertex to all other vertices in a weighted graph.

L=45,T=0,P=30,SL=45 TOTAL: 120 PERIODS

COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Infer the concepts of abstract data types and list structures for singly, doubly and circular linked lists.	Understand
CO2	Apply stack and queue operations implemented with linked lists to solve expression evaluation and data-handling problems.	Apply
CO3	Implement tree and graph structures with traversal techniques for hierarchical and network-based data processing.	Apply
CO4	Design solutions using searching, sorting, and hashing methods for fast and organized data access.	Apply
CO5	Demonstrate algorithm design principles and asymptotic analysis to solve computational problems with classical algorithms.	Apply

TEXT BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2nd Edition, 2018.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2017.

REFERENCES:

1. Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, Pearson Education, 2nd Edition, 2015.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, McGraw Hill, 4th Edition, 2022.
3. Alfred V. Aho, Jeffrey D. Ullman John E. Hopcroft, Data Structures and Algorithms, 1st Edition, Pearson, 2002.
4. Kruse, Data Structures and Program Design in C, Pearson Education, 2nd Edition, 2006.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	2	-	-
CO2	3	3	2	-	-	-	-	1	-	-	2	-	-
CO3	3	3	2	-	-	-	-	1	-	-	2	-	-
CO4	3	3	2	-	-	-	-	1	-	-	2	-	-
CO5	3	3	2	-	-	-	-	1	-	-	2	-	-

1-low, 2-medium, 3-high


Chairman (BoS)



24BMI41	ANALOG AND DIGITAL INTEGRATED CIRCUITS	Category	L	T	P	SL	C
		PCC	45	0	30	45	4
PREREQUISITE:							
Students require a strong foundation in basic electronics, semiconductor devices, circuit analysis, operational amplifiers, frequency response, CMOS technology, number systems, Boolean algebra, logic gates, and combinational and sequential circuits including flip-flops.							
OBJECTIVES:							
To equip students with knowledge of linear integrated circuits, ADCs, DACs, PLLs, and the design and analysis of combinational and sequential digital circuits, including synchronous and asynchronous systems, flip-flops, counters, and registers for practical digital system applications.							
UNIT - I	OPERATIONAL AMPLIFIER AND ITS APPLICATIONS	9					
Operational amplifier –ideal characteristics, Performance Parameters, Linear and Nonlinear Circuits and their analysis- voltage follower, Inverting amplifier, Non-inverting Amplifiers, Differentiator, Integrator, Voltage to Current converter, Current to Voltage converter, Instrumentation amplifier, Low pass, High pass filter and band pass filters, Comparator, Schmitt trigger.							
UNIT - II	DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS AND PLL	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. PLL-Closed loop analysis of PLL, Frequency multiplication/ division, FSK demodulator.							
UNIT - III	BASIC GATES AND COMBINATIONAL LOGIC CIRCUITS	9					
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods.							
UNIT - IV	COMBINATIONAL LOGIC CIRCUITS	9					
Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Mux/Demux.							
UNIT - V	SEQUENTIAL LOGIC CIRCUITS	9					
Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – state minimization, state assignment, circuit implementation. Counters, Ripple Counters, Ring Counters. Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out, Universal Shift Register.							
Lecture: 45 Periods							


Chairman (BoS)



List of Exercise/Experiments:

1. Design of Inverting, non-inverting amplifier
2. Design of Integrator, Differentiator and Instrumentation Amplifier
3. Design and analysis of active filters using op amp
4. Design of Schmitt trigger using operational amplifier
5. Design of early warning system for Home care using logic gates
6. Design and implementation of code converters using logic gates
 - (i) BCD to excess-3 code and vice versa
 - (ii) Binary to gray and vice-versa
7. Design of Multiplexer and Demultiplexer using digital ICs
8. Study of Half adder and Full adder
9. Design of Universal shift register using flip flops
10. Design and implementation of 3-bit synchronous up/down counter

Laboratory: 30 Periods**L = 45, P = 30, SL = 45, TOTAL: 120 PERIODS****COURSE OUTCOMES:**

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

Course Outcome	Description	Expt. No.	Bloom's Taxonomy Level
CO1	Apply operational amplifier principles to implement and analyze linear IC-based analog circuits such as amplifiers, integrators, filters, and Schmitt triggers.	1,2	Apply
CO2	Demonstrate the application of data conversion and timing concepts through practical realization of ADC/DAC-related circuits and PLL-based systems.	3,4	Apply
CO3	Construct digital logic solutions by applying Boolean algebra and logic gates to design basic combinational circuits.	5,6	Apply
CO4	Develop combinational digital circuits such as code converters, adders, multiplexers, and demultiplexers using standard digital ICs.	7,8	Apply
CO5	Execute the design and implementation of synchronous and asynchronous sequential circuits including registers and counters using flip-flops.	9,10	Apply

TEXT BOOKS:

1. M. Morris Mano and Michael D.Ciletti, "Digital Design", Pearson, 5th Edition, 2013.
2. S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, 3rd Edition, 2018
3. D.Roy Choudhry, Shail Jain, -Linear Integrated Circuits, New Age International Pvt. Ltd., 2018, Fifth Edition.

REFERENCES:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc GrawHill Education, 3rd Edition, 2017
2. John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018



Chairman (BOS)



3.	Taub and Schilling, "Digital Integrated Electronics", Mc Graw Hill, 2017.												
4.	Charles H.Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 7 th Edition, 2013.												
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	1	1	-	1	2	-
CO2	3	3	2	-	-	-	-	1	1	-	1	2	-
CO3	3	3	2	-	-	-	-	1	1	-	1	2	-
CO4	3	3	2	-	-	-	-	1	1	-	1	2	-
CO5	3	3	2	-	-	-	-	1	1	-	1	2	-
1-Low, 2-Medium, 3-High													

Laboratory Equipment Details
Requirements for a batch of 30 students

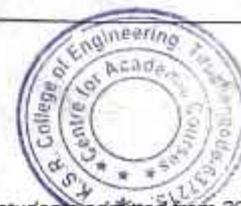
S.No.	Description of Equipment	Quantity required
1.	Digital Trainer Kit-(with 5V, Variable and fixed frequency Clock, Bread Board, Seven Segment displays, LEDs for output display, Logic 1 and 0 Input switches)	10
2.	Logic ICs - (7408,7432, 7404, 7400, 7402, 7486)	Each 25
3.	Resistors	50
4.	Capacitors	50
5.	Single power supply	5
6.	Breadboards	15
7.	IC741	30
8.	CRO (or) DSO	5
9.	Function Generator	5
10.	Digital Multimeter	3
11.	Digital IC Tester	1


Chairman (BoS)



24BMI42	SENSORS AND MEASUREMENTS	Category	L	T	P	SL	C
		PCC	45	0	30	45	4
PREREQUISITE: A strong foundation in physics, circuit theory, and mathematics is essential for understanding sensor operation, designing sensor interfaces, and analyzing AC/DC circuit behavior, while supporting accurate data interpretation, sensor modeling, and signal processing analysis.							
OBJECTIVES: To provide learners with a comprehensive understanding of measurement systems, sensor structures and working principles—including photoelectric, piezoelectric, and biosensor, and to apply appropriate measurement techniques for various physical quantities and practical applications.							
UNIT – I	SCIENCE OF MEASUREMENT						9
Basic Measurement System – Instrumentation – Classification and Characteristics of Transducers – Static and Dynamic – Errors in Measurements – Calibration and standards – Primary and secondary standards.							
UNIT - II	SENSORS AND TRANSDUCERS						9
Classification of Sensors and Transducers - Resistive, Capacitive, and Inductive Transducers - Piezoelectric and Thermoelectric Sensors - Optical and Ultrasonic Sensors - Smart Sensors and MEMS.							
UNIT - III	PHOTOELECTRIC AND PIEZOELECTRIC SENSORS						9
Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.							
UNIT - IV	MEASUREMENT OF PHYSICAL PARAMETERS						9
Temperature Measurement: RTDs, Thermocouples - Pressure and Force Measurement - Flow and Level Measurement - Displacement and Velocity Measurement - Vibration and Acceleration Measurement. AC and DC Bridges.							
UNIT - V	BIOSENSORS						9
Biosensors- Advantages and limitations, various components of biosensors, Classification of Biosensors Based on Type of Transduction - Electrochemical, Optical, Acoustic, Calorimetric. Classification of Biosensors Based on Biological Element - Enzyme Sensor, Immunosensors, Cell-based Sensors. Sensor Integration in IoT.							
Lecture: 45 Periods							


Chairman (BoS)



List of Exercise/Experiments:

1. Characteristics of strain gauges.
2. Displacement measurement using LVDT.
3. Characteristics of temperature transducer-thermistor, RTD.
4. Characteristics of temperature transducer- thermocouple.
5. Characteristics of Photo electronic transducers-LDR, Photo Diode, Photo Transistor.
6. Characteristics of Piezoelectric Transducer.
7. Wheatstone Bridge and Kelvin's Bridge for Measurement of Resistance.
8. Measurement of capacitance using bridge circuits.
9. Measurement of inductance using bridge circuits.
10. Miniproject.

Laboratory: 30 Periods**L = 45, P = 30, SL = 45, TOTAL: 120 PERIODS****COURSE OUTCOMES:****At the end of the course, the students will be able to:**

COs	Course Outcome	Expt. No.	Cognitive Level
CO1	Explain the structure and characteristics of measurement systems and identify sources of error.	-	Understand
CO2	Apply suitable sensors and transducers by experimentally characterizing strain gauges and LVDT for displacement measurement.	1,2	Apply
CO3	Demonstrate the use of photoelectric and piezoelectric sensors to obtain and interpret their operational characteristics.	5,6	Apply
CO4	Perform measurements of physical parameters using appropriate transducers and bridge circuits.	3,4,7,8,9	Apply
CO5	Apply biosensor principles and data acquisition techniques using Arduino for biomedical and IoT-based measurement applications.	10	Apply

TEXT BOOKS:

1. A.K. Sawhney, "Electrical & Electronics Measurement and Instrumentation", DhanpatRai&Co, New Delhi, 2023.
2. Doebelin E.O. and Manik D.N., "Measurement Systems", Tata McGraw-Hill Education Pvt. Ltd., 7th Edition, 2019.

REFERENCES:

1. Albert D.Helfrick and William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2015.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical equipment technology, Pearson Education, 4 th Edition, 2014.



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3. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 3rd Edition, 2014.

4. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurement", Prentice Hall India Pvt. Ltd, New Delhi, 2nd Edition, Reprint, 2013.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	2	-
CO2	3	3	2	-	-	-	-	1	1	-	1	2	-
CO3	3	3	2	-	-	-	-	1	1	-	1	2	-
CO4	3	3	2	-	-	-	-	1	1	-	1	2	-
CO5	3	3	2	-	2	-	-	1	1	-	1	2	-

1-Low, 2-Medium, 3-High

Laboratory Equipment Details

Requirements for a batch of 30 students

S.No.	Description of Equipment	Quantity required
1.	Strain gauges Kit	01
2.	Strain gauges Sensors (Bonded and Unbonded)	05
3.	LVDT Kit with Sensor Module	01
4.	Thermistor Kit	01
5.	RTD Kit	01
6.	RTD Sensor	05
7.	Thermocouple Kit	01
8.	Thermocouple Sensor	05
9.	LDR Kit	01
10.	Piezoelectric Transducer Kit	01
11.	Piezoelectric Sensor	05
12.	Trainer Kits - Wheatstone Bridge	01
13.	Trainer Kits - Kelvin's Bridge	01
14.	Trainer kits - Schering Bridge, Maxwell's bridge, Hay's bridge	Each 01


Chairman (BoS)



24BMP41	BIOMEDICAL INSTRUMENTATION LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	45	0	1.5
PREREQUISITE: Students should know the fundamentals of analog electronics, sensors, amplifiers, and signal conditioning techniques. A basic understanding of human anatomy, physiology, and bioelectric signals will be beneficial.							
OBJECTIVES: To provide hands-on experience in acquiring, conditioning, and analyzing biomedical signals using standard instrumentation, while understanding the principles of sensors, electrodes, amplifiers, filtering, and safety techniques, and interpreting physiological signals for basic clinical relevance.							
List of Experiments: <ol style="list-style-type: none"> 1. Identify and classify the bio electrodes. 2. Acquire ECG signal using 12 lead systems and tabulate the amplitude and frequency ranges. 3. Measure EEG and EMG signal and identify patterns indicative of abnormalities. 4. Measurement of EOG Signal to detect eye blinking. 5. Design of pre amplifiers to acquire bio signals along with impedance matching circuit using suitable IC's. 6. Design of ECG Amplifier with Power Line and Artifact Filtering. 7. Study the characteristics of optical Isolation amplifier. 8. Measurement of pulse-rate using Photo transducer. 9. Measurement and recording of peripheral blood flow. 10. Understanding of Chemical properties using pH and conductivity meter 							
P = 45, TOTAL: 45 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Ex. No	Cognitive Level				
CO1	Apply the principles of bioelectrodes and biosignal generation to identify and classify biological signals used in biomedical experiments.	1	Apply				
CO2	Analyze acquired ECG, EEG, EMG, and EOG signals to determine their amplitude, frequency, and waveform characteristics for abnormality detection.	2,3,4	Analyze				
CO3	Design amplifiers involved in monitoring and transmission of bio signals.	5,6,7	Apply				
CO4	Analyze the performance of biomedical signal conditioning and isolation circuits under practical laboratory conditions.	8,9	Analyze				
CO5	Demonstrate the biochemical measurement techniques as applicable for clinical interpretation.	10	Apply				


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REFERENCES:

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, 3rd Edition, 2014.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	1	1	-	1	2	-
CO2	3	3	3	2	2	-	-	1	1	-	1	2	-
CO3	3	3	2	-	-	-	-	1	1	-	1	2	-
CO4	3	3	3	4	2	-	-	1	1	-	1	2	-
CO5	3	3	2	-	-	-	-	1	1	-	1	2	-

1-Low, 2-Medium, 3-High

Laboratory Equipment Details

Requirements for a batch of 30 students

S.No.	Description of Equipment	Quantity required
1.	Bio Electrode – Disposable Electrode, Bubble Electrode, Clam Electrode, EEG Electrode	Each 5
2.	ECG	1
3.	EEG Machine	1
4.	EMG Amplifier	1
5.	EOG MACHINE	1
6.	Plethysmograph	1
7.	Blood Flow Measurement	1
8.	PH and conductivity machine	1
9.	Digital Oscilloscope	8
10.	Power supply	8
11.	Function Generator	8


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24ECP46	DESIGN STUDIO II	Category	L	T	P	SL	C
		ESC	0	0	30	0	1

PREREQUISITE: NIL

OBJECTIVES:
To equip students with Design Thinking competencies for addressing real-world challenges aligned with Smart India Hackathon (SIH) themes by fostering empathy, creativity, innovation, and multidisciplinary teamwork, while enabling effective project execution, documentation, and presentation through experiential learning and faculty mentorship.

GENERAL GUIDELINES

1. Students will form teams of 3 members.
2. Each team must select a problem statement from Smart India Hackathon or institute-approved innovation challenges.
3. A faculty mentor will guide each team throughout the semester.
4. Teams must maintain a Design Studio Logbook recording research, ideas, design iterations, feedback and reflections.
5. Projects must follow the Design Thinking Framework: Empathize → Define → Ideate → Prototype → Implement → Communicate.
6. Each phase will include review checkpoints to ensure progress.
7. Final deliverables include Design Process Portfolio, Functional Prototype or Software Demonstration, SIH Submission Document and Reflection Report.

MODULE STRUCTURE

Module 1 – Empathize (Weeks 1-2)

- Understanding SIH domains and societal challenge areas
- Identifying user needs, stakeholders and contexts
- Conducting field studies, surveys and interviews
- Developing empathy maps, personas and user journey maps

Module 2 – Define (Weeks 3-4)

- Synthesizing findings from user research
- Identifying core pain points and opportunity areas
- Framing clear, actionable problem statements
- Establishing project goals, boundaries and success metrics

Module 3 – Ideate (Weeks 5-6)

- Generating diverse ideas through brainstorming and design heuristics
- Sketching and conceptual visualization
- Evaluating ideas based on feasibility, desirability and viability
- Selecting optimal solution paths through mentor feedback and peer review

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Module 4 - Prototype (Weeks 7-8)

- Creating low and medium-fidelity prototypes (hardware, software, hybrid)
- Implementing iterative design improvements
- Conducting usability testing with target users
- Refining prototypes based on functional and experiential feedback

Module 5 - Implement (Weeks 9)

- Developing functional or deployable prototypes
- Integrating technical components (IoT, AI, software modules, sensors, etc.)
- Performing real-time validation, data collection and testing
- Ensuring robustness, scalability and sustainability

Module 6 - Communicate (Week 10)

- Preparing final presentations, poster displays and demo videos
- Showcasing design process and prototype outcomes
- Crafting compelling stories and narratives for SIH jury and stakeholders
- Reflecting on design journey, team collaboration and ethical learnings

TOTAL (P - 30) : 30 PERIODS**COURSE OUTCOMES:****At the end of the course, the students will be able to:**

COs	Course Outcome	Cognitive Level
CO1	Empathize with users and identify critical pain points through research, observation and engagement.	Analyze
CO2	Define precise and actionable problem statements based on design insights and contextual understanding.	Analyze
CO3	Generate creative ideas, evaluate them systematically and conceptualize innovative solutions.	Create
CO4	Build, test and refine prototypes using iterative design and implementation practices.	Apply
CO5	Communicate design solutions effectively through storytelling, visual presentation and demonstrations.	Apply

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	3	-	3	3	3	3	3	3	3	3
CO2	-	3	3	3	-	3	3	3	-	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	-	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	1.6	3	3	3	1.8	3	3	3	1.8	3	3	3	3

1-low, 2-medium, 3-high



24SDP49	SOFT SKILLS DEVELOPMENT – IV	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES:							
To the concept of aptitude and make them aware of its growing importance in academics, competitive exams, and professional life. In addition, it seeks to build a strong foundation in English grammar to improve language and communication skills.							
UNIT - I	TIME AND WORK						(6)
Relationship Between Time and Work – Efficiency Calculation – Wages – Alternate Days – Pipes and Cisterns – Chain Rule.							
UNIT - II	PERMUTATION COMBINATION AND PROBABILITY						(6)
Permutation Based on Words and Numbers – Combination Based on Committee, Balls and Cards – Probability Based on Persons, Balls, Cards, Dice and Coins.							
UNIT - III	SIMPLE INTEREST AND COMPOUND INTEREST						(6)
Introduction to Principal, Interest and Time – Simple Interest Calculation – Compound Interest: Compounded Annually, Half-yearly and quarterly.							
UNIT - IV	LOGICAL REASONING						(6)
Syllogism – Clocks – Calendar.							
UNIT - V	VERBAL ABILITY						(6)
Tenses – Articles – Subject Verb Agreement – Error Spotting – Essay Writing.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Apply time and work concepts to solve problems on efficiency, wages, alternate days and pipes & cisterns, and chain rule.	Apply					
CO2	Develop problem solving on permutations, combinations, and probability involving words, objects, and standard.	Understand					
CO3	Apply concepts of principal, rate, and time to calculate simple and compound interest under various compounding periods.	Apply					
CO4	Demonstrate logical reasoning to solve problems related to syllogisms, clocks, and calendars effectively.	Understand					
CO5	Demonstrate grammatical accuracy and coherence in writing by applying rules of tenses, articles, subject-verb agreement.	Understand					



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TEXT BOOKS:

1. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations".
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations".
3. Nishit K. Sinha, "Logical Reasoning and Data Interpretation for CAT".
4. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning".
5. Wren & Martin, "High School English Grammar & Composition".

REFERENCES:

1. Arun Sharma, Quantitative Aptitude for CAT, 11e, 2025.
2. Arun Sharma, Logical Reasoning for CAT, 7e, 2025.
3. English for Competitive Examinations – by Edgar Thorpe & Showick Thorpe.
4. <https://prepinsta.com/>.
5. <https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm>.
6. <https://www.youtube.com/@FeelFreetoLearn/playlists>.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	2	-	-	3	-	-
CO2	3	2	-	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	2	-	-	2	-	-	2	-	-	3	-	-
CO5	3	2	-	-	2	-	-	3	3	-	3	-	-
Avg.	3	2	2	-	2	-	-	2	3	-	3	-	-

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