CURRICULUM & SYLLABI

B.E. MEDICAL ELECTRONICS

(CHOICE BASED CREDIT SYSTEM)

REGULATIONS – 2023

(For the Students Admitted in the Academic Year 2023-2024 onwards)

SENGUNTHAR
ENGINEERING COLLEGE

EDUCATION   EDIFICATION   ELEVATION

Estd : 2001

Note: The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Sengunthar Engineering College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the program under the same Regulation as may be decided by the Academic Council.

SENGUNTHAR
Skins & Success
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DEPARTMENT
OF
MEDICAL ELECTRONICS

REGULATION 2023

CURRICULUM AND SYLLABI

FOR B.E. – MEDICAL ELECTRONICS

(For the Students admitted in the Academic Year 2023-2024 onwards)

FIRST SEMESTER
TO
EIGHTH SEMESTER

Estd : 2001

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SCHEME FOR CURRICULUM

B.E. - Medical Electronics

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REGULATIONS 2023
CHOICE BASED CREDIT SYSTEM
B.E. MEDICAL ELECTRONICS

VISION

- To emerge as a leading department in the field of medical electronics education and research through industry collaboration for sustainable development in the healthcare, by training the students into holistic and highly skilled professionals to address the present and future challenges in medical devices to meet the societal needs.

MISSION

- To impart technical education through effective teaching learning process to students for implementing engineering principles and emerging ideas in medical electronics.

- To collaborate with leading industries and medical regulation experts to ensure safe and effective healthcare devices.

- To foster the culture of innovative research and entrepreneurship for developing patentable medical equipments.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

- ✓ Apply their technical competence in Medical Electronics to solve real world problems, with leadership quality.

- ✓ Conduct cutting edge research and develop solutions to the problems of social relevance.

- ✓ Work in a business environment, exhibiting team skills, work ethics, adaptability and lifelong learning.

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/developm ent of solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work:	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication:	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation andability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1	Ability to understand the fundamental concepts, analyze, design, develop, implement using mathematical foundations and domain knowledge for medical equipment design with "R" policy (recycle, reduce, reusable, reverse engineering, renewable) and providing solutions to Problems, Challenges in Healthcare Industry by applying the new ideas and innovations on par with international standards
PSO2	Ability to work and communicate effectively in a team environment and foster the professional skills towards industrial and societal needs.
PSO3	Ability to grasp the advancements in hardware / software tools and creating a career path to become an entrepreneur, lifelong learner with moral values and ethics.

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MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	23HST101 - Professional English - I	-	-	-	-	-	1.4	2.2	1.25	1.8	3	-	3	-	-	-
		23MAT101 - Matrices and calculus	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
		23HST102 - தமிழர்மரபு/ Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23PHE103 – Applied Physics for Electronics Engineering	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
		23CYE101 - Engineering Chemistry	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	1.5	-	-	-	-
		23GEE101 - Programming in C	2.00	2.33	2.33	1.17	2.00	1.17	1.00	0.83	2.00	0.17	2.83	2.33	1.83	2.17	-
		23EEC101 - Soft Skills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC101 - Induction Program (2 Weeks)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	II	23HST201 - Professional English - II	-	-	-	-	2	1.2	1.2	1	2	3	-	3	-	-	-
		23MAT201 – Statistics and Numerical Methods with MATlab	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
		23PHT203 – Advanced Physics for Electronics Engineering	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
		23CYT201 - Environmental Science and Sustainability	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-
		23EET202 - Electric Circuit Analysis	3	3	2.4	2.2	-	-	-	-	-	1	-	0.6	1	-	-
		23HST202 - தமிழரும் தொழில்நுட்பமும் / Tamil and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23GEE201 - Engineering Graphics	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
		23GEL201 - Engineering Practices Laboratory	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
		23EEC201 - Communication Skills	-	-	-	-	-	1.2	1.5	1.5	1.8	3	-	3	-	-	-
		23MDC201 - Life skills & Leadership Enhancement Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
II	III	23MAT302 - Transforms and Random Process	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
		23MDT301 - Anatomy and Human Physiology	3	3	2.4	-	-	1	-	1	-	1	-	2	3	3	2
		23MDT302 - Biosensors and Measurements	3	3	2.4	1.4	2	-	-	-	-	1	-	2	3	2	1
		23MDE301 - Electronic Devices & Circuits	3	3	2.2	-	1	-	-	-	-	1	-	-	3	2	2
		23MDE302 - Biosciences for Medical Engineering	2	-	-	1	1	-	2	-	-	1	-	1	3	2	1
		23EEE304 - Basics of Electrical Machines	2	1.8	1	-	-	-	-	1	-	1	-	2	2	2	2
		23EEC301 - Professional Development	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	IV	23MDT401 - Human Assist Devices	3	2	1	1	3	-	1	-	-	1	-	2	2	2	1
		23MDT402 - Medical Physics	3	2	2	2	-	-	2	-	-	1	-	-	2	1	1
		23MDT403 - Bio Control Systems	3	2	2	2	0.4	-	2	-	-	1	-	1	2	1	-
		23MDE401 - Medical Instrumentation	3	2	1	1.2	-	3	-	-	2	-	0.5	1	2	2	2
		23MDE402 - Analog and Digital Integrated Circuits	3	2	1	1	0.5	2	-	-	-	1	-	1	3	2	1
		23GEE301 - Problem Solving and Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	-	-
		23EEC401 - Value Added Course - I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E- MEDICAL ELECTRONICS - FIRST SEMESTER

Course Code	Name of the Subject	Category	L	T	P	C	CIA	ESE	TOT
THEORY									
23HST101	Professional English – I	HS	3	0	0	3	40	60	100
23MAT101	Matrices and calculus	BS	3	1	0	4	40	60	100
23HST102	தமிழர் மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
EMBEDDED COURSE									
23PHE103	Applied Physics for Electronics Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	100
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC101	Soft Skills	EEC	1	0	0	1	100	-	100
MANDATORY COURSE									
23MDC101	Induction Program (2 Weeks)	MC	-	-	-	-	-	-	-
TOTAL CREDITS IN SEMESTER - I					21				

Periods / Week columns: L (Lecture), T (Tutorial), P (Practical); Credit column: C

HS : Humanities and Social Sciences
BS : Basic Sciences
ES : Engineering Sciences
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PE : Professional Elective
GE : General Elective
OE : Open Elective
EEC : Employability Enhancement Courses
MC : Mandatory Courses
L : Lecture
T : Tutorial
P : Practical
C : Credit Point
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ESE : End Semester Examination
TOT : Total

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B.E- MEDICAL ELECTRONICS - SECOND SEMESTER

Course Code	Name of the Subject	Category	L	T	P	C	CIA	ESE	TOT
THEORY									
23HST201	Professional English – II	HS	3	0	0	3	40	60	100
23MAT201	Statistics and Numerical Methods with MATLAB	BS	3	1	0	4	40	60	100
23PHT203	Advanced Physics for Electronics Engineering	BS	3	0	0	3	40	60	100
23CYT201	Environmental Sciences and Sustainability	HS	3	0	0	3	40	60	100
23EET202	Electric Circuit Analysis	ES	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HS	1	0	0	1	40	60	100
EMBEDDED COURSE									
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
PRACTICALS									
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC201	Communication Skills/Foreign Language	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
23MDC201	Life Skills and Leadership Enhancement Program	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - II						25			

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B.E- MEDICAL ELECTRONICS -THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23MAT302	Transforms and Random Process	BS	3	1	0	4	40	60	100
23MDT301	Anatomy and Human Physiology	PC	3	1	0	4	40	60	100
23MDT302	Biosensors and Measurements	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23MDE301	Electronic Devices & Circuits	PC	3	0	2	4	50	50	100
23MDE302	Biosciences for Medical Engineering	PC	3	0	2	4	50	50	100
23EEE304	Basics of Electrical Machines	ES	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
TOTAL CREDITS IN SEMESTER - III						24			

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B.E- MEDICAL ELECTRONICS - FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week				Credit	Maximum Marks		
			L	T	P	C		CIA	ESE	TOT
THEORY										
23MDT401	Human Assist Devices	PC	3	0	0	3		40	60	100
23MDT402	Medical Physics	PC	3	0	0	3		40	60	100
23MDT403	Bio Control Systems	PC	3	1	0	4		40	60	100
EMBEDDED COURSE										
23MDE401	Medical Instrumentation	PC	3	0	2	4		50	50	100
23MDE402	Analog and Digital Integrated Circuits	PC	3	0	2	4		50	50	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4		50	50	100
EMPLOYABILITY ENHANCEMENT COURSE										
23EEC401	Value Added Course - I	EEC	0	0	4	2		100	-	100
TOTAL CREDITS IN SEMESTER - IV							24			

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B.E- MEDICAL ELECTRONICS - FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23MDT501	Bio Materials and Artificial Organs	PC	3	1	0	4	40	60	100
	Professional Elective - I	PE	3	0	0	3	40	60	100
	Professional Elective – II	PE	3	0	0	3	40	60	100
	Professional Elective – III	PE	3	0	0	3	40	60	100
EMBEDDED COURSE									
23MDE501	Diagnostic and Therapeutic Equipments	PC	3	0	2	4	50	50	100
23MDE502	Bio Signal Processing	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC501	Value Added Course – II	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
23MDC501	Mandatory Course-I	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - V						23			

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B.E- MEDICAL ELECTRONICS - SIXTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week				Credit	Maximum Marks		
			L	T	P	C		CIA	ESE	TOT
THEORY										
	Professional Elective - IV	PE	3	0	0	3		40	60	100
	Professional Elective – V	PE	3	0	0	3		40	60	100
	Professional Elective – VI	PE	3	0	0	3		40	60	100
	Open Elective-I/NCC L1/ L3	OE	3	0	0	3		40	60	100
EMBEDDED COURSE										
23MDE601	Embedded Systems and IoMT	PC	3	0	2	4		50	50	100
23MDE602	Medical Image Processing	PC	3	0	2	4		50	50	100
EMPLOYABILITY ENHANCEMENT COURSE										
23MDJ601	Project Work	EEC	0	0	10	5		40	60	100
MANDATORY COURSE										
23MDC601	Mandatory Course-II	MC	3	0	0	0		-	-	-
TOTAL CREDITS IN SEMESTER - VI								25		

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B.E- MEDICAL ELECTRONICS - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	L	T	P	C	CIA	ESE	TOT
THEORY									
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100
	Elective – Management	GE	3	0	0	3	40	60	100
	Open Elective – II/ NCC-II L2/ L4	OE	3	0	0	3	40	60	100
	Open Elective - III	OE	3	0	0	3	40	60	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC701	Research Paper Writing/Publication / Hospital / Industry Training	EEC	0	0	4	2	40	60	100
TOTAL CREDITS IN SEMESTER - VII					14				

(Header note: Periods / Week spans L, T, P; Credit column = C; Maximum Marks spans CIA, ESE, TOT)

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B.E- MEDICAL ELECTRONICS - EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
EMPLOYABILITY ENHANCEMENT COURSE									
23MDJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - VIII					9				

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LIST OF HUMANITIES AND SOCIAL SCIENCE COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HST101	Professional English – I	HS	3	0	0	3	40	60	100
23HST102	தமிழர் மரபு /Heritage of Tamils	HS	1	0	0	1	40	60	100
23HST201	Professional English – II	HS	3	0	0	3	40	60	100
23CYT201	Environmental Sciences and Sustainability	HS	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100

LIST OF BASIC SCIENCE COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHE103	Applied Physics for Electronics Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	100
23MAT201	Statistics and Numerical Methods with MATLAB	BS	3	1	0	4	40	60	100
23PHT203	Advanced Physics for Electronics Engineering	BS	3	0	0	3	40	60	100
23MAT302	Transforms and Random Process	BS	3	1	0	4	40	60	100

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LIST OF ENGINEERING SCIENCE COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
23EET202	Electric Circuit Analysis	ES	3	0	0	3	40	60	100
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
23EEE304	Basics of Electrical Machines	ES	3	0	2	4	50	50	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4	50	50	100

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LIST OF PROFESSIONAL CORE COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDT301	Anatomy and Human Physiology	PC	3	1	0	4	40	60	100
23MDT302	Biosensors and Measurements	PC	3	0	0	3	40	60	100
23MDE301	Electronic Devices & Circuits	PC	3	0	2	4	50	50	100
23MDE302	Biosciences for Medical Engineering	PC	3	0	2	4	50	50	100
23MDT401	Human Assist Devices	PC	3	0	0	3	40	60	100
23MDT402	Medical Physics	PC	3	0	0	3	40	60	100
23MDT403	Bio Control Systems	PC	3	1	0	4	40	60	100
23MDE401	Medical Instrumentation	PC	3	0	2	4	50	50	100
23MDE402	Analog and Digital Integrated Circuits	PC	3	0	2	4	50	50	100
23MDT501	Bio Materials and Artificial Organs	PC	3	1	0	4	40	60	100
23MDE501	Diagnostic and Therapeutic Equipments	PC	3	0	2	4	50	50	100
23MDE502	Bio Signal Processing	PC	3	0	2	4	50	50	100
23MDE601	Embedded Systems and IoMT	PC	3	0	2	4	50	50	100
23MDE602	Medical Image Processing	PC	3	0	2	4	50	50	100

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LIST OF PROFESSIONAL ELECTIVE COURSES

Professional Elective - I

Course Code	Name of the Subject	Category	Periods / Week				Credit	Maximum Marks		
			L	T	P	C		CIA	ESE	TOT
23MDP501	Hospital Planning and Management	PE	3	0	0	3		40	60	100
23MDP502	Prosthetic Equipments	PE	3	0	0	3		40	60	100
23MDP503	Biomedical Optics and Biophotonics	PE	3	0	0	3		40	60	100
23MDP504	Patient Safety, Standards and Ethics	PE	3	0	0	3		40	60	100
23MDP505	Principles of Tissue Engineering	PE	3	0	0	3		40	60	100
23MDP506	Computer Vision	PE	3	0	0	3		40	60	100

Professional Elective - II

Course Code	Name of the Subject	Category	Periods / Week				Credit	Maximum Marks		
			L	T	P	C		CIA	ESE	TOT
23MDP507	Assistive Technology	PE	3	0	0	3		40	60	100
23MDP508	Wearable Devices	PE	3	0	0	3		40	60	100
23MDP509	Neural Engineering	PE	3	0	0	3		40	60	100
23MDP510	Medical Device Regulations	PE	3	0	0	3		40	60	100
23MDP511	Medical Innovation and Entrepreneurship	PE	3	0	0	3		40	60	100
23MDP512	Rapid Prototyping	PE	3	0	0	3		40	60	100

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Professional Elective - III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDP513	Clinical Engineering	PE	3	0	0	3	40	60	100
23MDP514	Bio MEMS	PE	3	0	0	3	40	60	100
23MDP515	Medical Waste Management	PE	3	0	0	3	40	60	100
23MDP516	Economics and Management for Engineers	PE	3	0	0	3	40	60	100
23MDP517	Biostatistics	PE	3	0	0	3	40	60	100
23MDP518	Critical Care and Operation Theatre Equipment	PE	3	0	0	3	40	60	100

Professional Elective – IV

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDP601	Biomechanics	PE	3	0	0	3	40	60	100
23MDP602	Rehabilitation Engineering	PE	3	0	0	3	40	60	100
23MDP603	Physiological Modelling	PE	3	0	0	3	40	60	100
23MDP604	Fundamentals of Healthcare Analytics	PE	3	0	0	3	40	60	100
23MDP605	Ergonomics	PE	3	0	0	3	40	60	100
23MDP606	Haptics	PE	3	0	0	3	40	60	100

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Professional Elective –V

Course Code	Name of the Subject	Category	Periods / Week				Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDP607	Introduction to Bio Energy and Bio Fuels	PE	3	0	0	3	40	60	100
23MDP608	Electrical Safety and Quality Assurance in Hospitals	PE	3	0	0	3	40	60	100
23MDP609	Speech and Audio Signal Processing	PE	3	0	0	3	40	60	100
23MDP610	Medical Imaging Systems	PE	3	0	0	3	40	60	100
23MDP611	Brain Computer Interface and Applications	PE	3	0	0	3	40	60	100
23MDP612	Biometric Systems	PE	3	0	0	3	40	60	100

Professional Elective – VI

Course Code	Name of the Subject	Category	Periods / Week				Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDP613	CommunicationSystems	PE	3	0	0	3	40	60	100
23MDP614	Medical Device Design	PE	3	0	0	3	40	60	100
23MDP615	Body Area Networks	PE	3	0	0	3	40	60	100
23MDP616	Foundation Skills in Integrated Product Development	PE	3	0	0	3	40	60	100
23MDP617	Telehealth Technology	PE	3	0	0	3	40	60	100
23MDP618	Medical Informatics	PE	3	0	0	3	40	60	100

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LIST OF OPEN ELECTIVE COURSES

OPEN ELECTIVES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MEO601	Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100
23ECO602	Fundamentals of Electronic Devicesand Circuits	OE	3	0	0	3	40	60	100
23EEO603	Electric Vehicle Technology	OE	3	0	0	3	40	60	100
23EEO604	Renewable Energy System	OE	3	0	0	3	40	60	100
23MEO605	Resource Management Technique	OE	3	0	0	3	40	60	100
23MAO606	Graph Theory	OE	3	0	0	3	40	60	100
23CEO607	Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100
23PMO608	Pharmaceutical Nanotechnology	OE	3	0	0	3	40	60	100
23RAO609	Foundation of Robotics	OE	3	0	0	3	40	60	100
23CSO610	Introduction to Drone Technologies	OE	3	0	0	3	40	60	100
23MDO611	Biomolecules	OE	3	0	0	3	40	60	100
23CSO612	Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100

OPEN ELECTIVES- II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HSO701	English for Competitive Examinations	OE	3	0	0	3	40	60	100
23MGO702	Democracy and Good Governance	OE	3	0	0	3	40	60	100
23MEO703	Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100

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23CEO704	Remote Sensing Concepts	OE	3	0	0	3	40	60	100
23MEO704	Nano Technology	OE	3	0	0	3	40	60	100
23MDO705	Ultrasound Principles and itsMedical Applications	OE	3	0	0	3	40	60	100
23PMO706	IPR For Pharma Industry	OE	3	0	0	3	40	60	100
23RAO707	Concepts in Mobile Robots	OE	3	0	0	3	40	60	100
23ECO708	Energy Technology	OE	3	0	0	3	40	60	100
23EEO709	Sensors and Actuators	OE	3	0	0	3	40	60	100
23MAO710	Operations Research	OE	3	0	0	3	40	60	100
23CSO711	Introduction to Cyber Security	OE	3	0	0	3	40	60	100
23MEO712	3D Printing and Design	OE	3	0	0	3	40	60	100

OPEN ELECTIVES – III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HSO713	Project Report Writing	OE	3	0	0	3	40	60	100
23MAO714	Advanced Numerical Methods	OE	3	0	0	3	40	60	100
23CSO715	Fundamentals of Blockchain Techology	OE	3	0	0	3	40	60	100
23EEO716	Electrical, Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
23CEO717	Geographical Information System	OE	3	0	0	3	40	60	100
23ECO718	VLSI Design	OE	3	0	0	3	40	60	100
23MDO719	Wearable Technology	OE	3	0	0	3	40	60	100
23MEO720	Additive manufacturing	OE	3	0	0	3	40	60	100
23RAO721	Nanomaterials and Application	OE	3	0	0	3	40	60	100
23MGO722	Cost Management of EngineeringProjects	OE	3	0	0	3	40	60	100
23HSO723	Food Safety and Quality Regulations	OE	3	0	0	3	40	60	100
23MDO724	Lifestyle Diseases	OE	3	0	0	3	40	60	100

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GENERAL ELECTIVES COURSES

Course Code	Name of the Subject	Category	Periods/ Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23NCCL01	NCC AIRFORCE LEVEL - 1	GE	3	0	0	3	40	60	100
23NCCL02	NCC AIRFORCE LEVEL - 2	GE	3	0	0	3	40	60	100
23NCCL03	NCC ARMY LEVEL - 3	GE	3	0	0	3	40	60	100
23NCCL04	NCC ARMY LEVEL - 4	GE	3	0	0	3	40	60	100

ELECTIVE - MANAGEMENT COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MGT701	Principles of Management	GE	3	0	0	3	40	60	100
23MGT702	Total Quality Management	GE	3	0	0	3	40	60	100
23MGT703	Engineering Economics and Financial Accounting	GE	3	0	0	3	40	60	100
23MGT704	Human Resource Management	GE	3	0	0	3	40	60	100
23MGT705	Knowledge Management	GE	3	0	0	3	40	60	100
23MGT706	Industrial Management	GE	3	0	0	3	40	60	100
23MGT707	Hospital Management	GE	3	0	0	3	40	60	100
23MGT708	e-Waste Management	GE	3	0	0	3	40	60	100

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LIST OF EMPLOYABILITY ENHANCEMENT COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23EEC101	Soft Skills	EEC	1	0	0	1	100	-	100
23EEC201	Communication Skills / Foreign Language	EEC	0	0	4	2	100	-	100
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
23EEC401	Value Added Course-I	EEC	0	0	4	2	100	-	100
23EEC501	Value Added Course - II	EEC	0	0	4	2	100	-	100
23MDJ601	Project Work	EEC	0	0	10	5	40	60	100
23EEC701	Research Paper Writing/Publication / Hospital / Industry Training	EEC	0	0	4	2	40	60	100
23MDJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100

LIST OF MANDATORY COURSES

MANDATORY COURSES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC501	Introduction to Women and GenderStudies	MC	3	0	0	0	-	-	-
23MDC502	Elements of Literature	MC	3	0	0	0	-	-	-
23MDC503	Film Appreciation	MC	3	0	0	0	-	-	-
23MDC504	Disaster Risk Reduction and Management	MC	3	0	0	0	-	-	-
23MDC505	Constitution of India	MC	3	0	0	0	-	-	-

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MANDATORY COURSES - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC601	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	0	-	-	-
23MDC602	History of Science and Technologyin India	MC	3	0	0	0	-	-	-
23MDC603	Political and Economical Thought fora Human Society	MC	3	0	0	0	-	-	-
23MDC604	State Nation Building and Politics inIndia	MC	3	0	0	0	-	-	-
23MDC605	Industrial Safety	MC	3	0	0	0	-	-	-

SCHEME

Credit Summary

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CREDIT SUMMARY

B.E.- MEDICAL ELECTRONICS

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	4	7	--	--	--	–	3	--	14
BS	12	7	4	--	--	--	--	--	23
ES	4	9	4	4	--	--	--	--	21
PC	--	--	15	18	12	8	--	--	53
PE	--	--	--	--	9	9	--	--	18
OE	--	--	--	--	--	3	6	--	9
GE	--	--	--	--	--	--	3	--	3
EEC	1	2	1	2	2	5	2	9	24
MC	--	--	--	--	--	--	--	--	0
Total	21	25	24	24	23	25	14	9	165

SCHEME FOR SYLLABI

B.E. - Medical Electronics

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SEMESTER I

23HST101   **PROFESSIONAL ENGLISH – I**   **L T P C**
                    (Common to all B.E. & B.Tech. Branches)   **3 0 0 3**

OBJECTIVES
- To develop learning English language through grammar.
- To use grammar efficiently for demonstrating all the four language skills (LSRW).
- To write business letters, dialogue writing, paragraph and essay writing.
- To speak effectively about self introduction and real time situation.
- To build the reading skills through reading comprehension and note taking

UNIT I   VOCABULARY   8
Synonyms and Antonyms - Word Formation - Sentence Types (declarative, imperative, interrogative & exclamatory) - Single Word Substitutes - Use of Abbreviations and Acronyms- Homonyms and Homophones - Collocation - British and American Vocabulary.

UNIT II   GRAMMAR   10
Parts of speech - Be, Have and Do verbs - Punctuation - Tenses - Numerical Adjectives - modal verbs - Single line Definition - Direct and Indirect Speech - Gerunds and Infinitives - Same Word Used as Different Parts of Speech.

UNIT III   WRITING   9
Letter Writing - Business communications - quotations, placing orders, complaints, replies to queries from business customers - Dialogue Writing – Paragraph Writing (descriptive, narrative, expository & persuasive) - Essay Writing - Writing Instructions.

UNIT IV   SPEAKING   9
Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes - Tongue twisters

UNIT V   READING SKILLS   9
Reading Comprehension – Reading techniques, pre-reading, post-reading, comprehension questions (multiple choice questions or short questions) - Short Comprehension Passages, practice skimming - Scanning and Predicting - Reading the passage and taking (Note making) Notes - Scan and understand main contents of the passage.

                                                              TOTAL : 45 PERIODS

Mandatory activity: Self Introduction

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OUTCOMES

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

- Use a wide range of vocabulary in oral and written communication
- Frame grammatically correct sentences
- Write letters, frame paragraphs and Essays, develop conversation.
- Develop speaking skills for self-Introduction, delivering speeches and Technical Presentation
- Read and comprehend the passage, technical content and take notes

TEXT BOOKS

1. Board of Editors. Using English A Course book for Under graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", 1st Edition, Orient Black Swan, Chennai, 2012.
2. MacMillan, Krishna Mohan, Meera Banerji, Developing Communication Skills, Paperback, 2019.

E-RESOURCES

1. http://www.usingenglish.com.
2. https://www.khanacademy.org/humanities/grammar

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	3	1	2	3	-	3	-	-	-
2	-	-	-	-	-	1	2	-	1	3	-	3	-	-	-
3	-	-	-	-	-	3	3	2	3	3	-	3	-	-	-
4	-	-	-	-	-	1	2	1	2	3	-	3	-	-	-
5	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.4	2.2	1.25	1.8	3.0	-	3.0	-	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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23MAT101   **MATRICES AND CALCULUS**   **L T P C**
(Common to all B.E. & B.Tech. Branches)   **3 1 0 4**

OBJECTIVES
- To develop the use of matrix algebra techniques those are needed by engineers for practical application.
- To familiarize the students with differential and integral calculus.
- To describe the student with functions of several variables.
- To acquire the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines.

UNIT I   MATRICES   9+3
Eigen values and Eigen vectors – Properties of Eigen values – Cayley-Hamilton theorem – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of quadratic form.

UNIT II   DIFFERENTIAL AND INTEGRAL CALCULUS   9+3
Differentiation rules: Derivatives of polynomials and exponential functions – The product and quotient Rules – Derivatives of trigonometric functions – The Chain rule – Implicit differentiation – Applications of differentiation: Maximum and Minimum Values – Techniques of integration: Integration by parts – Trigonometric integrals – Integration of rational functions by partial fractions.

UNIT III   FUNCTIONS OF SEVERAL VARIABLES   9+3
Partial derivatives – Homogeneous functions – Euler's theorem – Total derivative – Jacobians – Taylor's theorem for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV   MULTIPLE INTEGRALS   9+3
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double integrals.

UNIT V   VECTOR CALCULUS   9+3
Scalar and vector point functions – Gradient – Divergence and curl – Line integral – Surface integral – Green's theorem in a plane – Volume integral – Divergence theorem – Irrotational and Solenoidal fields.

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OUTCOMES

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

- Classify the matrix algebra methods for solving practical problems
- Discover differential calculus tools in solving various application problems and compare different methods of integration in solving practical problems
- Develop differential calculus ideas on several variable functions.
- Apply multiple integral ideas in solving areas, volumes and other practical problems
- Solve engineering problems using the concept of vector calculus

LIST OF TUTORIALS

a. Computation of Eigen values and Eigenvectors.
b. Calculate differentiation and integration of simple functions.
c. Determining Maxima and minima of functions for two variables.
d. Evaluating double and triple integrals.
e. Computing Gradient, divergence and curl of point functions.

TOTAL: 45+15 PERIODS

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, New Delhi, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

REFERENCES

1. Bali N.P, Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Kanti B. Dutta., "Mathematical Methods of Science and Engineering – Aided with MATLAB", Cengage Learning, New Delhi, 2013.

E-RESOURCES

1. https://nptel.ac.in/courses/111105121 (Differential Calculus and Integral Calculus).
2. https://nptel.ac.in/courses/111107112 (matrix analysis)

Mapping of Cos-Pos & PSOs

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

1-Low 2-Medium 3-High '-' – No Correlation

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23HST102	HERITAGE OF TAMILS	L T P C
	(Common to all B.E. & B.Tech. Branches)	1 0 0 1

UNIT- I   LANGUAGEAND LITERATURE   3

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

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

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

UNIT- III   FOLK AND MARTIAL ARTS   3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu,Oyillattam,Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils

UNIT- IV   THINAI CONCEPT OF TAMILS   3

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

Unit- V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN
            CULTURE   3

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

TOTAL: 15 PERIODS

TEXT 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.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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5. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

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

REFERENCE BOOKS

1. Heritage of Tamils,Publishedby:Yes Dee Publishing Pvt Ltd,Chennai.

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

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23HST102   தமிழர் மரபு   **L T P C**
                                                                          1 0 0 1

UNIT- I   மொழி மற்றும் இலக்கியம்   **3**

இந்திய மொழி குடும்பங்கள்- திராவிட மொழிகள் -தமிழ் ஒரு செம்மொழி -தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தில் சமய சார்பற்ற தன்மை- சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மை கருத்துக்கள் -தமிழ் காப்பியங்கள்- தமிழகத்தில் பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள் -தமிழில் நவீன இலயக்கியத்தின் வளர்ச்சி -தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

UNIT-II   மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை-
சிற்பக்கலை   **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை -ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினை பொருட்கள் ,பொம்மைகள் -தேர் செய்யும் கலை-சுடுமண் சிற்பங்கள் -நாட்டுப்புற தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை-இசை கருவிகள் -மிருதங்கம் ,பறை ,வீணை,யாழ், நாதஸ்வரம் ,தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT-III   நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள்   **3**

தெருக்கூத்து,கரகாட்டம் ,வில்லுப்பாட்டு, கணியான் கூத்து ,ஒயிலாட்டம், தோல்பாவை கூத்து,சிலம்பாட்டம், வளரி ,புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

UNIT-IV   தமிழர்களின் திணைகோட்பாடுகள்   **3**

தமிழகத்தின் தாவரங்களும் , விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறகோட்பாடுகள்-தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவு,கல்வியும்- சங்க கால நகரங்களும் துறை முகங்களும் -சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT-V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு   **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு- இந்தியாவின் பிறபகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்தமருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் -தமிழ்

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புத்தகங்களின் வரலாறு

TOTAL: 15 PERIODS

TEXT BOOKS

1.தமிழக வரலாறு -மக்களும் பண்பாடும் -கே கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2.கணினி தமிழ் -முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)

3.கீழடி -வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4.பொருநை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1.தமிழர் மரபு -முனைவர் ஆ பூபாலன் (வி ஆர்பி பி பப்ளிஷர்ஸ்

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23PHE103	APPLIED PHYSICS FOR ELECTRONICS ENGINEERING	L T P C
	(Common to ECE, EEE & Medical Electronics**)**	3 0 2 4

OBJECTIVES

- To Recognize different lattices and crystal structures
- To explore the principles of lasers and the uses for them in general.
- To build knowledge about optical fibre and its applications.
- To understand the applications of acoustics and ultrasonics in industry.
- To utilize Schrödinger's wave equation and the fundamentals of quantum mechanics to investigate the complicated physical phenomena.
- To analyze the engineering physics that may be used to calculate thermal properties, substance characteristics, optics, acoustics, and ultrasonics.

UNIT I   CRYSTAL PHYSICS   9
Lattice and Unit cell – Crystal Systems and Bravais Lattice – Lattice Planes – Miller Indices – d - Spacing in Cubic Lattice – Calculation of Number of Atoms per Unit Cell – Atomic Radius, Coordination number, Packing factor for SC, BCC, FCC and HCP Structures – Crystal Growth Techniques – Melt Growth Techniques (Bridgman and Czochralski).- Silicon chip Production Process.

UNIT II   PHOTONICS   9
Spontaneous and Stimulated Emission- Population Inversion - Derivation of Einstein's A and B co-efficient – Principle and Working of Laser - He Ne Laser - Direct Band gap and Indirect Bandgap Semiconductors - Semiconductor Diode Laser (Homo junction & hetero junction) - Applications of Lasers in Science, Engineering and Medicine – Working principle of Laser Printer - Digital Laser Material Processing Technology.

UNIT III   FIBRE OPTICS   9
Principle and Propagation light in Optical Fibres- Derivation of Numerical Aperture and Acceptance angle - Fibre Optic Communication System - Classification of Optical Fibre -Ray Optics - losses in Optical Fibre- Types of fibre optic sensors. (Pressure, Temperature fibre)-Local area Network (qualitative) -Advantages of Optical Fibre and Application of Optical Fibre.

UNIT IV   ACOUSTICS & ULTRASONICS   9
ACOUSTICS: Classification of Sound – Decibel - Weber Fechner law- Reverberation-Sabine's formula (Qualitative) - Factors affecting Acoustics of Buildings and their remedies.
ULTRASONICS: Properties -Production of ultrasonic's - Magnetostriction and Piezoelectric methods - Non Destructive Testing – Pulse Echo System, through Transmission and Reflection modes - Medical Endoscope - Sonogram.

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UNIT V   QUANTUM PHYSICS   **9**

Black Body Radiation – Planck's Theory (Derivation) – Electron Diffraction – Wave function and its Physical Significance – Schrödinger's Wave Equation: Time Independent and Time Dependent Equations – Particle in a One-Dimensional Box - Scanning Electron Microscope - Transmission Electron Microscope - Quantum Tunneling – Scanning Tunneling Electron Microscope.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply crystallographic knowledge to get familiar with the structure of crystalline solids.
- Learn the basics of lasers and their use in some applications
- Acquire knowledge about fibre optics and apply it to various fields
- Understand the basics of Acoustic, Ultrasonic's and estimate the applications in diverse fields.
- Apply the basic principles of quantum mechanics and Schrödinger's wave equation to study the complex physical phenomenon.
- Relate elasticity, optics, and semiconductor physics in engineering applications.

TEXT BOOKS

1. P.Mani, "Engineering Physics Practicals", Dhanam Publications, 2019.
2. Rajendiran V, "Engineering Physics" Tata McGraw Hill, 2012.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGrawHill (Indian Edition), 2017

REFERENCES

1. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials" Narosa Publishing House, 2009
3. K.Thyagarajan and A.Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019

E-RESOURSES

1. https://archive.nptel.ac.in/courses/122/107/122107035/
2. https://archive.nptel.ac.in/courses/115/101/115101107/

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LIST OF EXPERIMENTS
(Common to ECE EEE & Medical Electronics)
(Eight experiments are to be conducted in Lab)

1. Determination of wavelength of laser.
2. Determination of particle Size lycopodium powder using laser.
3. Fibre Optics: Determination of Numerical Aperture and Acceptance angle.
4. Determination of wavelength of mercury spectrum- Spectrometer.
5. Determination of velocity of ultrasonic in liquid.
6. Verification of truth tables of logic gates using IC's: (OR, AND, NOT, XOR, NOR and NAND)
7. Determination of thickness of wire - Air wedge method.
8. Determination of bandgap of a given semiconductor diode.
9. Determination of reverse bias characteristics of the photodiode. (Virtual)
10. Compact disc- Determination of width of the groove using laser. (virtual)

TOTAL: 15 PERIODS

Mapping of Cos-Pos & PSOs

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

1-Low 2-Medium 3-High '-' – No Correlation

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23CYE101 **ENGINEERING CHEMISTRY** **L T P C**
(Common to CSE, EEE, ECE, CSE (CS), MDE, AIDS, IT & PT) **3 0 2 4**

OBJECTIVES

- To classify the impurities of water and know the treatment and the conditioning methods for domestic and industrial uses.
- To develop an understanding the fundamentals of polymers.
- To gain knowledge the phase rule and its applications in engineering field.
- To explain the basics of Nanochemistry, synthesis, properties and applications of nano materials.
- To be familiar with the types of corrosion and control measures and working of batteries.
- To inculcate practical skills in the determination of water quality parameters and instrumental analysis.

UNIT I   WATER TECHNOLOGY 9

Introduction - Characteristics – Hardness – Estimation of hardness by EDTA method – Alkalinity and its estimation - Boiler feed water – Requirements –Boiler troubles (Scale and Sludge) – Internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis-Nano filtration - Municipality water treatment - Break point chlorination.

UNIT II POLYMER CHEMISTRY 9

Introduction - Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting plastic. Functionality – Degree of polymerization. Types of polymerization: Addition Condensation and Copolymerization, Properties of polymers: Glass transition temperature, Tacticity- Molecular weight – Weight average, Number average and Polydispersity index- Preparation, properties and uses of PVC, Nylon 6,6, Polyethylene - Rubbers – Types – Vulcanization of rubber – Plastics – Moulding constituents of plastics – Moulding of plastics - Compression, injection and blow moulding-Biodegradable polymers-Conducting polymers.

UNIT III PHASE RULE AND ALLOYS 9

Phase rule - Explanation of terms involved – One component system – Water system – Condensed phase rule – Construction of phase diagram by thermal analysis – Simple eutectic systems (Lead – Silver system only). Alloys: Introduction – Definition- Properties of alloys-Significance of alloying, functions and effect of alloying elements - Ferrous alloys – Nichrome and stainless steel – Heat treatment of steel, non-ferrous alloys – Brass and bronze.

UNIT IV CHEMISTRY OF NANO MATERIALS 9

Nano chemistry – Basics (Surface area to volume ratio - Quantum confinement – 0D, 1D, 2D& 3D) - Distinction between molecules, nanoparticles and bulk materials- Characterization of nanomaterials using EDX and HR-TEM. Synthesis of nano materials: Top down approach - Ball milling - Bottom up approach - Sol-gel method, Chemical vapour deposition - Properties of nanomaterials and Applications of nanomaterials (Nano products of today).

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UNIT V ELECTROCHEMISTRY, CORROSION AND ITS CONTROL   9

Introduction- Electrochemical cells, applications of electrochemical series-Reference Electrode- standard calomel electrode, ion selective electrode, glass electrode, Potentiometric titration - Redox titration, Conductometric titration- Strong acid vs Strong base. Corrosion – Types – Chemical Corrosion – Electrochemical Corrosion (galvanic and differential aeration) - Factors influencing corrosion – Material selection and design aspects-Control methods of corrosion – sacrificial anodic and impressed current cathodic protection.

OUTCOMES

Upon completion of the course, Students will be able to

- Infer the quality of water and Identify the method of removal of impurities from water for domestic and industrial purpose.
- Identify the different types of polymers, polymerization processes and some special properties and applications of polymers.
- Apply theknowledge of phase rule to alloy making for various engineering applications.
- Discuss the fundamentals of the nano materials and apply the basic concepts of nanochemistry in engineering applications.
- Analyze the causes of corrosion, suggest the control measures and discuss the functions of batteries.
- Determine the water quality parameters and perform quantitative chemical analysis By pH metery, flame photometry, conductometry and potentiometry.

                                                    TOTAL: 45 + 15 = 60 PERIODS

TEXT BOOKS

1. Jain P.C and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpet Rai Publishing Company (P) Ltd. New Delhi, 2015.
2. Viswanathan B, "Nanomaterials" Alpha Science International Ltd, 2009.
3. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

REFERENCES

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Second Edition, Cambridge University Press, Delhi, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/104105084
2. http://library.iitbbs.ac.in/open-access-e-resources.php

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LIST OF EXPERIMENTS
(Any Eight Experiments to be conducted)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of sodium and potassium present in water using flame photometer.
7. Conductometric Precipitation Titration using $BaCl_2$ and Na_2SO_4.
8. Conductometric titration of strong acid vs strong base.
9. Estimation of Ferrous ions by Potentiometric Titration.
10. Estimation of copper content in the brass by Iodometry.

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	-	1	-	3	-	-	-	-	2	-	-	-
2	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
3	2	2	3	1	1	1	-	-	-	-	-	1	-	-	-
4	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-
5	2	1	2	1	3	-	1	-	-	-	-	-	-	-	-
6	2	3	-	2	3	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	1.5	-	-	-

1-Low 2-Medium 3-High '-' – No Correlation

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23GEE101 **PROGRAMMING IN C** **L T P C**
(Lab Embedded Theory Course) **3 0 2 4**

OBJECTIVES
- To develop C Programs using basic programming constructs.
- To demonstrate C programs using arrays and strings.
- To know the applications in C using functions and pointers.
- To understand the structures and Unions.
- To construct input/output and file handling programs in C and perform read and write operations on file.
- To apply the practical knowledge through the various concepts in C.

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

UNIT II ARRAYS AND STRINGS 9
Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program**:** Computing Mean, Median and Mode – Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) – String operations: length, compare, concatenate, copy –Sorting – Selection sort, Insertion sort, Merge sort, quick sort –Searching – linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9
Introduction to functions: Function prototype, function call, Built–in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions – Pointers – Pointer operators – Arrays and pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

UNIT IV STRUCTURES 9
Structure – Example Programs – Nested structures – Pointer in Structures – Array of structures - Example Program using structures and pointers – Self referential structures – Dynamic memory allocation.

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

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LIST OF EXPERIMENTS
(Any Eight Experiments to be conducted)

1. Programs using I/O statements, expressions and decision–making constructs.
2. Write a program to find whether the given year is leap year or Not.
3. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
4. Check whether a given number is Armstrong number or not?
5. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
   a) 5 if it is a perfect cube.
   b) 4 if it is a multiple of 4 and divisible by 6.
   c) 3 if it is a prime number.
6. Sort the numbers based on the weight in the increasing order as shown below
   <10,its weight>, <36,its weight> <89,its weight>
7. Populate an array with height of persons and find how many persons are above the average height.
8. From a given paragraph perform the following using built–in functions:(i)Find the total number of words.(ii)Capitalize the first word of each sentence.(iii)Replace a given word with another word.
9. Solve towers of Hanoi using recursion.
10. Locate and Display the Contents of an Array using Pointers.
11. Generate salary slip of employees using structures and pointers.
12. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 +15 = 60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to,
- Develop C programs for simple applications making use of basic constructs,
- Implement C programs for simple applications making use of basic arrays and strings.
- Construct C programs involving functions, recursion and pointers
- Write C programs using structures.
- Design applications using sequential and random access file processing.
- Do problem solving by applying various programming methodologies.

TEXT BOOKS
1. E.Balagurusamy,"Programming in ANSI C", Tata McGraw Hill, 8th Edition, 2019.
2. Kernighan, B.W and Ritchie,D.M,"The C Programming language", 2nd Edition, Pearson Education, 2006.

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REFERENCES

1. ReemaThareja, "Programming in C", Oxford University Press, 2nd Edition, 2016.
2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt.Ltd., 2011.

E – RESOURCES

1. https://nptel.ac.in/courses/106/105/106105085/ (Introduction to C Programming)
2. https://nptel.ac.in/courses/106/106/106106210/ (Stack Operations)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	2	1	1	1	2	-	3	2	1	2	-
2	2	2	2	1	2	1	1	1	2	-	3	3	2	2	-
3	2	3	2	1	2	1	1	1	2	-	3	2	2	2	-
4	3	2	2	1	3	1	1	1	2	-	3	3	2	2	-
5	2	3	3	1	2	1	2	1	2	-	3	2	2	3	-
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	-
AVG	2.00	2.33	2.33	1.17	2.00	1.17	1.00	0.83	2.00	0.17	2.83	2.33	1.83	2.17	-

1-Low 2-Medium 3-High '-' – No Correlation

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SEMESTER II

23HST201   **PROFESSIONAL ENGLISH – II**   **L T P C**
(Common to all B.E. & B.Tech. Branches)   **3 0 0 3**

OBJECTIVES
- To use grammatical components effectively in written communication.
- To read and understand on comprehend technical writing.
- To develop skills for writing email, business letters, Job Application Letter and Resume.
- To write checklist, recommendation, transcoding graphics and letter.
- To speak fluently in real contexts.

UNIT I   GRAMMAR   **9**
Articles - Prepositions - Compound words - Conditionals - Subject verb agreement - Active and Passive voice - Impersonal Passive Voice.

UNIT II   LISTENING & READING   **9**
Syllabification – Reading Vocabulary - Reading Newspapers - Listening to Youtube Documentaries - Listening to Podcast - Listening to Motivational Movies.

UNIT III BUSINESS WRITING   **9**
E-mail writing - fixing an appointment, cancelling appointment, conference details, training programme details, paper submission for seminars and conferences - Job Application Letter and Résumé.

UNIT IV WRITING   **9**
Checklist - Writing Recommendations - Transcoding Graphics - Bar Chart, Flow Chart, Pie Chart and Tables - Formal Letter Writing - inviting dignitaries and declining invitations.

UNIT V SPEAKING   **9**
Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging - Suggesting - Comparing and Contrasting – Expressing - Finding out facts, attitudes and opinions - Situational Role-play.

TOTAL: 45 PERIODS

Mandatory activity: Power Point Presentation

OUTCOMES
Upon completion of the course, the students will be able to:
- Use grammar to frame sentences and write sentences in passive forms
- Read vocabulary, newspaper and improve listening skills
- Draft emails, write business letters, construct resume with job application letter.
- Frame checklist, write recommendation and Transcoding graphical representation.
- Develop speaking skill for taking part in Collaborative task and Situational Role-play.

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TEXT BOOKS
1. S. Sumant Maven Learning. Technical English II.
2. KN Shoba, Lourdes Joavani Rayen. Communicative English. Published by Cambridge university, 2017.

REFERENCES
1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists", Cambridge University Press, 1st Edition, Foundation Books, New Delhi, 2013.
2. Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.
3. Norman Whitby, Business Benchmark- Pre-Intermediate to Intermediate, Students book, Cambridge University Press, 2006.

E-RESOURCES
1. https://www.fluentu.com/Blog/english/english-small-talk
2. https://www.britishcouncil.com

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-
2	-	-	-	-	2	1	1	1	2	3	-	3	-	-	-
3	-	-	-	-	2	1	2	1	2	3	-	3	-	-	-
4	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
5	-	-	-	-	-	2	1	1	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	2.0	1.2	1.2	1.0	2.0	3.0	-	3.0	-	-	-

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23MAT201   **STATISTICS AND NUMERICAL METHODS WITH MATLAB**   **L T P C**
(Common to all B.E./ B.Tech. Branches)   **3 1 0 4**

OBJECTIVES

- To provide the necessary basic concepts in testing of hypothesis for small and large samples which plays an important role in real life problems.
- To acquaint the knowledge of classifications of design of experiments.
- To extend the basic concepts of solving algebraic and transcendental equations.
- To apply the numerical techniques of interpolation and integration.
- To produce the knowledge of various techniques in solving ordinary differential equations.

UNIT I   TESTING OF HYPOTHESIS   **9+3**

Sampling distribution – Testing of significance for single proportion, single mean and difference of means – Test of significance for small samples by 't' test – Snedecor's F- test of significance – Chi-square test : Chi-square test of goodness of fit – Independent of attributes.

UNIT II   DESIGN OF EXPERIMENTS   **9+3**

Basic principles of experimental design – Completely randomised design – Analysis of vaiance for one way classification – Randomised block design – Analysis of variation for two factor experiments variations – Latin square design.

UNIT III   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   **9+3**

Solution of algebraic and transcendental equations by Newton Raphson method – Solution of simultaneous algebraic equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

UNIT IV   INTERPOLATION AND NUMERICAL INTEGRATION   **9+3**

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's interpolation formula – Newton's divided difference formula – Numerical integration by Trapezoidal and Simpson's 1/3 rule –Numerical double integration by Trapezoidal rule.

UNIT V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   **9+3**

Euler's method – Modified Euler's method – Fourth order Runge - Kutta method for solving first order equations – Taylor's series method – Predictor-corrector methods: Milne's method – Adams-Bash forth method.

OUTCOMES

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

- Analyze the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Summarize the numerical techniques of interpolation in various intervals and apply the

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numerical techniques of integration for engineering problems.
- Produce various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial conditions by using certain techniques with engineering applications.

LIST OF TUTORIALS

1. Solving one sample and paired sample't' test.
2. Determination of roots of a polynomial.
3. Solution of linear system of equations by Gauss Seidel methods.
4. Evaluation of line integrals by Trapezoidal rule.
5. Solution of ordinary differential equations by Euler's method.

TOTAL:45+15=60 PERIODS

TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Statistics and Numerical Methods", S. Chand and Company Ltd., NewDelhi, 2010.

REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 12th Edition, New Delhi, 2020.

E-RESOURCES

1. https://nptel.ac.in/courses/111/105/111105041/ (Statistics)
2. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)

Mapping of Cos-Pos & PSOs

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

1-Low 2-Medium 3-High '-' – No Correlation

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23PHT203   **ADVANCED PHYSICS FOR ELECTRONICS ENGINEERING**   **L T P C**
(Common to ECE, EEE & Medical Electronics)   **3 0 0 3**

OBJECTIVES
- To Learn the basic conduction process in conducting materials
- To understand the fundamentals of semiconducting materials and plastic electronics.
- To develop the knowledge in Magnetic and Superconducting materials.
- To grab the concept of Spintronics & Nano Electronic Devices
- To know the basics of Biophotonics and Biomaterials.

UNIT I   CONDUCTING MATERIALS & DIELECTRIC MATERIALS   9

Conductors – Classical Free Electron Theory of Metals – Electrical and Thermal Conductivity – Wiedemann – Franz law, Lorentz number – Draw backs of Classical Theory -Fermi Dirac distribution function – Density of energy states – Carrier concentration in metal. Dielectric Materials: Electrical Susceptibility – Dielectric constant – Electronic, Ionic, Orientation and Space Charge Polarization- Internal filed and Clausius-Mosotti Relation.

UNIT II   SEMICONDUCTING MATERIALS & PLASTIC ELCTRONICS   9

Elemental and Compound Semiconductors – Intrinsic Semiconductor – Carrier concentration derivation in Intrinsic Semiconductor – Extrinsic semiconductor- Derivation of carrier concentration in N-type and P-type semiconductor (qualitative) – Hall effect and applications.

Plastic Electronics: Principle of Organic Materials (OMs) - Properties of OMs, Including Electronic and Optical Properties - Organic devices and working principles (*ex.* Transistors, Diodes, Sensors, Solar cells) - Applications of organic materials and Devices.

UNIT III   MAGNETIC & SUPERCONDUCTING MATERIALS   9

Electron theory of magnetism; Dia, Para, Ferromagnetism and their Properties- Domain theory of Ferromagnetism – Hard and Soft magnetic Materials - Ferrites - Superconductivity: Properties – Type I and Type II Superconductors – BCS theory of superconductivity – General applications of Superconductors –Cryotron and Magnetic levitation.

UNIT IV   SPINTRONICS & NANO ELECTRONIC DEVICES   9

Introduction- Quantum confinement- Quantum well, Quantum Wire and Quantum Dot structure – Tunnelling: Single Electron Phenomena and Single Electron Transistor (SET) - Spintronics – Quantum Dot Laser- Quantum Bits (qubits)- Quantum Computing- Carbon Nano Tubes (CNT) structure, Properties and applications - Concepts of Graphene Transistor – Carbon nano tube transistor (qualitative) - Applications of Nanodevices and Nanosensors.

UNIT-V BIOPHOTONICS & BIOMATERIALS   9

BIOPHOTONICS: Basic principles of light - Reflection - Refraction - Absorption - Polarization - Interference – Coherence- Principles of Optical biosensing - Immobilization of Bio-recognition elements-Types of Optical Biosensor

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BIOMATERIALS: Definition and classification of Bio-Material- Viscoelasticity and biomaterial performance- Stainless Steel Alloys and its applications- Biopolymers and its Applications - Shape Memory Alloy.

TOTAL: 45 PERIODS

OUTCOMES

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

- Obtain knowledge from conducting and dielectric properties of materials.
- Learn the fundamentals of plastic electronics, semiconductor physics, and how these technologies are used in many types of electronic devices.
- Utilise the uses of magnetic and superconducting materials.
- Demonstrate knowledge and understanding of spintronics and nano electronic devices
- Identify and explain the fundamentals of biophotonics and biomaterials.

TEXT BOOK

1. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2012.
2. R,Murugesan, Er,Kiruthiga sivaprasath "Modern Physics", S.chand, seventh Edition 2013
3. Gupta and Kumar, "Solid State Physics" K. Nath & Co. (2018)

REFERENCES

1. Sujata V. Bhatt, "Biomaterials", Second Edition, Narosa Publishing House, 2005.
2. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
3. Charles Kittel "Introduction to Solid State Physics", Wiley (2019)
4. D.N. Vasudeva "Electricity and Magnetism" S.Chand&Co, twelfth edition (2007)

E – RESOURCES

1. https://archive.nptel.ac.in/courses/115/101/115101092/
2. https://nptel.ac.in/courses/108104113

Mapping of Cos-Pos & PSOs

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

1-Low 2-Medium 3-High '-' – No Correlation

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23CYT201   **ENVIRONMENTAL SCIENCE AND SUSTAINABILITY**   **L T P C**

(Common to All B.E /B.Tech Branches)   **3 0 0 3**

OBJECTIVES

- To understand the importance of the environment, ecosystem, biodiversity and its conservation.
- To impart knowledge on various kinds of pollutions, solid waste management and precautionary measures for disasters.
- To be familiar with the social issues and identify the possible way to improve the quality of the environment.
- To analyze the problems of overpopulation and understand the value education.
- To familiarize the concept of sustainability and implement sustainable practices in various fields.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   9

Definition, scope and importance of environment – Need for public awareness - Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Biogeographically classification of India – Value of biodiversity – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity – Endangered and endemic species of India – Conservation of biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

Activity: Biodiversity in and around the campus and report submission.

UNIT II ENVIRONMENTAL POLLUTION   9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: causes, effects and control measures of municipal solid wastes - E-waste – Role of an individual in prevention of pollution - Pollution case studies – Disaster management: floods, earthquake and cyclone.

Activity: Local pollution case study and report submission.

UNIT III SOCIAL ISSUES AND THE ENVIRONMENT   9

Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies - Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Green Chemistry and principles - Environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Public awareness.

Activity: Creating environmental awareness.

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UNIT IV HUMAN POPULATION AND THE ENVIRONMENT   9

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.
Activity: Visit to local primary health center.

UNIT V SUSTAINABLE MANAGEMENT   9

Sustainability-Concept, needs and challenges-economic, social and aspects of sustainability-From unsustainability to sustainability-Millennium development goals, and protocols-Sustainable Development Goals-Targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-Case studies. Zero waste and R concept, Material Life cycle assessment, Environmental Impact Assessment, Sustainable habitat: Energy efficiency, Sustainable transports.
Activity: Field trips to local organizations or facilities with sustainable practices in place.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to
- Acquire knowledge on public awareness & about the environment, ecosystem and biodiversity.
- Find solutions for pollutions and waste management to improve the quality of environment.
- Identify the causes of social issues and apply the concept of green chemistry to maintaining a clean environment.
- Analyze the effects of human population and issues related to the environment and human health.
- Understand the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXT BOOKS
1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.
3. Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", 1st edition, Prentice Hall, 2015.

REFERENCES
1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd, Hydrabad, 2015.
2. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.

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3. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

E-RESOURCES
1. https://nptel.ac.in/courses/122102006/
2. https://swayam.gov.in/nd1_noc19_ge22/preview

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	3	2	-	1	3	-	1	-	-	1	-	-	-
2	2	2	2	2	2	2	1	-	-	-	-	-	-	-	-
3	-	2	2	2	1	1	3	-	-	-	-	-	-	-	-
4	1	2	2	1	1	2	3	3	-	-	-	-	-	-	-
5	-	2	2	2	2	1	1	1	-	2	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-

1-Low 2-Medium 3-High '-' – No Correlation

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23EET202	ELECTRIC CIRCUIT ANALYSIS	L T P C
		3 0 0 3

OBJECTIVES

- To understand the basic concepts of DC and AC circuits behavior.
- To know the different methods of circuit analysis using Network theorems.
- To study the steady state response of the circuits subjected to step and sinusoidal excitations.
- To understand the transient response and resonance of electric circuits
- To learn about coupled circuits and network topologies.

UNIT I   BASIC CIRCUITS ANALYSIS   9

Basic elements of electric Circuits - Voltage and Current Sources - Series and Parallel Connected Independent Sources - Ohms Law - Kirchhoff's Laws - Resistors in series and parallel circuits - Mesh current and node voltage method of analysis for D.C and A.C. circuits..

UNIT II   NETWORK THEOREMS FOR DC AND AC CIRCUITS   9

Network reduction: Voltage and current division - Source transformation – Star Delta conversion - Thevenin's and Norton's Theorem - Superposition Theorem - Maximum power transfer theorem - Applications of network theorems.

UNIT III   SINUSOIDAL STEADY STATE ANALYSIS   9

Characteristics of Sinusoids - The Complex Forcing Function – Phasor and Phasor relationship for R, L and C - Impedance and Admittance - AC Circuit Power Analysis - Instantaneous Power - Average Power - Apparent Power and Power Factor - Complex Power - Sinusoidal Steady State analysis of RL, RC and RLC circuits

UNIT IV   TRANSIENTS AND RESONANCE IN RLC CIRCUITS   9

Basic RL and RC Circuits - Source Free RL, RC Circuits - The Unit Step Function - Transient response of RL, RC and RLC Circuits for DC input - Frequency Response - Series Resonance - Parallel Resonance - Quality Factor and Bandwidth.

UNIT V   COUPLED CIRCUITS AND TOPOLOGY   9

Magnetically Coupled Circuits - Self and mutual inductance - Dot rule - Coefficient of coupling - Introduction to Network Topology - Trees and General Nodal analysis - Links and Loop analysis.

TOTAL : 45 PERIODS

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OUTCOMES

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

- Understand and evaluate DC ad AC electrical circuits
- Develop the capacity to apply the circuit theorems in real time
- Acquire the knowledge in steady state analysis of electric circuits
- Analyze the concepts of transients and resonance in RLC circuits
- Explain the coupled circuits and network topologies

TEXT BOOKS

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", McGraw Hill Science Engineering, Ninth Edition, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", sixth Edition ,Tata McGraw Hill, 2019.

REFERENCES

1. Chakrabati A, "Circuits Theory (Analysis and synthesis)", Dhanpath Rai & Sons,New Delhi, 2018.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis",Tata McGraw Hill, Fifth edition 2017.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/108/105/108105159/   (Network Analysis)
2. https://onlinecourses.nptel.ac.in/noc20_ee64/preview (Basic Electrical Circuits)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	-	-	-	-	-	1	-	-	1	-	-
2	3	3	2	3	-	-	-	-	-	1	-	-	1	-	-
3	3	3	2	3	-	-	-	-	-	1	-	1	1	-	-
4	3	3	3	2	-	-	-	-	-	1	-	1	1	-	-
5	3	3	3	2	-	-	-	-	-	1	-	1	1	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2.4	2.2	-	-	-	-	-	1	-	0.6	1	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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23HST202 **TAMILS AND TECHNOLOGY** **L T P C**
1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY   3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY   3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- ThirumalaiNayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY   3
Dam, Tank, ponds, Sluice, Significance of 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   3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

TOTAL: 15 PERIODS

TEXT 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.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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6. .Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

REFERENCES

1. Heritage of Tamils, Published by:Yes Dee Publishing Pvt Ltd, Chennai
2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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23HST202   தமிழரும் தொழில்நுட்பமும்

L T P C
1 0 0 1

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

அலகு II   வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:   3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III   உற்பத்தித் தொழில் நுட்பம்:   3
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV   வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:   3
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுமித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V   அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:   3
அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

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TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1.தமிழரும் தொழில்நுட்பமும், முனைவர் கே பூபாலன் வி ஆர் பி பப்ளிஷர்ஸ்

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23GEE201   **ENGINEERING GRAPHICS**   **L T P C**
                          (Common to all Programmes)   **3 0 2 4**

OBJECTIVES
- To acquire the knowledge of various curves.
- To learn projections of points, lines, planes viewed in different positions.
- To impart the graphic skills for converting pictorial views of solids in to orthographic views and perspective projections.
- To learn the principles of projection of simple solids.
- To gain the knowledge about the section of solids and development of surfaces of the given solids.

UNIT I   PLANE CURVES (Manual drafting)   9+3
Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per BIS conventions. **(Not for Examination)**
Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the curves.

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACES (Manual drafting)   9+3
Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III ORTHOGRAPHIC AND PERSPECTIVE PROJECTIONS (Manual drafting)   9+3
Conversion of isometric projection into orthographic projection. Perspective projection of prisms, pyramids, cones and cylinders by visual ray method.

UNIT IV   PROJECTION OF SOLIDS (CAD software)   9+3
Projections of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT V   SECTION OF SIMPLE SOLIDS AND DEVELOPMENT OF SURFACES (CAD
              software)   9+3
Sectioning of simple solids like prisms – pyramids, cylinder and cone - Inclined to one reference plane. Development of lateral surfaces of simple and truncated solids: Prisms, Pyramids, Cylinders and Cones.

                                    TOTAL: 45+15=60 PERIODS

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OUTCOMES

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

- Predict the construction of various curves.
- Analyze the principles of projection of various planes by different angle to project points, lines and plane surfaces.
- Draw the projection of three dimensional into two dimensional objects and perspective projections.
- Draw the principles of projection of simple solids by change of position method.
- Construct the sectional views of components and develop the component surface.

TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., - "Engineering Graphics", 15th Edition, New Age International (P)   Limited, 2018.
2. Natarajan K.V., "Engineering Graphics", 32nd Edition, Dhanalakshmi Publishers, 2019.
3. Bhatt N.D., "Engineering Drawing", 53rd Edition Charotar Publishing House Pvt. Ltd., 2014.

REFERENCES

1. K.R. Gopalakrishna, "Engineering Drawing Volume 1 & 2", 55th Edition, Subhas Publications, Bangalore, 2017.
2. T.Jeyapoovan., "Engineering Graphics using Auto CAD" 3rd Edition, vikas publishing house Pvt Ltd, New Delhi, 2017.
3. Dhananjay A. Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.

E- RESOURCES

1. https://nptel.ac.in/courses/112/103/112103019/ - (Geometric Constructions)
2. https://nptel.ac.in/courses/105/104/105104148/ - (Projections)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	3	2	3	-	-	-	-	-	1	-	-	1	-	-
3	3	3	2	3	-	-	-	-	-	1	-	1	1	-	-
4	3	3	3	2	-	-	-	-	-	1	-	1	1	-	-
5	3	3	3	2	-	-	-	-	-	1	-	1	1	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2.4	2.2	-	-	-	-	-	1	-	0.6	1	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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23GEL201	**ENGINEERING PRACTICES LABORATORY**	**L T P C**
	(Common to all Programmes)	**3 0 2 4**

OBJECTIVES

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wirework.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB

GROUP – A (CIVIL & ELECTRICAL)

PART I   **CIVIL ENGINEERING PRACTICES**   **15**

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used inhousehold appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

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

PART II   **ELECTRICAL ENGINEERING PRACTICES**   **15**

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

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g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III   MECHANICAL ENGINEERING PRACTICES   15

WELDING WORK:
   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
   b) Practicing gas welding.

BASIC MACHINING WORK:
   a) (simple)Turning
   b) (simple)Drilling
   c) (simple)Tapping

ASSEMBLY WORK:
   a) Assembling a centrifugal pump.
   b) Assembling a household mixer.
   c) Assembling an airconditioner.

SHEET METAL WORK:

   a) Making of a square tray

FOUNDRY WORK:

   a) Demonstrating basic foundry operations.

PART IV   ELECTRONIC ENGINEERING PRACTICES   15
SOLDERING WORK:

   a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK
   a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
   a) Study an elements of smart phone.
   b) Assembly and dismantle of LED TV.
   c) Assembly and dismantle of computer/ laptop

TOTAL = 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
   • Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
   • Wire various electrical joints in common household electrical wirework.
   • Weld various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly

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of common household equipments; Making a tray out of metal sheet using sheet metal work.

- Solder and tests simple electronic circuits; Assembling and testing simple electronic components on PCB

Mapping of Cos-Pos & PSOs

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

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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JAS-ANZ
BSCIC
ISO 9001 REGISTERED

ESTD 2001

23EEC201	COMMUNICATION SKILLS	L T P C
	(Common to all B.E. & B.Tech. branches)	0 0 4 2

OBJECTIVES
- To use vocabularies appropriately in a sentence and various situations.
- To improve communicative competence through listening.
- To make effective presentations and group discussions.
- To read and recognize different context.
- To write paragraph, essay and special addresses.

UNIT I   VOCABULARY   6
Vocabulary building – Articulate ideas and thoughts; usage of palindromes, greetings, wishes, festival related words - Vocabulary Words with Sentences. - Idiomatic Expressions.

UNIT II   LISTENING   6
Listening Skill- Its importance – Purpose - Process - Types- Barriers - Effective Listening strategies- Listening to telephonic conversations – Watching Inspiring Speech videos on Youtube - Listening native speaker's videos for pronunciation - Listening to broadcast, messages, announcements - Listening to Instagram Videos.

UNIT III   SPEAKING   6
JAM Talk - Role play - Debate - Conversational skills (formal and informal) - Conversation practice - Group Discussion and Interview Skills – Introducing oneself and others – Goal Settings - Immediate, Long term and short term.

UNIT IV   READING   6
Reading for the Main idea- Finding Specific Information - Reading for Detail - Read and recognize different text types ranging from newspaper, articles, magazines, books and Reading autobiographies.

UNIT V   WRITING   6
Paragraph Writing - Essay writing - Creative writing - Special Address on Specific topic - Welcome Address, vote of Thanks.

OUTCOMES
Upon completion of the course, the students will be able to:
- Improve vocabulary and express the same contextually.
- Listen and comprehend the general and technical text.
- Speak effectively in presentation, debate and group discussions.
- Read and understand the concept from newspapers, articles, magazines and books.
- Draft special addresses, welcome address, vote of thanks and write paragraph and essay.

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TEXT BOOKS

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011

REFERENCES

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan:
3. Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press 1992.
4. Technical communication by Asraf rezvi

EXTENSIVE READING

1. Dr. A. P. J. Abdul Kalam " Wings of Fire "

E-RESOURCES

1. https://youglish.com
2. https://newsinlevels.com
3. https://britishcouncil.org
4. https://writeandimprove.com

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
2	-	-	-	-	-	1	-	-	1	3	-	3	-	-	-
3	-	-	-	-	-	1	2	2	3	3	-	3	-	-	-
4	-	-	-	-	-	2	2	-	3	3	-	3	-	-	-
5	-	-	-	-	-	1	1	-	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.20	1.50	1.50	1.80	3.00	-	3.00	-	-	-

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SEMESTER III

23MAT302	TRANSFORMS AND RANDOM PROCESSES	LT P C
	(Common to ECE & MDE)	3 1 0 4

OBJECTIVES

- To provide necessary basic concepts in random variables for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of one and two dimensional random variables describe real life phenomenon.
- To understand the classifications of random processes and concepts.
- To explain Fourier transforms techniques used in wide variety of situations.
- To utilize the effective mathematical tools to develop Z transform techniques for discrete time systems.

UNIT I   RANDOM VARIABLES   9+3

Random variables - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable.

UNIT II   TWO – DIMENSIONAL RANDOM VARIABLES   9+3

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

UNIT III RANDOM PROCESSES   9+3

Classification – Stationary process – Markov process – Poisson process – Discrete parameter-Markov chain – Chapman Kolmogorov equations (Statement only) – Limiting distributions.

UNIT IV FOURIER TRANSFORMS   9+3

Statement of Fourier integral theorem – Fourier transform – Fourier sine and cosine transforms – Properties of Fourier transform – Convolution theorem for Fourier transform – Parseval's identity for Fourier transform.

UNIT V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS   9+3

Z-transforms: Some standard Z-transforms – Elementary properties – Some useful Z- transforms and inverse Z- transforms – Convolution theorem – Evaluation of Inverse Z-transforms by partial fraction method – Application to difference equations.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

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

- Apply the concept of random variables in engineering disciplines.
- Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.
- Understand the basic concepts of random processes which are widely used in signal processing to analyze and manipulate signals.
- Analyze some of the physical problems of engineering by Fourier transforms.
- Apply Z transforms techniques in solving difference equation.

TEXT BOOKS:

1. Grewal, B.S., "Higher Engineering Mathematics & quot;, 43rd Edition, Khanna Publishers, New Delhi, 2014..
2. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

REFERENCES:

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier,1st Indian Reprint, 2007.
2. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.

E-RESOURCES

1. https://nptel.ac.in/courses/117105085 (Probability and Random Processes)
2. https://archive.nptel.ac.in/courses/111/102/111102129/# (Transforms)

Mapping of Cos-Pos & PSOs

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

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23MDT301   **ANATOMY AND HUMAN PHYSIOLOGY**   **L T P C**
                                                       3 1 0 4

OBJECTIVES
- To understand the basic elements of human body.
- To know the structure and properties of Skeletal and Muscular system.
- To study the important functions of cardiovascular and respiratory system.
- To learn the structure and functions of digestive and excretory systems.
- To understand the basic functioning of nervous and sensory system.

UNIT I   BASIC ELEMENTS OF HUMAN BODY   9+3
Cell – Cell Structure and organelles - Functions of each component in the cell - Cell membrane – Transport across membrane - Action potential (Nernst, Goldman equation), Homeostasis. Tissue: Types - Functions.

UNIT II   SKELETAL AND MUSCULAR SYSTEM   9+3
Skeletal: Types of Bone and function - Physiology of Bone formation - Division of Skeleton - Types of joints and function - Types of cartilage and function. Types of muscles - Structure and Properties of Skeletal Muscle - Changes during muscle contraction - Neuromuscular junction.

UNIT III   CARDIOVASCULAR AND RESPIRATORY SYSTEM   9+3
Cardiovascular System: Structure - Conduction System of heart - Cardiac Cycle - Cardiac output. Blood: Composition - Functions - Haemostasis - Blood groups and typing - Blood Vessels: Structure and types - Blood pressure. Respiratory system: Parts of respiratory system - Respiratory physiology - Lung volumes and capacities - Gaseous exchange.

UNIT IV   DIGESTIVE AND EXCRETORY SYSTEMS   9+3
Structure and functions of gastrointestinal system - Secretion functions of the alimentary tract - Digestion and absorption in the gastrointestinal tract. Structure of nephron - Mechanism of urine formation - Skin and sweat gland - Temperature regulation.

UNIT V   NERVOUS AND SENSORY SYSTEM   9+3
Structure and function of nervous tissue - Brain and spinal cord - Functions of CNS - Nerve conduction and synapse - Reflex action - Somatic and Autonomic Nervous system. Physiology of Vision - Hearing - Integumentary - Olfactory systems - Taste buds.

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LIST OF EXPERIMENTS
(Any Eight Experiments to be conducted)

1. Hearing test
2. Visual Acuity
3. BMI Test
4. Lung capacity Test (Manual & Digital)
5. Body Temperature Measurements (Invasive & non Invasive)
6. Design the model of any one Functional system of Human Body
7. Cardio Vascular Test
8. Identification Joints ,bones , tissues, Arteries, veins
9. Neuro Muscular stimulation & Function Test
10. Blood Pressure Test

TOTAL: 45+15=60 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Identify and explain basic elements of human body
- Explain the functions of skeletal and muscular system
- Describe the structure, function of cardiovascular system and respiratory system
- Discuss the structure of digestive and excretory system
- Identify the physiological process of Nervous and sensory system.

TEXT BOOKS
1. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.
2. Atheena Milagi Pandian S, "Human Anatomy & Physiology" First Edition, International Notion Publishers, 2019

REFERENCES
1. Guyton & Hall, "Text book of Medical Physiology", 13th Edition, Saunders, 2015.
2. Ranganathan T S, "Text book of Human Anatomy", S.Chand& Co. Ltd., New Delhi, 2012.

E-RESOURCES
1. https://youtu.be/aqxuezBzxcg - (Essential of Human Anatomy and Physiology)
2. https://www.digimat.in/nptel/courses/medical/anatomy/AN11.html (Kidneys)

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Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	1	-	1	-	1	-	2	3	3	2
2	3	3	2	-	-	1	-	1	-	1	-	2	3	3	2
3	3	3	2	-	-	1	-	1	-	1	-	2	3	3	2
4	3	3	3	-	-	1	-	1	-	1	-	2	3	3	2
5	3	3	3	-	-	1	-	1	-	1	-	2	3	3	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	3	3	2.4	-	-	1	-	1	-	1	-	2	3	3	2

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23MDT302 **BIO SENSORS AND MEASUREMENTS** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the fundamentals of measurements.
- To study the principle of different types of sensors.
- To learn about the construction and working of photoelectric and piezo electric sensors.
- To study about signal conditioning circuits and meters.
- To know the different types of recording devices.

UNIT I   FUNDAMENTALS OF MEASUREMENTS   9

Measurement System – Instrumentation - Classification and Characteristics of Transducers - Static and Dynamic - Errors in Measurements and their statistical analysis- Methods of error analysis,- Uncertainty analysis - Expression of uncertainty: Accuracy and Precision index - propagation of errors - Calibration - Primary and secondary standards.

UNIT II   DISPLACEMENT, PRESSURE AND TEMPERATURE SENSORS   9

Strain Gauge: Gauge factor - Sensing elements - Configuration and Unbounded strain gage. Capacitive transducer: Various arrangements. Inductive transducer - LVDT. Passive types: RTD materials & range - Relative resistance vs. Temperature characteristics - Thermistor characteristics. Active type: Thermocouple - characteristics.

UNIT III   PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS   9

Phototube - Scintillation counter - Photo multiplier tube (PMT) - Photovoltaic - Photo conductive cells - Photo diodes - Phototransistor - Comparison of photoelectric transducers. Optical displacement sensors and optical encoders - Piezoelectric active transducer - Equivalent circuit and its characteristics.

UNIT IV   SIGNAL CONDITIONING CIRCUITS AND METERS   9

Functions of signal conditioning circuits - Preamplifiers - Concepts of passive filters - Impedance matching circuits. AC and DC Bridges: Wheat stone bridge - Kelvin bridge – Maxwell bridge - Hay bridge - Schering bridge. Q meter - PMMC, MI and dynamometer type instruments - DC potentiometer - Digital voltmeter - Multi meter.

UNIT V   RECORDING DEVICES AND ADVANCED SENSORS   9

CRO - Block diagram - CRT - Vertical & horizontal deflection system - DSO - LCD monitor - PMMC writing systems - Servo recorders - Photographic recorder - Magnetic tape recorder - Inkjet recorder - Thermal recorder. Biosensors: Transduction mechanism in a biosensor and Classification - Electronic noise.

TOTAL: 45 PERIODS

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OUTCOMES

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

- Explain the fundamentals of measurements.
- Discuss the principle and working of different types of sensors.
- Evaluate about the construction and working of photoelectric and piezo electric sensors.
- Elaborate the functions of signal conditioning circuits and meters.
- Analyze the different types of recording devices.

TEXT BOOKS

1. A.K.Sawhney , "Electrical & Electronics Measurement and Instrumentation", Dhanpat Rai &Co, New Delhi, 2017.
2. John G. Webster, "Medical Instrumentation Application and Design", Wiley India Pvt Ltd, New Delhi, 2020.

REFERENCES

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2015..
2. Albert D.Helfrick, William D. Cooper, "Modern Electronic Instrumentation and MeasurementTechniques", Prentice Hall of India, New Delhi, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/108/105/108105153/ (Electrical Measurements and Electronic Instrument)
2. https://nptel.ac.in/courses/108/108/108108147/ (Sensors And Actuators)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	-	-	-	-	1	-	2	3	2	1
2	3	3	2	1	2	-	-	-	-	1	-	2	3	2	1
3	3	3	2	1	2	-	-	-	-	1	-	2	3	2	1
4	3	3	3	2	2	-	-	-	-	1	-	2	3	2	1
5	3	3	3	2	2	-	-	-	-	1	-	2	3	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	3	3	2.4	1.4	2	-	-	-	-	1	-	2	3	2	1

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23MDE301	ELECTRONIC DEVICES & CIRCUITS	L T P C
	(Lab Embedded Theory Course)	3 0 2 4

OBJECTIVES

- To understand the structure of PN junction devices.
- To know the transistors and thyristors operation and applications.
- To learn the operation and analysis of amplifiers.
- To study about feedback amplifiers and oscillators principles.
- To know about various display and special semiconductor device characteristics and applications
- To understand the various electronic devices and circuits for medical applications.

UNIT I   PN JUNCTION DEVICES   9

PN junction diode: Structure - Operation and VI characteristics - Diffusion and Transition capacitance - Rectifiers - Half Wave and Full Wave Rectifier - Zener diode characteristics - Zener Reverse characteristics - Zener as regulator.

UNIT II   TRANSISTORS AND THYRISTORS   9

Structure, operation, characteristics and Biasing: BJT - JFET - MOSFET - UJT - Thyristors - Diac - Triac. IGBT 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.

UNIT IV   FEEDBACK AMPLIFIERS AND OSCILLATORS   9

Advantages of negative feedback - Voltage / Current feedback Amplifiers - Series and Shunt feedback Amplifiers - Positive feedback - Condition for oscillations. Oscillators: Phase shift - Wien bridge - Hartley - Colpitts and Crystal oscillators.

UNIT V   DISPLAY AND SPECIAL SEMICONDUCTOR DEVICES   9

LED - LCD - Photo transistor - Opto Coupler - Solar cell - CCD - Metal - Semiconductor Junction - MESFET - FINFET - PINFET - Schottky barrier diode - Varactor diode - Tunnel diode - Gallium Arsenide device.

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LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode
2. Zener Diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics of BJT
4. Common Base input-output Characteristics of BJT.
5. FET Characteristics.
6. SCR Characteristics.
7. Clipper and Clamper & FWR.
8. Characteristics of Photo Diode.
9. Characteristics of Photo Transistor.
10. Characteristics of LED & LCD.

TOTAL: 45+15=60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:
- Describe the structure of PN junction devices
- Explain the structure and working operation of transistors and thyristors.
- Analyze the characteristics of different amplifiers.
- Explain the design and analysis of oscillators and feedback amplifiers.
- about various display and special semiconductor device characteristics and applications.
- Simulate the working of electronic devices and circuits for the effective utilization in medical field.

TEXT BOOKS

1. Millman and Halkias, "Electronic Devices and Circuits", Fourth Edition, McGraw Hill, 2015.
2. Donald A Neaman, Semiconductor Physics and Devices, Fourth Edition,Tata Mc GrawHill Inc. 2017.

REFERENCES

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
2. Mohammad Rashid, "Electronic Devices and Circuits", Cengage Learning Pvt. Ltd, 2015.

E-RESOURCES

1. https://youtu.be/VSUOFdMN00E- (Electronic Devices and Circuit Theory)
2. https://youtu.be/SC1kpLGyK-w- (Solid State Electronic Devices)

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Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	-	1	-	-	-	-	1	-	-	3	2	2
2	3	3	3	-	1	-	-	-	-	1	-	-	3	2	2
3	3	3	3	-	1	-	-	-	-	1	-	-	3	2	2
4	3	3	2	-	1	-	-	-	-	1	-	-	3	2	2
5	3	3	2	-	1	-	-	-	-	1	-	-	3	2	2
6	3	3	2	-	1	-	-	-	-	1	-	-	3	2	2
AVG.	3	3	2.2	-	1	-	-	-	-	1	-	-	3	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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23MDE302	BIOSCIENCES FOR MEDICAL ENGINEERING	L T P C
	(Lab Embedded Theory Course)	3 0 2 4

OBJECTIVES

- To understand the fundamentals of biochemistry.
- To know the basics of structural and functional properties of carbohydrates, proteins, lipids and aminoacids
- To study about the structural and functional aspects of living organisms.
- To learn the basics of fluid and hemodynamic derangements.
- To understand the fundamentals of microbiology and immunopathology.
- To study about bio analyzer for medical applications.

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.

UNIT II   CARBOHYDRATES, LIPIDS, PROTEIN AND NUCLEIC ACID   9

Classification of carbohydrates - Polysaccharides - Structure - Physical and chemical properties of carbohydrates. Classification of lipids - Simple, compound and derived 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 - Carcinogenesis - Spread of tumours - Autopsy and biopsy.

UNIT IV   FLUID AND HEMODYNAMIC DERANGEMENTS   9

Edema - Hyperemia/Ischemia - Normal hemostasis - Thrombosis - Disseminated intravascular coagulation - Embolism - Infarction - Chronic venous congestion - Hematological disorders - Bleeding disorders - Leukaemias - Lymphomas Haemorrhage..

UNIT V   FUNDAMENTALS OF MICROBIOLOGY AND IMMUNOPATHOLOGY   9

Structure of Bacteria and Virus - Morphological features and structural organization of bacteria and virus - List of common bacterial, fungal and viral diseases of human beings. Basics of Microscopes - Light microscope - Electron microscope (TEM & SEM). Natural and artificial immunity - Types of Hypersensitivity - Antibody and cell mediated tissue injury. Immunological techniques: immune diffusion - Immuno electrophoresis - RIA and ELISA - Monoclonal antibodies.

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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 (λmax) of a given solution
4. Preparation of serum and plasma from blood
5. Separation of proteins by SDS electrophoresis (Demo) and amino acids by thin layer chromatography (Demo).
6. Types of Staining : Simple stain, Gram stain
7. Measurement of blood sugar & hemoglobin in blood
8. Collection of Blood Samples & Identification of Blood groups
9. Estimation of RBC ,WBC & BTCT
10. Analysis of Urine Sample

TOTAL: 45 +15=60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to :
- Explain the fundamentals of biochemistry.
- Explain the structural and functional properties of carbohydrates, proteins, lipids and aminoacids
- Analyze structural and functional aspects of living organisms.
- Explain the function of hemodynamic derangements.
- Describe methods involved in treating the pathological diseases.
- Devise best bio analyzer for medical applications.

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", Tenth Edition: South Asia Edition Elsevier India, 2020.

REFERENCES

1. Ananthanarayanan, Panicker, "Microbiology",Orientblackswan,Tenth Edition, 2017.
2. Wilson, Walkers, "Principles And Techniques Of Biochemistry And Molecular Biology", Eighth Edition, 2018.

E-RESOURCES

1. https://youtu.be/ld3A065dELc- (General and Systematic Pathology)
2. https://youtu.be/Yh9w_fyvpUk- (Pathologic Basis of Diseases)

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Mapping of Cos-Pos & PSOs

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

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23EEE304   **BASICS OF ELECTRICAL MACHINES**   **L T P C**
(Lab Embedded Theory Course)   **3 0 2 4**

OBJECTIVES
- To explain the fundamental concepts and operation of DC machines.
- To describe the working principles of single phase and three phase transformers.
- To evaluate the principle of operation and performance characteristics of synchronous machines.
- To analyze the construction, principle of operation, and performance characteristics of induction motors.
- To discuss the construction, principle of operation, and working of single-phase and special electrical machines.
- To compare different types of motor characteristics for their utilization in medical instrumentation.

UNIT I   DC MACHINES   9
DC Generators: Constructional details - Principle of operation - EMF equation - Types of DC generators - Characteristics of DC Generators. DC Motors: Principle of operation - Significance of back emf - Types of DC motor - Characteristics of DC motors - Starting methods of DC motors.

UNIT II   TRANSFORMERS   9
Construction and working of single phase transformer - EMF Equation - Types of transformers - voltage regulation - Losses and efficiency - Applications of single phase transformer. Three Phase Transformer: Construction - Types of connections - Construction and working of auto transformer - All day efficiency - Applications of autotransformer.

UNIT III   SYNCHRONOUS MACHINES   9
Synchronous Generator: Constructional details - Types of rotors - Principle of operation - EMF equation - Types of armature winding - Synchronous reactance - Armature reaction - Voltage regulation - EMF and MMF methods - Synchronous Motor: Principle of operation - Starting methods.

UNIT IV   THREE PHASE INDUCTION MOTOR   9
Constructional details - Types of rotors - Principle of operation - Slip - Torque Equation - Torque Slip characteristics - Necessity of Starter - Types of starters: DOL, Autotransformer and Star Delta starters - Load test - Speed control: Slip power recovery scheme.

UNIT V   SINGLE PHASE INDUCTION MOTOR AND SPECIAL ELECTRICAL MACHINES   9
Construction Details of single phase induction motor - Double field revolving theory and operation - Starting methods: Split Phase - Capacitor Start - Capacitor Start and Run - Shaded Pole - Applications. Hysteresis motor - Reluctance motor- Servo motors - Stepper motors

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LIST OF EXPERIMENTS

1. Open circuit characteristics of DC shunt generator
2. Load characteristics of DC shunt generator
3. Load test on DC shunt motor.
4. Load test on DC series motor.
5. Load test on single-phase transformer
6. Load test on three-phase induction motor.
7. Load test on single-phase induction motor

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Describe the constructional details and principle of operation, characteristics of DC Machines.
- Explain the construction, working principle and performance of transformers.
- Explain the working principle, voltage regulation of synchronous Generator and starting methods of synchronous motor.
- Explain the construction, starting and speed control methods of three phase induction motor.
- Explain the construction and working of single phase induction motor and special electrical machines.
- Analyze and select the appropriate type of motor for medical instrumentation.

TEXT BOOKS

1. B.L. Theraja, A K Theraja, "A Text Book of Electrical Technology", Volume I & II, S.Chand publications, 2021.
2. D.P. Kothari,I.J. Nagrath, "Electric Machines", McGraw Hill Publishing Company Ltd, Fifth Edition 2017.

REFERENCES

1. E. Clayton, N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.
2. K.Dhayalini, "Special Electrical Machines", Anuradha Publications, 2018.

E-RESOURCES

1. https://youtu.be/OiscWFfO08s- (Electrical Machines)
2. https://youtu.be/cv2L7CfBYrA- (Special Electrical Machines)

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Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	-	-	-	-	1	-	1	-	2	2	2	2
2	2	2	1	-	-	-	-	1	-	1	-	2	2	2	2
3	2	1	1	-	-	-	-	1	-	1	-	2	2	2	2
4	2	2	1	-	-	-	-	1	-	1	-	2	2	2	2
5	2	2	1	-	-	-	-	1	-	1	-	2	2	2	2
6	2	2	1	-	-	-	-	1	-	1	-	2	2	2	2
AVG.	**2**	**1.8**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**2**	**2**	**2**

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SEMESTER IV

23MDT401   **HUMAN ASSIST DEVICES**   **L T P C**
       3 0 0 3

OBJECTIVES

- To study the role and importance of machines that takes over the functions of the heart and lungs.
- To study various mechanical techniques that helps a non-functioning heart.
- To learn the functioning of the unit that does the clearance of urea from the blood.
- To understand the functions of respiratory and hearing aids.
- To study about recent techniques used in modern clinical applications.

UNIT I   HEART LUNG MACHINE AND ARTIFICIAL HEART   9

Condition to be satisfied by the H/L System - Different types of Oxygenators, Pumps, Pulsatile and Continuous Types - Monitoring Process - Shunting - The Indication for Cardiac Transplant - Driving Mechanism - Blood Handling System - Functioning and different types of Artificial Heart - Schematic for temporary bypass of left ventricle.

UNIT II   CARDIAC ASSIST DEVICES   9

Assisted through Respiration - Right and left Ventricular Bypass Pump - Auxiliary ventricle - Open Chest and Closed Chest type - Intra Aortic Balloon Pumping - Prosthetic Cardiac valves – Principle of External Counter Pulsation techniques.

UNIT III   ARTIFICIAL KIDNEY   9

Indication and Principle of Hemodialysis - Membrane - Dialysate - Types of filter and membranes - Different types of hemodialyzers - Monitoring Systems - Wearable Artificial Kidney - Implanting Type.

UNIT IV   RESPIRATORY AND HEARING AIDS   9

Ventilator and its types - Intermittent positive pressure - Breathing Apparatus Operating Sequence - Electronic IPPB unit with monitoring for all respiratory parameters. Types of Deafness - Hearing Aids – SISI - Masking techniques - Wearable devices for hearing correction.

UNIT V   RECENT TRENDS   9

Transcutaneous electrical nerve stimulator – Bio feedback - Diagnostic and point of care platforms.

            TOTAL: 45 PERIODS

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OUTCOMES

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

- Explain the principles and construction of artificial heart.
- Explain the various mechanical techniques that improve therapeutic technology.
- Explain the functioning of the membrane or filter that cleanses the blood.
- Describe the various respiratory and hearing aids.
- Analyze and research on electrical stimulation and biofeedback techniques in rehabilitation and physiotherapy.

TEXT BOOKS

1. Gray E. Wnek, Gray L Browlin,"Encyclopedia of Biomaterials and Biomedical Engineering",Marcel Dekker Inc New York, 2004.
2. Joseph D. Bronzino, Donald R. Peterson ,"Biomedical Engineering Fundamentals" ,scond Edition,2018.

REFERENCES

1. Gray E Wnek, Gray L Browlin, "Encyclopedia of Biomaterials and Biomedical Engineering"Marcel Dekker Inc New York ,Second Edition, 2015.
2. D.S. Sunder, "Rehabilitation Medicine", Fourth Edition, Jaypee Brothers Medical Publishers, 2019.

E-RESOURCES

1. https://archive.nptel.ac.in/noc/courses/noc21/SEM1/noc21-me52/ (Mechanics of Human Movement)
2. https://youtu.be/bgpwPB22Ap0 - (Artificial Organs)

Mapping of Cos-Pos & PSOs

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

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ESTD 2001

23MDT402 **MEDICAL PHYSICS** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the properties of electromagnetic radiations and its effect on human.
- To know the principles and understand the production of radioactive nuclides.
- To learn the fundamentals of interaction of radiation with matter lipids.
- To study about the radiation quantities and its effects.
- To understand the effects of sound in human body.

UNIT I LOW ENERGY ELECTROMAGNETIC SPECTRUM AND ITS MEDICAL APPLICATION **9**

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

UNIT II PRINCIPLES OF RADIOACTIVE NUCLIDES **9**

Radioactive Decay - Spontaneous Emission - Isometric Transition - Gamma ray emission, alpha, beta, Positron decay, electron capture - Sources of Radioisotopes: Natural and Artificial radioactivity - Radionuclide used in Medicine and Technology - Production of radio nuclides. Laser applications in medical field.

UNIT III INTERACTION OF RADIATION WITH MATTER LIPIDS **9**

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

UNIT IV RADIATION DOSE AND ITS EFFECTS **9**

Dose and Exposure measurements - Units (SI) - Inverse square law - Maximum permissible exposure - Relationship between the Dosimetric quantities - Radiation biology - Effects of radiation - Concept of LD50 - Stochastic and Non-stochastic effects - Radiation Syndrome.

UNIT V PRINCIPLES AND APPLICATIONS OF SOUND IN MEDICINE **9**

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

TOTAL: 45 PERIODS

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OUTCOMES
Upon completion of the course, the students will be able to:
- Analyze the properties of electromagnetic radiations and its effect on human
- Apply the principles and understand the production of radioactive nuclides
- Explain the interaction of radiation with matter lipids.
- Identify and Analyze the radiation quantities and its effects
- Describe the knowledge on the properties of sound and its application in medicine.

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, First Edition, 2017.
2. Gopal B. Saha, "Physics and Radiobiology of Nuclear Medicine ",Fourth edition ,Springer, 2014.

REFERENCES
1. Zhihua Qi PhD, Robert D. Wissman MD , "Radiologic Physics", First Edition ,2019.
2. Alim Yucel-Finn , Fergus Mckiddie , Rachel Bentley , Sarah Prescott ,"Farr's Physics for Medical Imaging" , Third Edition ,2022.

E-RESOURCES
1. https://nptel.ac.in/courses/102105090. (Introduction to Biomedical Imaging Systems)
2. https://nptel.ac.in/courses/115106087 (Nuclear Reactors and Safety- An Introduction, IIT Madras)

MAPPING OF CO's,PO's & PSO's

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

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23MDT403   **BIO CONTROL SYSTEMS**   **L T P C**
3 1 0 4

OBJECTIVES

- To understand the concept behind feedback and continuum in various systems and subsystems and the need for mathematical modeling of various systems.
- To know the systems in time and frequency domains.
- To understand the concept of stability of various systems.
- To study the concept of frequency response analysis.
- To learn about mathematical modeling principles in understanding the various fundamental biological systems.

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 - 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+3

Sinusoidal transfer function - Frequency response - Frequency domain specifications - Bode plots - Polar plots - Constant M and N circles - Nichol's chart.

UNIT V   BIOLOGICAL CONTROL SYSTEM ANALYSIS   9+3

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.

TOTAL: 45+15=60 PERIODS

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OUTCOMES

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

- Explain the need for mathematical modeling of various systems, representation of systems in block diagrams and signal flow graphs and are introduced to biological control systems.
- Determine the time response of various systems.
- Discuss the concept of system stability**.**
- Examine the frequency response characteristics of various systems using different charts.
- Analyze the concept of modeling basic physiological systems.

TEXT BOOKS

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

REFERENCES

1. Salivahanan S. Rengaraj R,Venkatakrishnan G. R., " Control Systems Engineering", Pearson Education India, 2015.
2. Ogata, "Modern control engineering", Fifth Edition,2015

E-RESOURCES

1. https://nptel.ac.in/courses/108/101/108101037/ (Control Engineering)
2. https://www.youtube.com/watch?v=RgbXo_jHAXY (Biomedical Control Systems)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	2	-	-	1	-	1	2	1	-
2	3	2	2	2	-	-	2	-	-	1	-	1	2	1	-
3	3	2	2	2	-	-	2	-	-	1	-	1	2	1	-
4	3	2	2	2	1	-	2	-	-	1	-	1	2	1	-
5	3	2	2	2	1	-	2	-	-	1	-	1	2	1	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	3	2	2	2	0.4	-	2	-	-	1	-	1	2	1	-

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23MDE401 **MEDICAL INSTRUMENTATION** **L T P C**
(Lab Embedded Theory Course) **3 0 2 4**

OBJECTIVES

- To understand the origin of various biological signals and electrode configurations specific to bio-potential measurements.
- To study the characteristics of Bio signals.
- To know the design of bio amplifiers
- To learn the different techniques used for measurement of non-electrical bio-parameters
- To understand the biochemical measurement techniques as applicable for diagnosis and treatment.
- To know some innovative ideas on new biomedical devices.

UNIT I   ELECTRODE CONFIGURATIONS   9

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

UNIT II   BIOSIGNAL CHARACTERISTICS   9

Bio signals characteristics - ECG: Frequency and amplitude ranges - Einthoven's triangle - Standard 12 lead system. EEG: 10-20 electrode system - Unipolar, bipolar and average mode. EMG: Electrode configuration - Unipolar and bipolar mode..

UNIT III   BIOAMPLIFIERS   9

Need for bio-amplifier - Differential bio-amplifier - Single ended amplifier - Band pass filtering - isolation amplifiers - Transformer and optical isolation - Isolated DC amplifier and AC carrier amplifier - Chopper amplifier - Power line interference.

UNIT IV   MEASUREMENT OF BIO SIGNALS   9

Temperature, respiration rate and pulse rate measurements - Blood Pressure: 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, pO2 and pCO2 - Ion selective Field effect Transistor (ISFET) - Immunologically sensitive FET (IMFET) - Blood glucose sensors - Blood gas analyzers: Colorimeter - Flame photometer – Spectrophotometer - Blood cell counter - Auto analyzer

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LIST OF EXPERIMENTS

1. Blood pressure measurement.
2. Recording of Bio signals : ECG,EEG,EMG
3. Recording of various physiological parameters using patient monitoring system and telemetry units.
4. Measurement of respiration rate.
5. Study of Dialyzer and Defibrillator
6. Measurement of PH and Conductivity
7. Measurement of Blood Glucose
8. Study of AC and DC Bridges
9. Study of Piezoelectric Transducer Characteristics.
10. Study of LVDT Characteristics.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Illustrate the origin of various biological signals and their characteristics.
- Analyze the characteristics of bio signals.
- Analyze the various amplifiers involved in monitoring and transmission of bio signals.
- Explain the different measurement techniques for non-electrical bio-parameters
- Explain the biochemical measurement techniques as applicable for diagnosis and further treatment.
- Design new biomedical instruments.

TEXT BOOKS

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Second Edition, Prentice hall of India, New Delhi, 2015.
2. John G. Webster, "Medical Instrumentation Application and Design", Fourth edition, WileyIndia Pvt Ltd, New Delhi, 2015.

REFERENCES

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

2. Sarbadhikari S.N, "A Short Introduction To Biomedical Engineering", First Edition, 2020.

E - RESOURCES

1. https://www.egr.msu.edu/classes/ece445/mason/Files/2-Basics_ch1.pdf (Medical Instrumentation: Application and Design)
2. https://youtu.be/2aqJ5wYuvfQ (Developing Biomedical Devices-Design)

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MAPPING OF CO's, PO's & PSO's

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	3	-	-	2	-	-	1	2	2	2
2	3	2	1	1	-	3	-	-	2	-	-	1	2	2	2
3	3	2	1	1	-	3	-	-	2	-	-	1	2	2	2
4	3	2	1	2	-	3	-	-	2	-	1	1	2	2	2
5	3	2	1	1	-	3	-	-	2	-	1	1	2	2	2
6	3	2	1	1	-	3	-	-	2	-	1	1	2	2	2
AVG.	3	2	1	1.2	-	3	-	-	2	-	0.5	1	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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ESTD 2001

23MDE402	ANALOG AND DIGITAL INTEGRATED CIRCUITS	L T P C
	(Lab Embedded Theory Course)	3 0 2 4

OBJECTIVES

- To study the operational amplifier and its applications.
- To understand the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.
- To know the design of various combinational digital circuits using logic gates.
- To learn the analysis and design procedures for combinational and sequential circuits.
- To understand the concepts of waveform generation and introduce some special function ICs.
- To study about electronic circuits used for medical applications.

UNIT I   INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS   9

Operational amplifier: ideal characteristics, Performance Parameters - Voltage follower - Inverting and Non-inverting Amplifiers - Differentiator - Integrator - Voltage to Current converter - Instrumentation amplifier - Low pass, High pass and band pass filters - Comparator - Multivibrator and Schmitt trigger - Triangular wave generator.

UNIT II   DIGITAL TO ANALOG, 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. A/D converter: Flash type - Dual slope - Successive approximation type. Voltage controlled oscillator - Voltage to Frequency converters. PLL - Closed loop analysis of PLL - Frequency multiplication/ division.

UNIT III BASIC GATES AND COMBINATIONAL LOGIC CIRCUITS   9

Number Systems - Decimal, Binary, Octal, Hexadecimal - 1's and 2's complements. Codes: Binary, BCD, 8-4-2-1, 2-4-2-1, Excess 3, Gray - Boolean theorems - Logic gates - Universal gates - Sum of products and Product of sums - Minterms and Maxterms - Karnaugh map and Tabulation methods. Logic families: TTL - MOS.

UNIT IV DESIGN OF COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS   9

Problem formulation and design of combinational circuits - Half and Full Adders - Magnitude Comparator - Decoder - Encoder - Mux/Demux. Flip flops: SR, JK, T, D - Analysis and design of clocked sequential circuits: State minimization - state assignment, Counters - Shift Registers.

UNIT V   WAVEFORM GENERATORS AND VOLTAGE REGULATORS   9

Sine-wave generators - Multivibrators and Triangular wave generator – Saw tooth wave generator - Timer IC 555 - IC Voltage regulators - IC 723 general purpose regulator - Monolithicswitching regulator - Low Drop Out(LDO) Regulators

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LIST OF EXPERIMENTS

1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Schmitt trigger using operational amplifier
4. Instrumentation amplifier using operational amplifier
5. Multivibrators using IC555 Timer
6. Study of logic gates, Half adder and Full adder
7. Encoder and BCD to 7 segment decoder
8. Multiplexer and Demultiplexer using digital ICs
9. Universal shift register using flip flops
10. Simulation and analysis of circuits using software.

TOTAL : 45+15=60 PERIODS

OUTCOMES

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

- Analyze the working of operational amplifier and its applications.
- Apply the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.
- Use Boolean algebra and apply it to digital systems and Design various combinational digital circuits using logic gates.
- Analysis and design procedures for combinational and sequential circuits.
- Explain waveform generators and voltage regulators.
- Design electronic circuits for medical applications

TEXT BOOKS

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, Third Edition, 2017.
2. John.F.Wakerly, "Digital design principles and practices", Pearson Education, Fifth Edition, 2018.

REFERENCES

1. Taub ,Schilling, "Digital Integrated Electronics", Mc Graw Hill, 2017.
2. S Salivahanan, V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, Third Edition, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/108/108/108108111/ (Integrated Circuits, MOSFETS, OP-AMPS and their Applications)
2. https://nptel.ac.in/courses/117/106/117106030/ (Analog IC Design)

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Mapping of Cos-Pos & PSOs

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1	3	2	1	1	-	2	-	-	-	1	-	1	3	2	1
2	3	2	1	1	-	2	-	-	-	1	-	1	3	2	1
3	3	2	1	1	-	2	-	-	-	1	-	1	3	2	1
4	3	2	1	1	1	2	-	-	-	1	-	1	3	2	1
5	3	2	1	1	1	2	-	-	-	1	-	1	3	2	1
6	3	2	1	1	1	2	-	-	-	1	-	1	3	2	1
AVG.	3	2	1	1	0.5	2	-	-	-	1	-	1	3	2	1

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23GEE301	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**L T P C**
	(Lab Embedded Theory Course)	**3 0 2 4**

OBJECTIVES

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

UNIT I   COMPUTATIONAL THINKING AND PROBLEM SOLVING   9

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

UNIT II   DATA TYPES, EXPRESSIONS, STATEMENTS   9

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

UNIT III   CONTROL FLOW, FUNCTIONS, STRINGS   9

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

UNIT IV   LISTS,TUPLES, DICTIONARIES   9

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

UNIT V   FILES, MODULES, PACKAGES& DATA VISUALIZATION   9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file - Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms.

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LIST OF EXPERIMENTS
(Any Eight Experiments to be conducted)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.).

2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).

3. 3.Scientific problems using Conditionals and Iterative loops.(Number series, Number Patterns, pyramid pattern).

4. 4.Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples).

5. 5.Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries).

6. Implementing programs using Functions.(Factorial, largest number in a list, area of shape)

7. Implementing programs using Strings (reverse, palindrome, character count, replacing characters).

8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy).

9. Implementing real-time/technical applications using File handling.(copy from one file to another, word count, longest word).

10. Implementing real-time/technicalapplicationsusingExceptionhandling.(dividebyzeroerror, voter's age validity, student mark range validation).

TOTAL: 45 +15 = 60 PERIODS

OUTCOMES
Upon completion of the course, Students will be able to:
- Develop algorithmic solutions to simple computational problems.
- Develop and execute simple Python programs.
- Design Python programs using conditional sand loops for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries etc.
- Read and write data from/to files in Python programs.

TEXT BOOKS
1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", Second Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", Firs Edition, BCS Learning & Development Limited, 2017.

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REFERENCES

1. Paul Deitel ,Harvey Deitel, "Python for Programmers", Pearson Education, First Edition, 2021.
2. G Venkatesh, Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", Firs Edition, Notion Press, 2021.

E-RESOURCES

1. https://nptel.ac.in/courses/106104074 (Introduction to Algorithms)
2. https://archive.nptel.ac.in/courses/106/106/106106182 (Joy of Computing)

MAPPING OF CO's, PO's & PSO's

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1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
AVG.	2	3	3	3	2	-	-	-	-	-	2	2	3	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

MINOR DEGREE / HONOURS

DEPARTMENT OF   MEDICAL ELECTRONICS

REGULATION-2023

MINOR DEGREE / HONOURS

ADVANCED HEALTHCARE MANAGEMENT

CURRICULUM AND SYLLABI

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CURRICULUM AND SYLLABI
FOR B.E. / B.Tech. DEGREE PROGRAMMES
(MINOR/HONOURS DEGREE- ADVANCED HEALTHCARE MANAGEMENT)

B.E-MEDICAL ELECTRONICS

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23MDAT01	Virtual Reality and Augmented Reality In Healthcare	PC	3	0	0	3	40	60	100
23MDAT02	Robotics in Medicine	PC	3	0	0	3	40	60	100
23MDAT03	Advancements in Healthcare Technology	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23MDAE01	Data Analytics for Healthcare Technologies	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23MDAP01	Project Work	EEC	0	0	12	6	40	60	100
		TOTAL CREDITS				19			

PC   :   Professional Core

EEC :   Employability Enhancement Courses

L   :   Lecture

T   :   Tutorial

P   :   Practical

C   :   Credit Point

CIA   :   Continuous Internal Assessment

ESE   :   End Semester Examination

TOT :   Total

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SEMESTER III

23MDAT01   VIRTUAL REALITY AND AUGMENTED REALITY IN HEALTHCARE   L T P C
3 0 0 3

OBJECTIVES:

- To understand the virtual reality, augmented reality and using them to build Biomedical engineering applications
- To know the intricacies of these platform to develop VR with better optimality.
- To understand the concept of Content creation in Virtual reality
- To learn the possibilities of implementing target-specific VR applications on mobile.
- To know the various applications of VR.

UNIT I   INTRODUCTION   9

The three I's of virtual reality - Commercial VR technology and the five classic components of a VR system - Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers - Navigation and manipulation - Interfaces and gesture interfaces - Output Devices: Graphics displays - Sound displays & haptic feedback.

UNIT II VR DEVELOPMENT PROCESS   9

Geometric modeling - Kinematics modeling - Physical modeling - Behaviour modeling - Model management.

UNIT III CONTENT CREATION CONSIDERATIONS   9

Methodology and terminology - User performance studies - VR health and safety issues - Usability of virtual reality system - Cyber sickness - Side effects of exposures to virtual reality environment

UNIT IV VR ON THE WEB & VR ON THE MOBILE   10

JS - Pros and cons - Building blocks (WebVR, WebGL, Three.js, device orientation events) - Frameworks (A-frame, React VR) - Google VR for Android - Scripts, mobile device configuration, building to android - Cameras and interaction – Teleporting - Spatial audio - Assessing human parameters - Device development and drivers - Design Haptics.

UNIT V APPLICATIONS   8

Medical applications-military applications-robotics applications- Advanced Real time Tracking-other applications- games, movies, simulations, therapy

TOTAL: 45 PERIODS

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OUTCOMES

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

- Analyze and Design a system or process to meet given specifications with realistic engineering constraints
- Identify problem statements and function as a member of an engineering design team
- Illustrate the implications and issues pertaining to VR
- Explain technical documents and give technical oral presentations related to design VR mini project results
- Develop simple and portable VR applications using appropriate software

TEXT BOOKS

1. Jason Jerald, "The VR Book: Human-Centred Design for Virtual Reality", Association for Computing Machinery and Morgan & Claypool, New York, USA, 2015.
2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles and Practice", June 2016.

REFERENCES

1. Steve Aukstakalnis, Addison-Wesley Professional , "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability)", First Edition, 2016.

2. C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc., 2008.

E - RESOURCES

1. https://www.youtube.com/watch?v=04AMaTsXFJU (AR & VR)
2. https://www.youtube.com/watch?v=AttXbcLUyR0 (Virtual Reality in Medicine)

Mapping of Cos-Pos & PSOs

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1	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1
2	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1
3	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1
4	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1
5	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	1	1	2	-	-	1	-	1	-	-	2	-	1

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SEMESTER IV

23MDAT02   **ROBOTICS IN MEDICINE**   **L P T C**

3 0 0 3

OBJECTIVES

- To understand the fundamentals of robotics and position analysis
- To learn about Parallel robots, different types of motions and force analysis
- To know the basics of trajectory planning, Motion control systems and actuators
- To study the need of various sensors, image processing techniques and vision systems
- To understand the concept of Fuzzy control and Applications of Robotics in Medicine

UNIT I FUNDAMENTALS AND POSITION ANALYSIS   9

Fundamentals – Classification - Advantages and disadvantages – Components - Degrees of freedom – Joints – Coordinates - Reference frames - Programming modes - Characteristics, Workspace – Languages - Collaborative robots - Position analysis – Robots as mechanisms – Conventions – Transformations - Forward and inverse kinematics - Denavit Hartenberg Representation - Degeneracy and Dexterity - Screw based robots - Position analysis of Articulated robot - Case studies.

UNIT II PARALLEL ROBOTS, DIFFERENTIAL MOTIONS AND FORCE ANALYSIS   9

Parallel robots: Physical characteristics - Forward and Inverse Kinematic approaches - Planar and Spatial parallel robots - Differential relationships - The Jacobian, Large scale motions - Frame vs Robot - Differential motions and change - Hand frame - Operator - Jacobian and Inverse for Screw based and Parallel Robots - Differential operator - Lagarangian mechanics, Moments of Inertia - Dynamic Equations of Multiple DOF Robots - Static force analysis - Transformation of forces and moments between coordinate frames - Case studies.

UNIT III TRAJECTORY PLANNING, MOTION CONTROL SYSTEMS AND ACTUATORS   10

Path and Trajectory - Joint Space and Cartesian Space Descriptions and Trajectory Planning - Cartesian - Trajectory Recording - Basics - Block diagrams - Laplace Transform - Block diagram Algebra - Transfer Functions - Characteristic equation - Steady state error - Root locus - Proportional, Integral and Derivative controllers - Compensators, Bode, Loops, Multiple IO systems - Control - State space and Digital, Nonlinear systems - Characteristics of Hydraulic, Pneumatic, Electric motors - Other actuators - Speed reduction - Case studies

UNIT IV SENSORS, IMAGE PROCESSING AND ANALYSIS WITH VISION SYSTEMS   9

Sensor Characteristics: Position, Velocity, Acceleration, Force, Pressure and Torque. Microswitches - Visible and IR, Touch, Proximity, Range finders, Sniff, Vision, Transforms – Fourier, Hough, Resolution, Quantization, Sampling, Image processing - Segmentation, Region growing and splitting, Operations, Object recognition, Depth, Specialized lighting, Compression, Colour images, Heuristics - Case studies

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UNIT V FUZZY CONTROL AND APPLICATIONS IN MEDICINE   8

Fuzzy control - Crisp vs Fuzzy, Sets, Inference rules, Defuzzification, Simulation - Applications in Biomedical Engineering - Applications in rehabilitation - Nanobots in medicine - Clinical diagnosis and Surgery - Cardiac and abdominal procedures with teleoperated robots - Orthopedic surgery with cooperative robots Case studies

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, students will be able to

* Describe the fundamentals of robotics and position analysis
* Outline the functioning of parallel robots, different types of motions and force analysis
* Illustrate the basics of trajectory planning, Motion control systems and actuators.
* Explain the use of various sensors and vision systems in robotics.
* Apply Fuzzy control in robotics and Robotics in Medicine

TEXT BOOKS

1. Olfa Boubaker, "Medical and Healthcare Robotics", First Edition - August 1, 2023
2. S. B. Niku, "Introduction to Robotics, Analysis, Control, Applications", 2020

REFERENCES

1. João Silva Sequeira, "Robotics in Healthcare", First Edition, 18 February 2020
2. Achim Schweikard, Floris Ernst, "Medical Robotics", First Edition, 19 October 2015

E-RESOURCES

1. https://www.youtube.com/watch?v=rYWJdZ5qg6M&list=PLbRMhDVUMngcdUbBySzyz cPiFTYWr4rV_ (Fundamentals of Robotics)
2. https://onlinecourses.nptel.ac.in/noc21_me49/preview (Robotics and Control)

Mapping of Cos-Pos & PSOs

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

1 - Low, 2 - Medium, 3 - High, '-' - No correlation

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SEMESTER V

23MDAT03   ADVANCEMENTS IN HEALTHCARE TECHNOLOGY   L T P C

3 0 0 3

OBJECTIVES
- To understand the need for digital methods of handling medical records.
- To study the functions of digital radiology
- To learn about the tools and methods for work flow in E-Health
- To know the available technology in mobile healthcare and wearable healthcare devices
- To study the various standards for inter-operability of devices, quality and safety standards for developing healthcare systems

UNIT I   DIGITAL HEALTH   9
Digital Health: Requirements and best practices - Laws and regulations in Digital health - Ethical issues - Barriers and strategies for innovation.

UNIT II DIGITAL RADIOLOGY   9
Digital radiology for digital hospital - Picture archiving and communication - System integration, digital history of radiology - Medical image archives - Storage and networks.

UNIT III E-HEALTH   9
E-Health: Health care networking - Medical reporting using speech recognition - Physiological tests and functional diagnosis with digital methods - Tele-consultation in medicine and radiology.

UNIT IV M-HEALTH CARE AND WEARABLE DEVICES   9
Introduction to mobile healthcare devices - Economy - Average length of stay in hospital - Outpatient care - Health care costs - Mobile phones - 4G - Smart devices - Wearable devices - Uptake of e-health and m-health technologies – Standards - System Design and case study.

UNIT V MODALITY AND STANDARDS FOR INTER-OPERABILITY   9
Multimodality registration in daily clinical practice - Mobile healthcare - Selection and Implementation in e-Health project - Design of medical equipment based on user needs - Security and privacy in digital health care - Case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
- Analyze the need for digital methods of handling medical records
- Explain the digital radiology
- Apply the tools and methods for work flow in E-Health
- Identify the available technology for wearable healthcare devices
- Classify various standards for inter-operability of devices, quality and safety standards for developing healthcare systems

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TEXT BOOKS.

1. Christoph Thuemmler, Chunxue Bai, "Health 4.0: How Virtualization and Big Data are Revolutionizing Healthcare", Springer, First Edition, 2017
2. Wlater Hruby, "Digital revolution in radiology – Bridging the future of health care", Second Edition, Springer, New Yorkm, 2006.

REFERENCES

1. Rick Krohn (Editor), David Metcalf, Patricia Salber, "Health-e Everything: Wearables and The Internet of Things for Health", 2013.
2. Samuel A. Fricker, Christoph Thummler , Anastasius Gavras, "Requirements Engineering For Digital Health", Springer, 2015

E-RESOURCES

1. https://www.youtube.com/watch?v=l-WE30LqXjc (Health 4.0)
2. https://nptel.ac.in/courses/110104095   (Economics of Health and Health Care)

Mapping of Cos-Pos & PSOs

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

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SEMESTER VI

23MDAE01   DATA ANALYTICS FOR HEALTHCARE TECHNOLOGIES   L T P C

3 0 2 4

OBJECTIVES:

- To study the various forms of electronic health care information
- To learn the techniques adopted to analyze health care data
- To understand the natural language based analytics
- To study the predictive models for clinical data
- To know about health care analytics and its applications
- To learn the advanced health care analytic system

UNIT I   INTRODUCTION   9

Introduction to Healthcare Data Analytics - Electronic Health Records - Components of HER - Coding Systems - Benefits of EHR- Barrier to Adopting HER - Challenges - Phenotyping Algorithms.

UNIT II   DATA ANALYSIS   9

Biomedical Image Analysis - Mining of Sensor Data in Healthcare - Biomedical Signal Analysis Genomic Data Analysis for Personalized Medicine

UNIT III   ANALTICS   9

Natural Language Processing and Data Mining for Clinical Text - Mining the Biomedical - Social Media Analytics for Healthcare.

UNIT IV   ADVANCED ANALYTICS   9

Advanced Data Analytics for Healthcare - Review of Clinical Prediction Models - Temporal Data Mining for Healthcare Data - Visual Analytics for Healthcare - Predictive Models for Integrating Clinical and Genomic Data - Information Retrieval for Healthcare - Privacy - Preserving Data Publishing Methods in Healthcare

UNIT V   APPLICATIONS   9

Applications and Practical Systems for Healthcare - Data Analytics for Pervasive Health Fraud Detection in Healthcare - Data Analytics for Pharmaceutical Discoveries - Clinical Decision Support Systems - Computer Assisted Medical Image Analysis Systems - Mobile Imaging and Analytics for Biomedical Data.

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LIST OF EXPERIMENTS

1. Study of open source software
2. Medical data storage and retrieval
3. Creation of electronic patient record
4. Web page creation and digital Marketing
5. Preprocessing the given dataset
6. User interface design
7. Univariate and Multivariate regression
8. Multimedia and power BI presentation

TOTAL: 45 +15=60 PERIODS

OUTCOMES

Upon completion of this course, the student will be able to

- Explain the various forms of electronic health care information
- Evaluate the techniques adopted to analyze health care data
- Implement the natural language based analytics
- Illustrate the predictive models for clinical data
- Apply health care analytics and its applications in medical field.
- Design advanced digital healthcare analytic system for the betterment of hospitals and healthcare.

TEXT BOOKS

1. Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis, 2015
2. Hui Yang, Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement", Wiley, 2016.

REFERENCES

1. Michael Berthold, David J.Hand, "Intelligent Data Analysis", Springer, 2007.
2. David J. Lubliner , "Biomedical Informatics: An Introduction to Information Systems and Software in Medicine and Health", CRC Press, Boca Raton, 2016

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_cs45/preview (Data Analytics with Python)
2. https://onlinecourses.nptel.ac.in/noc22_hs40/preview (Exploring Survey Data on Health Care)

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ESTD 2001

Mapping of Cos-Pos & PSOs

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1	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
2	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
3	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
4	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
5	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
6	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3
AVG	3	2	1	1	1	-	-	-	2	1	-	-	2	2	3

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SEMESTER VII

23MDAP01	PROJECT WORK	L T P C
		0 0 12 6

OBJECTIVES

- To understand a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To study the skills needed to formulate a technical project.
- To learn the methodology to solve the identified problem.
- To study the use of new tools, algorithms and techniques required to carry out the projects
- To understand about preparing project reports and face reviews and viva-voce

GUIDELINE FOR REVIEW AND EVALUATION

The students in a group of 4 works on a topic approved by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of engineering design. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 15 PERIODS

OUTCOMES

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

- Analyze the real world problem, identify the requirement and develop the design solutions
- Identify the technical ideas, strategies and methodologies
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
- Develop technical report and oral presentations
- Categorize any challenging practical problems and find solution by formulating proper methodology

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2	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
3	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
4	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
5	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2

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FOR B.E./ B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE /HONOURS - Advanced Healthcare Management)

CREDIT SUMMARY

B.E.- MEDICAL ELECTRONICS

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	-	-	-	-	-	-	-	-	-
BS	-	-	-	-	-	-	-	-	-
ES	-	-	-	-	-	-	-	-	-
PC	-	-	3	3	3	4	-	-	13
PE	-	-	-	-	-	-	-	-	-
OE	-	-	-	-	-	-	-	-	-
EEC	-	-	-	-	-	-	6	-	6
MC	-	-	-	-	-	-	-	-	-
Total	-	-	3	3	3	4	6	-	19