

NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode - 638 052, Tamilnadu, India, Phone: 04294 – 225585



Curriculum and Syllabi

for

B.E – Biomedical Engineering [R22]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year (2022-23) onwards)

AUGUST 2022

INSTITUTE VISION AND MISSION	
VISION	<ul style="list-style-type: none"> • To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society
MISSION	<ul style="list-style-type: none"> • To provide quality education to produce ethical and competent professionals with social Responsibility • To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems • To create a learner centric environment and improve continually to meet the changing global needs

B.E – BIOMEDICAL ENGINEERING	
VISION	<ul style="list-style-type: none"> • To foster academic excellence imparting knowledge in Biomedical and allied disciplines to meet the ever growing needs of the society
MISSION	<ul style="list-style-type: none"> • To impart quality education and develop an aptitude for professional career and continuous learning with ethics and social responsibility • To provide a framework for research and innovation to meet the emerging challenges through regular interaction with healthcare industry • To create a learner centric environment by upgrading knowledge and skills to cater the needs and challenges of the society
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	<p>The graduates of Biomedical Engineering will be</p> <p>PEO1: Core Competency: Successful professionals with core competency and interdisciplinary skills to satisfy the Industrial needs</p> <p>PEO2: Research, Innovation and Entrepreneurship: Capable of identifying technological requirements for the society and providing innovative ideas for real time problems</p> <p>PEO3: Ethics, Human values and Life-long learning: Able to demonstrate ethical practices and managerial skills through continuous learning</p>
PROGRAMME SPECIFIC OUTCOMES (PSO)	<p>The students of Biomedical Engineering will be able to</p> <ul style="list-style-type: none"> • Design and develop the electronic systems to offer healthcare solutions by applying the knowledge of Mathematics, Life Sciences, Engineering and Technology • Apply software skills, Information and Communication Technologies (ICT) for solving the clinical problems

PROGRAM OUTCOMES:

At the end of this programme the students will be able to

a-l	GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
a	Engineering Knowledge	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
b	Problem Analysis	PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
c	Design and Development of Solutions	PO3	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
d	Investigation of Complex Problems	PO4	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
e	Modern Tool Usage	PO5	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
f	The Engineer and Society	PO6	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
g	Environment and Sustainability	PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
h	Ethics	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
i	Individual and Team Work	PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
j	Communication	PO10	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
k	Project Management and Finance	PO11	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
l	Lifelong Learning	PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Educational Objectives and the Outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	2	3	2	1	1	2	1	1	3	1
2	3	3	3	3	3	1	1	1	1	1	1	2
3	3	3	3	3	3	2	2	3	1	2	2	2

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	2	2	1	1	2	1	1	2
2	1	3	2	3	3	2	2	1	2	1	1	3

Contribution

1: Reasonable

2: Significant

3: Strong

SEMESTER: I									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22MAN01	Induction Programme	MC	-	-	-	-	-	-
THEORY									
2	22EYA01	Professional Communication – I	HSMC	-	4	2	0	2	3
3	22MYB01	Calculus and Linear Algebra*	BSC	-	4	3	1	0	4
4	22CYB01	Introduction to Biochemistry	BSC	-	3	3	0	0	3
5	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
6	22ECC02	Basics of Electrical and Instrumentation Engineering	ESC	-	3	3	0	0	3
7	22GYA01	தமிழர் மரபு / Heritage of Tamils	HSMC	-	1	1	0	0	1
PRACTICAL									
8	22GEP01	Engineering Practices Laboratory	ESC	-	4	0	0	4	2
9	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
10	22CYP01	Chemistry Laboratory*	BSC	-	2	0	0	2	1
Mandatory Non Credit Courses									
11	22MAN02	Soft/Analytical Skills – I	MC	-	3	1	0	2	0
12	22MAN03	Yoga – I*	MC	-	1	0	0	1	0
TOTAL					32	16	1	15	22

*Ratified by Eleventh Academic Council

SEMESTER: II									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3
2	22MYB04	Transforms and Partial Differential Equations*	BSC	-	4	3	1	0	4
3	22PYB03	Solid State Physics	BSC	-	3	3	0	0	3
4	22CSC02	Data Structures using C*	ESC	22CSC01	3	3	0	0	3
5	22ECC04	Electronic Devices and Circuits (Theory + Lab)	ESC	-	5	3	0	2	4
6	22GYA02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	-	1	1	0	0	1
PRACTICAL									
7	22CSP02	Data Structures Laboratory*	ESC	22CSP01	4	0	0	4	2
8	22PYP01	Physics Laboratory*	BSC	-	2	0	0	2	1
9	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2
Mandatory Non Credit Courses									
10	22MAN04	Soft/Analytical Skills – II	MC	22MAN02	3	1	0	2	0
11	22MAN05	Yoga – II*	MC	-	1	0	0	1	0
TOTAL					34	16	1	17	23



*Ratified by Eleventh Academic Council

SEMESTER: III									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22MYB06	Probability and Random Processes	BSC	-	4	3	1	0	4
2	22BMC01	Analog and Digital Electronics	PCC	22ECC04	3	3	0	0	3
3	22BMC02	Anatomy and Human Physiology (Theory + Lab)	PCC	-	5	3	0	2	4
4	22BMC03	Sensors and Measurements	PCC	22ECC02	3	3	0	0	3
5	22ECC06	Signals and Systems	PCC	22MYB01, 22MYB04	3	3	0	0	3
6	22CYB06	Environmental Science and Sustainability	ESC	-	3	3	0	0	3
PRACTICAL									
7	22BMP01	Analog and Digital Electronics Laboratory	PCC	-	4	0	0	4	2
8	22BMP02	Sensors and Measurements Laboratory	PCC	-	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN07	Soft / Analytical Skills – III	MC	-	3	1	0	2	0
10	22MAN09	Indian Constitution	MC	-	2	2	0	0	0
TOTAL					34	21	1	12	24

SEMESTER: IV									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22ITC06	Java Programming	ESC	-	3	3	0	0	3
2	22MECI3	Engineering Mechanics for Biomedical Engineers	PCC	-	3	3	0	0	3
3	22BMC04	Biomedical Instrumentation	PCC	22BMC03	3	3	0	0	3
4	22BMC05	Biosignal Processing	PCC	22ECC06	3	3	0	0	3
5	22BMC06	Biocontrol System	PCC	-	3	3	0	0	3
6	22BMC07	Biomaterials and Artificial Organs	PCC	22BMC02	3	3	0	0	3
PRACTICAL									
7	22ITP04	Java Programming Laboratory	ESC	-	4	0	0	4	2
8	22BMP03	Biosignal Processing Laboratory	PCC	-	4	0	0	4	2
9	22BMP04	Biomedical Instrumentation Laboratory	PCC	-	4	0	0	4	2
Mandatory Non Credit Courses									
10	22MAN08	Soft/Analytical Skills – IV	MC	-	3	1	0	2	0
11	22GED01	Personality and Character Development	MC	-	0	0	0	1	0
TOTAL					33	19	0	15	24

SEMESTER: V									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22BMC08	Microprocessors and Microcontrollers Interfacing	PCC	22BMC01	3	3	0	0	3
2	22BMC09	Radiology Equipment	PCC	-	3	3	0	0	3
3	22BMC10	Diagnostic and Therapeutic Equipment	PCC	22BMC04	3	3	0	0	3
4	E1	Elective(PEC)	PEC	-	3	3	0	0	3
5	E2	Elective(OEC/PEC)	PEC	-	3	3	0	0	3
6	E3	Elective(PEC)	PEC	-	3	3	0	0	3
PRACTICAL									
7	22BMP05	Microprocessors and Microcontrollers Interfacing Laboratory	PCC	-	4	0	0	4	2
8	22BMP06	Diagnostic and Therapeutic Equipment Laboratory	PCC	22BMP04	4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN10	Soft/Analytical Skills - V	MC	-	3	1	0	2	0
10	22MAN11	Certification Course - I	MC	-	1	0	0	1	0
TOTAL					30	19	0	11	22

SEMESTER: VI									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22BMC11	Fundamentals of Healthcare Analytics	PCC	-	3	3	0	0	3
2	22BMC12	Medical Image Processing	PCC	-	3	3	0	0	3
3	E4	Elective(OEC)	OEC	-	3	3	0	0	3
4	E5	Elective(PEC)	PEC	-	3	3	0	0	3
5	E6	Elective(PEC)	PEC	-	3	3	0	0	3
6	E7	Elective(OEC/PEC)	PEC	-	3	3	0	0	3
PRACTICAL									
7	22BMP07	Medical Image Processing Laboratory	PCC	-	4	0	0	4	2
Mandatory Non Credit Courses									
8	22MAN12	Soft/Analytical Skills - VI	MC	-	3	1	0	2	0
9	22MAN13	Certification Course - II	MC	-	1	0	0	1	0
TOTAL					26	19	0	7	20

SEMESTER: VII									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22GEA01	Universal Human Values	HSMC	-	2	2	0	0	2
2	EMI	Elective (Management)	HSMC	-	3	3	0	0	3
3	E8	Elective(PEC)	PEC	-	3	3	0	0	3
4	E9	Elective(PEC)	PEC	-	3	3	0	0	3
5	E10	Elective(OEC)	OEC	-	3	3	0	0	3
PRACTICAL									
6	22GED02	Internship / Industrial Training	EEC	-	2	0	0	0	2
TOTAL					16	14	0	0	16

SEMESTER: VIII									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICAL									
I	22BMD01	Project Work	EEC	-	20	0	0	20	10
TOTAL					20	0	0	20	10

B.E. BIOMEDICAL ENGINEERING

REGULATIONS – 2022

CHOICE BASED CREDIT SYSTEM

(A) HSMC, BSC, ESC and MC Courses										
(a) Humanities Science including Management Courses(HSMC)			AICTE Credit Distribution Norm:12							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22EYA01	Professional Communication – I	HSMC	-	4	2	0	2	3	I
2.	22GYA01	தமிழர் மரபு / Heritage of Tamils	HSMC	-	1	1	0	0	1	I
3.	22EYA02	Professional Communication- II	HSMC	22EYA01	4	2	0	2	3	II
4.	22GYA02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	-	1	1	0	0	1	II
5.	22GEA01	Universal Human Values	HSMC	-	2	2	0	0	2	VII
6.	EMI	Elective(Management)	HSMC	-	3	3	0	0	3	VII

(b)Basic Science Courses (BSC)			AICTE Credit Distribution Norm:25							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22MYB01	Calculus and Linear Algebra	BSC	-	4	3	1	0	4	I
2.	22CYB01	Introduction to Biochemistry	BSC	-	3	3	0	0	3	I
3.	22CYP01	Chemistry Laboratory	BSC	-	2	0	0	2	1	I
4.	22MYB04	Transforms and Partial Differential Equations	BSC	-	4	3	1	0	4	II
5.	22PYB03	Solid State Physics	BSC	-	3	3	0	0	3	II
6.	22PYP01	Physics Laboratory	BSC	-	2	0	0	2	1	II
7.	22MYB06	Probability and Random Processes	BSC	-	4	3	1	0	4	III

(c) Engineering Science Courses (ESC)			AICTE Credit Distribution Norm:24							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3	I
2.	22ECC02	Basics of Electrical and Instrumentation Engineering	ESC	-	3	3	0	0	3	I
3.	22GEP01	Engineering Practices Laboratory	ESC	-	4	0	0	4	2	I
4.	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2	I
5.	22CSC02	Data Structures using C	ESC	22CSC01	3	3	0	0	3	II
6.	22ECC04	Electronic Devices and Circuits (Theory + Lab)	ESC	-	5	3	0	2	4	II
7.	22CSP02	Data Structures Laboratory	ESC	22CSP01	4	0	0	4	2	II
8.	22MEP01	Engineering Graphics Laboratory	ESC	-	4	0	0	4	2	II
9.	22CYB06	Environmental Science and Sustainability	ESC	-	3	3	0	0	3	III
10.	22ITC06	Java Programming	ESC	-	3	3	0	0	3	IV
11.	22ITP04	Java Programming Laboratory	ESC	-	4	0	0	4	2	IV

(d) Mandatory Courses (MC)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22MAN01	Induction Programme	MC	-	0	0	0	0	0	I

2.	22MAN02	Soft /Analytical Skills - I	MC	-	3	1	0	2	0	I
3.	22MAN03	Yoga - I	MC	-	1	0	0	1	0	I
4.	22MAN04	Soft /Analytical Skills - II	MC	-	3	1	0	2	0	II
5.	22MAN05	Yoga - II	MC	-	1	0	0	1	0	II
6.	22MAN07	Soft / Analytical Skills - III	MC	-	5	3	0	2	0	III
7.	22MAN09	Indian Constitution	MC	-	1	1	0	0	0	III
8.	22MAN08	Soft/Analytical Skills - IV	MC	-	5	3	0	2	0	IV
9.	22GED01	Personality and Character Development	MC	-	1	0	0	1	0	IV
10.	22MAN10	Soft/Analytical Skills - V	MC	-	3	1	0	2	0	V
11.	22MAN11	Certification Course - I	MC	-	1	0	0	1	0	V
12.	22MAN12	Soft/Analytical Skills - VI	MC	-	3	1	0	2	0	VI
13.	22NAN13	Certification Course - II	MC	-	1	0	0	1	0	VI

(B) Programme Core Courses (PCC)			AICTE Credit Distribution Norm:48							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22BMC01	Analog and Digital Electronics	PCC	22ECC04	3	3	0	0	3	III
2.	22BMC02	Anatomy and Human Physiology (Theory + Lab)	PCC	-	5	3	0	2	4	III
3.	22BMC03	Sensors and Measurements	PCC	22ECC02	3	3	0	0	3	III

4.	22ECC06	Signals and Systems	PCC	22MYB01, 22MYB04	3	3	0	0	3	III
5.	22BMP01	Analog and Digital Electronics Laboratory	PCC	-	4	0	0	4	2	III
6.	22BMP02	Sensors and Measurements Laboratory	PCC	-	4	0	0	4	2	III
7.	22MEC13	Engineering Mechanics for Biomedical Engineers	PCC	-	3	3	0	0	3	IV
8.	22BMC04	Biomedical Instrumentation	PCC	22BMC03	3	3	0	0	3	IV
9.	22BMC05	Biosignal Processing	PCC	22ECC06	3	3	0	0	3	IV
10.	22BMC06	Biocontrol System	PCC	-	3	3	0	0	3	IV
11.	22BMC07	Biomaterials and Artificial Organs	PCC	22BMC02	3	3	0	0	3	IV
12.	22BMP03	Biosignal Processing Laboratory	PCC	-	4	0	0	4	2	IV
13.	22BMP04	Biomedical Instrumentation Laboratory	PCC	-	4	0	0	4	2	IV
14.	22BMC08	Microprocessors and Microcontrollers Interfacing	PCC	22BMC01	3	3	0	0	3	V
15.	22BMC09	Radiology Equipment	PCC	-	3	3	0	0	3	V
16.	22BMC10	Diagnostic and Therapeutic Equipment	PCC	22BMC04	3	3	0	0	3	V
17.	22BMP05	Microprocessors and Microcontrollers Interfacing Laboratory	PCC	-	4	0	0	4	2	V
18.	22BMP06	Diagnostic and Therapeutic Equipment Laboratory	PCC	22BMP04	4	0	0	4	2	V
19.	22BMC11	Fundamentals of	PCC	-	3	3	0	0	3	VI

		Healthcare Analytics								
20.	22BMC12	Medical Image Processing	PCC	-	3	3	0	0	3	VI
21.	22BMP07	Medical Image Processing Laboratory	PCC	-	4	0	0	4	2	VI

(D) Employability Enhancement Courses (EEC)			AICTE Credit Distribution Norm :15							
S. No	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22GED02	Internship / Industrial Training	EEC	-	2	0	0	0	2	VII
2.	22BMD01	Project Work	EEC	-	20	0	0	20	10	VIII

SUMMARY

S. No.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HSMC	4	4	-	-	-	-	5	-	13
2.	BSC	8	8	4	-	-	-	-	-	20
3.	ESC	10	11	3	5	-	-	-	-	29
4.	PCC	-	-	17	19	13	8	-	-	57
5.	PEC	-	-	-	-	9	9	6	-	24
6.	OEC	-	-	-	-	-	3	3	-	6
7.	EEC	-	-	-	-	-	-	2	10	12
CREDITS TOTAL		22	23	24	24	22	20	16	10	161

22EYA01 - PROFESSIONAL COMMUNICATION - I (Common to All Branches)					
		L	T	P	C
		2	0	2	3
PREREQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To build essential English skills to address the challenges of communication in today's work environment	1.1	The students will be able to apply knowledge of communication and language processes occur in various work environment		
2.0	To comprehend the various dimensions of communication by employing LSRW skills	2.1	The students will be able to involve in diverse discourse forms utilizing LSRW skills		
3.0	To deploy students in contextual initiatives by assisting them in developing communication abilities	3.1	The students will be able to participate actively in communication activities that enhance their creative skill		
4.0	To facilitate students in comprehending the intent, target audience and environments of various forms of communication	4.1	The students will be able to associate with the target audience and contexts using varied types of communication		
5.0	To enhance coherence, cohesion, and proficiency in both verbal and nonverbal communication in the workplace environment	5.1	The students will be able to convey the idea distinctly both in verbal and non verbal communication in work culture		

UNIT I –INTRODUCTORY SKILLS	(6+6)
Grammar – Parts of Speech – Verb (Auxiliaries – Primary & Modal, Main Verb) - Listening – Listening to Short Conversations or Monologues - Listening to Experiences – Listening to Descriptions- Speaking – Introducing Oneself – Exchanging Personal information - Talking about food and culture - Reading – Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting - Writing - Seeking Permission for Industrial Visit & In-plant Training	
UNIT II – LANGUAGE ACUMEN	(6+6)
Grammar – Word Formation – Tenses (Present Tense) – Synonyms & Antonyms - Listening – Listening to Announcements – Listening to Interviews - Listening and Note-taking - Speaking – Talking about Holidays & Vacations – Narrating Unforgettable Anecdotes - Reading – Skimming – Scanning (Short Texts and Longer Passages) – Critical Reading - Writing – Instruction – Process Description	
UNIT III – COMMUNICATION ROOTERS	(6+6)
Grammar – Cause and Effect – Tenses (Past Tense) – Discourse Markers - Listening – Listening to Telephonic Conversations – Listening to Podcasts - Speaking – Talking about neoteric Technologies – Eliciting information to fill a form - Reading –Book Reading(Motivational) - Practicing Speed Reading (reading newspaper reports & biographies) - Writing – Checklist – Circular, Agenda & Minutes of the Meeting	

UNIT IV – DISCOURSE FORTE	(6+6)
Grammar – Tenses (Future Tense) –Yes/No & WH type questions – Negatives - Listening – Listening to TED/ Ink talks - Speaking – Participating in Short Conversations - Reading – Reading Comprehension (Multiple Choice / Short / Open Ended Questions) - Writing - E-Mail Writing	
UNIT V – LINGUISTIC COMPETENCIES	(6+6)
Grammar – Articles – Homophones & Homonyms – Single line Definition – Phrasal Verb - Listening – Intensive listening to fill in the gapped text - Speaking –Expressing opinions through Situations & Role play Reading – Cloze Texts - Writing – Paragraph Writing	
LIST OF SKILLS ASSESSED IN THE LABORATORY	
<ol style="list-style-type: none"> 1. Grammar 2. Listening Skills 3. Speaking Skills 4. Reading Skills 5. Writing Skills 	
TOTAL (L:30 , P:30) = 60 PERIODS	
TEXT BOOK:	
1. Shoba K N., Deepa Mary Francis, “English for Engineers and Technologists”, Volume I, 3rd Edition, Orient Black Swan Pvt. Ltd., Telangana, 2022.	
REFERENCES:	
<ol style="list-style-type: none"> 1. Koneru, Aruna, “English Language Skills”, Tata McGraw Hill Education (India) Private Limited, Chennai, 2006. 2. Hewings M, “Advanced English Grammar”, Cambridge University Press, Chennai, 2000. 3. Jack C Richards, Jonathan Hull and Susan Proctor, “Interchange”, Cambridge University Press, New Delhi, 2015 (Reprint 2021). 	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2	1	
2									3	3		2	1	
3									3	3		2	1	
4									3	3		2	1	
5									3	3		2	1	
CO (W.A)									3	3		2	1	

P. Anand

22MYB01 - CALCULUS AND LINEAR ALGEBRA (Common to All Branches)				
			L	T
			P	C
			3	4
PRE REQUISITE : NIL				
Course Objectives			Course Outcomes	
1.0	To develop the use of matrix algebra techniques needed by engineers for practical applications.	1.1	The students will be able to apply the concept of orthogonal reduction to diagonalise a given matrix.	
2.0	To use the techniques, skills and engineering tools necessary for engineering practice, with geometric concepts.	2.1	The students will be able to identify the geometric aspects of plane, straight line and sphere.	
3.0	To improve the ability of the students in solving geometrical applications of differential calculus problems.	3.1	The students will be able to evaluate the radius of curvature, circle of curvature and centre of curvature for a given curve.	
4.0	To learn the important role of mathematical concepts in engineering applications with the functions of several variables.	4.1	The students will be able to calculate the maxima and minima for a given function with several variables by finding the stationary points.	
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.	5.1	The students will be able to evaluate the area and volume by double and triple integrals.	

UNIT I – MATRICES	(9+3)
Characteristic Equation - Eigen values and Eigen vectors of a matrix - Cayley Hamilton Theorem (excluding proof) and its applications - Quadratic form - Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II – ANALYTICAL GEOMETRY OF THREE DIMENSIONS	(9+3)
Equation of plane – Angle between two planes – Equation of straight lines - Coplanar lines – Equation of sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	(9+3)
Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature - Circle of curvature - Evolutes and Involutives.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	(9+3)
Partial derivatives - Euler’s theorem on homogeneous function - Jacobian - Maxima and Minima of functions of two variables - Constrained Maxima and Minima by Lagrange’s multiplier method.	
UNIT V - MULTIPLE INTEGRALS	(9+3)
Double integration in Cartesian Co-ordinates - Change of order of integration - Area as double integral -Triple integration in Cartesian Co-ordinates - Volume as triple integrals.	
TOTAL (L:45+T:15) :60 PERIODS	

LIST OF PROGRAMS USING MATLAB (Assignment/Online Test):

1. Introduction to MATLAB
2. Matrix operations – Addition, Multiplication, Transpose and Inverse
3. Characteristic equation of a Matrix
4. Eigen values and Eigen vectors of Higher order Matrices.
5. Curve Tracing
6. Determining Maxima and Minima of a function of one variable.
7. Determining Maxima and Minima of a function of two variables.
8. Evaluating double integrals
9. Evaluating triple integrals
10. Finding area between two curves.

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Dr. Grewal B S., “Higher Engineering Mathematics”, 42nd Edition, Khanna Publications, 2012. 2. Erwin Kreyszig, “Advanced Engineering Mathematics”, 9th Edition, John Wiley & Sons, 2013. 3. Veerarajan T., “Engineering Mathematics of Semester I & II”, 3rd Edition, Tata McGraw Hill, 2016.
REFERENCES:
<ol style="list-style-type: none"> 1. Bali N P., Manish Goyal, “A Text book of Engineering Mathematics-Sem-II”, 6th Edition, Laxmi Publications, 2014. 2. Kandasamy P., Thilagavathy K., Gunavathy K., “Engineering Mathematics for First Year”, 9th Rev. Edition, S.Chand & Co Ltd, 2013. 3. Glyn James, “Advanced Engineering Mathematics”, 7th Edition, Wiley India, 2007.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2		1				1		2	2	2	
2	3	2	2		1	1			1			2	2	
3	3	2	2		1							2	2	
4	3	2	2	1	1				1			2	2	
5	3	2	2	1	1				1		1	2	2	
CO (W.A)	3	2	2	1	1	1			1		1.5	2	2	

*Ratified by Eleventh Academic Council

22CYB01 – INTRODUCTION TO BIOCHEMISTRY					
<i>(For BME Branch Only)</i>					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To make the students conversant with water treatment, boiler feed water techniques.	1.1	The students will be able to identify the various water treatment techniques for domestic and industrial purpose.		
2.0	To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of energy sources and storage devices.	2.1	The students will be able to impart knowledge on renewable energy sources like nuclear, solar, wind energy and also on storage devices.		
3.0	The students should be conversant with structural and basic properties of carbohydrates and lipids.	3.1	The students will be able to predict the impact of carbohydrates, fats on processing and quality of the finished products.		
4.0	To gain the knowledge on enzyme and its clinical application.	4.1	The students will be able to depict the chemical nature of enzymes and their function in biochemical reactions.		
5.0	To recognize the basic concepts of biotechnology, electrochemistry and understand electrochemical processes.	5.1	The students will be able to evaluate fundamentals of biotechnology, electrochemistry, electrodes, cells and electrode potentials.		

UNIT I - WATER TECHNOLOGY AND NANO MATERIALS	(9)
Municipal Water Treatment - Disinfection Methods (UV, Ozonation, Chlorination) - Desalination of Brackish Water - Reverse Osmosis - Boiler Troubles (Scale, Sludge, Priming, Foaming and Caustic Embrittlement) - Treatment of Boiler Feed Water - Internal Treatment (Carbonate, Phosphate and Calgon Conditioning) - External Treatment - Demineralization Process. Nano Materials - Synthesis (Laser Ablation and Chemical Vapour Deposition Method), Properties and Applications of Nanomaterials in Medicine, Energy, Electronics and Catalysis.	
UNIT II - ENERGY SOURCES AND STORAGE DEVICES	(9)
Nuclear Energy - Nuclear Fission - Nuclear Fusion - Light Water Nuclear Power Plants - Breeder Reactor - Solar Energy Conversion - Solar Cells - Solar Water Heater - Wind Energy - Batteries - Types of Batteries - Lead Acid Storage Battery – Lithium - Ion Battery, Electric Vehicles - Working Principles.	
UNIT III - CARBOHYDRATES AND LIPIDS	(9)
Carbohydrate - Classification of Carbohydrates - Monosaccharides - Structure: Trioses - Properties of Monosaccharides. Disaccharides - Structure: Sucrose. Oligosaccharides - Raffinose - Polysaccharides - Starch. Lipids - Classification of Lipids - Simple - Complex - Derived Lipids - Nomenclature of Fatty Acids - Physical and Chemical Properties of Fat.	

UNIT IV – ENZYMOLOGY	(9)
Enzymes - Classifications of Enzymes - Kinetics of Enzymes - Michaelis - Menten Equation - Factors Affecting Enzymatic Activity - Temperature - pH - Concentration of Substrate - Enzyme Concentration - Product Concentration – Activators - Enzyme Inhibitors - Reversible Inhibitors - Competitive - Non Competitive - Irreversible Inhibitors - Active Site Directed Irreversible Inhibitors - Suicide Inhibitors - Difference between Reversible and Irreversible Inhibitors.	
UNIT V - BIOTECHNOLOGY AND ELECTROCHEMISTRY	(9)
Biotechnology - Importance - Types - Applications. Electrochemistry - Electrode Potential - Nernst Equation - Derivation and Problems - Reference Electrodes - Standard Hydrogen Electrode -Calomel Electrode - Potentiometric Titrations (Redox) - Conductometric Titrations (Acid-Base).	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Dr.Ravikrishnan A., “Engineering Chemistry I & Engineering Chemistry II”, 13th Edition, Sri Krishna Hitech Publishing Company Pvt. Ltd., Chennai, 2020. 2. Lehninger A L., Nelson D L and Cox M M., “Principles of Biochemistry”, 4th Edition, Freeman Publishers, New York, 2017.
REFERENCES:
<ol style="list-style-type: none"> 1. Jain P C. and Monica Jain, “Engineering Chemistry”, Volume I and II, 15th Edition, Dhanpat Rai Publishing Company, New Delhi 2018. 2. Keith Wilson and John Walker, “Practical Bio Chemistry – Principles & Techniques”, Oxford University Press, 2018. 3. Donald Voet and Judith G. Voet, “Biochemistry”, 3rd Edition, Wiley, John & Sons, 2019.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		1			2	1		1			2	1	
2	3	1				2						2		
3	3	1					1		1			2	1	
4	3	2	2			2	2		2			2	2	
5	3	2				2	2					2	2	
CO (W.A)	3	1.5	1.5			2	1.5		1.3			2	1.5	

Pharm

22CSC01 - PROBLEM SOLVING AND C PROGRAMMING (Common to AI&DS, BME, CSE, CSE(CS), CSE(IOT), ECE, EEE and IT Branches)					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To understand problem solving, problem solving aspects, programming and to know about various program design tools.	1.1	The students will be able to identify the appropriate problem solving techniques to drive the solution for the given problem.		
2.0	To learn basic structure and Control Statements in C programming.	2.1	The students will be able to implement the appropriate looping and control statements in C for developing applications.		
3.0	To learn the manipulation of arrays and strings	3.1	The students will be able to develop programs on arrays of different dimensions of arrays and strings concepts.		
4.0	To understand the concept of modular programming using user defined functions.	4.1	The students will be able to implement programs using user defined functions.		
5.0	To acquaint with the use and benefits of Memory Allocation and file handling.	5.1	The students will be able to use dynamic memory allocation functions for assigning memory space during execution.		

UNIT I - PROBLEM SOLVING AND C PROGRAMMING BASICS	(9)
General Problem Solving: Algorithms, Flowcharts and Pseudo-codes, Implementation of Algorithms Basics of C Programming : Introduction to C - Structure of C program - Programming Rules – Compilation – Errors - C Declarations: Tokens - Keywords - Identifiers - Constants - Data Types - Variable Declaration and Initialization - Type Conversion - Constant and Volatile Variables - Operators and Expressions.	
UNIT II - DECISION CONTROL STATEMENTS	(9)
Managing Input and Output operations, Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements.	
UNIT III - ARRAYS AND STRINGS	(9)
Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions.	
UNIT IV - FUNCTIONS	(9)
Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes.	

UNIT V - POINTERS AND FILE MANAGEMENT	(9)
Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation	
TOTAL (L:45) :45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Ashok N. Kamthane, "Programming in C", 2nd Edition, Pearson Education, 2013. 2. Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.
REFERENCES:
<ol style="list-style-type: none"> 1. Dromey R G., "How to Solve it by Computer", 1st Edition, Pearson Education India, ISBN10: 8131705625, ISBN-13: 978-8131705629. 2. Maureen Spankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson, India, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645. 3. YashavantKanetkar, "Let us C", 16th Edition, BPB Publications, 2018. 4. ReemaThareja, "Programming in C", 2nd Edition, Oxford University Press, New Delhi, 2018. 5. Balagurusamy E, "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2									3		3
2	3	2	3									3		3
3	3	2	3								3	3		3
4	3	2	3						3		3	3		3
5	3	2	3								3	3		3
CO (W.A)	3	2	2.8						3		3	3		3

Pravin

22ECC02 - BASICS OF ELECTRICAL AND INSTRUMENTATION ENGINEERING (Common to ECE and BME Branches)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To make students to learn and understand the basics of Electrical Motor concepts.	1.1	The students will be able to narrate Constructional details, principle of operation, performance and starters of D.C. Machines.		
2.0	To enable the student to understand the basic concepts of electrical transformer	2.1	The students will be able to explicate the Constructional details, principle of operation and testing of Transformer.		
3.0	To make the students to understand the concepts of induction motor and synchronous motor.	3.1	The students will be able to describe the Constructional details, principle of operation, starting, speed control of induction and synchronous Motors.		
4.0	To make the students to understand basic concepts of measuring and electronics instruments.	4.1	The students will be able to understand the principle of operation of basic measuring and electronics instruments.		
5.0	To make the students to understand various types of transducers.	5.1	The students will be able to understand about operation of various types of transducers.		

UNIT I - D.C. MACHINES	(9)
DC Generators: Constructional details – Principle of operation – EMF Equation – Methods of excitation – Applications – DC Motor: Constructional details – Principle of operation – Torque Equation – Applications – Types of starters.	
UNIT II - TRANSFORMERS	(9)
Single phase Transformers: Constructional details – Principle of operation – EMF Equation – Transformation ratio – Equivalent circuit – Efficiency and Voltage Regulation – Applications.	
UNIT III - INDUCTION MOTORS	(9)
Three phase Induction Motor: Construction – Types – Principle of operation – Applications – Single phase Induction Motor: Construction – Principle of operation – Starting methods – Applications.	
UNIT IV - MEASUREMENTS AND INSTRUMENTATION	(9)
Functional elements of an instrument – Standards and calibration – Measurement Errors - types of error – Moving coil meters – Moving iron meters – CRO – Digital voltmeter: successive Approximation type.	

UNIT V -TRANSDUCERS	(9)
Transducers: Basic Requirements – Classification – Resistive: Strain gauge – Resistance Thermometer – Thermistor – Inductive: LVDT – Piezoelectric – Thermocouples.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Kothari D P and Nagrath I J, “Basic Electrical and Electronics Engineering”, 2nd Edition, McGraw Hill Education, 2020. 2. Sawhney A K and Puneet Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Company, New Delhi, 2015.
REFERENCES:
1. Bhattacharya S K, “Basic Electrical and Electronics Engineering”, 2nd Edition, Pearson Education, 2017. 2. Rajput R K, “Electronic Measurements and Instrumentation”, S. Chand & Company Limited, 2015.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	1	2		2	1						1	
2	2	2	1	3		2	1						1	
3	2	2	2	2		2	2						1	
4	2	1	2	1		3	1						1	
5	2	1	2	2		2	3						1	
CO (W.A)	2	1.6	1.6	2		2.2	1.6						1	

P. Anand

22GEP01 - ENGINEERING PRACTICES LABORATORY
(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches)

		L	T	P	C
		0	0	4	2
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To provide hands on training on various basic engineering practices in Civil Engineering	1.1	The students will be able to make various joints/connections in civil engineering practices like plumbing and carpentry.		
2.0	To provide hands on training on welding in Mechanical Engineering	2.1	The students will be able to make various shapes using welding processes.		
3.0	To provide hands on training on various basic engineering practices in Mechanical Engineering	3.1	The students will be able to make various shapes using manufacturing processes like machining and sheet metal work.		
4.0	To understand the basic working principle of electric components	4.1	The students will be able to do residential house wiring and measure electric quantities-Voltage, Current and Power in R Circuit		
5.0	To understand the basic working principle of electronic components	5.1	The students will be able to perform the assembling and testing of the PCB based electronic circuits.		

GROUP-A (MECHANICAL AND CIVIL ENGINEERING)

I - CIVIL ENGINEERING PRACTICE	(15)
Buildings:	
a. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects	
Plumbing:	
a. Study of tools and operations	
b. Hands-on-exercise: External thread cutting and joining of pipes	
Carpentry:	
a. Study of tools and operations	
b. Hands-on-exercise: "L" joint and "T" joint	
II - MECHANICAL ENGINEERING PRACTICE	(15)
Welding:	
a. Study of arc welding, gas welding tools and equipments	
b. Arc welding- Butt joints, Lap joints and Tee joints	
c. Practicing gas welding	
Basic Machining:	
a. Study of lathe and drilling machine	
b. Facing and turning	
c. Drilling and Tapping	

Sheet Metal Work:

- Study of tools and operations
- Rectangular tray
- Cone

GROUP - B (ELECTRICAL AND ELECTRONICS)**I - ELECTRICAL ENGINEERING PRACTICE****(15)**

- Residential house wiring using Switches, fuse, indicator and lamp.
- Fluorescent lamp wiring.
- Stair Case Wiring.
- Measurement of electrical quantities –Voltage, current, power in R Circuit.
- Study of Electrical apparatus-Iron box & water heater.
- Study of Electrical Measuring instruments - Megger.

II - ELECTRONICS ENGINEERING PRACTICE**(15)**

- Study of Electronic components and various use of multi meter.
- Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
- Study of logic gates AND, OR, XOR and NOT.
- Study of Clock Signal.
- Soldering practice -Components Devices and Circuits - Using general purpose PCB.
- Study of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR).
- Study of Telephone, FM Radio and Cell Phone.

TOTAL (P: 60) = 60 PERIODS**Mapping of COs with POs / PSOs**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2					1	1	1		2	1	
2	3	3	2					1	1	1		2	1	
3	3	2	2					1	1	1		2	1	
4	3	2						1	1	1		2	1	
5	3	2						1	1	1		2	1	
CO (W.A)	3	2.4	2					1	1	1		2	1	



22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY
(Common to AI&DS, BME, CSE, CSE(CS), CSE(IOT), ECE, EEE and IT Branches)

	L	T	P	C
	0	0	4	2

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language.	1.1	The students will be able to identify the appropriate programming construct to develop programs for all types of problems.
2.0	To study, analyze and implement the concepts of arrays and strings in C programming.	2.1	The students will be able to implement programs on arrays of different dimensions and string concepts.
3.0	To learn the importance user defined functions and pointers.	3.1	The students will be able to develop programs using user defined functions and pointers.
4.0	To gain knowledge in user defined data types and file handling functions in C programming	4.1	The students will be able to design programs using user defined data types and various file handling functions.
5.0	To acquire skill in dynamic memory allocation	5.1	The students will be able to use dynamic memory allocation functions for assigning memory space during execution.

C-Programming:

1. Draw the flowchart for the following using Raptor tool.
 - a) Simple interest calculation
 - b) Greatest among three numbers
 - c) Find the sum of digits of a number
2. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures)
3. Programs for demonstrating repetitive control statements like 'for', 'while' and 'do-while' (Iterative structures)
4. Programs for demonstrating one-dimensional and two-dimensional numeric array
5. Programs to demonstrate modular programming concepts using functions
6. Programs to implement various character and string operations with and without built-in library functions.
7. Programs to demonstrate the use of pointers
8. Programs to illustrate the use of user-defined data types
9. Programs to implement various file management.
10. Program Using Dynamic memory allocation functions

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

Software:

- RAPTOR Tool
- Compiler – C

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
1	3	2	2										3		3
2	3	2	3										3		3
3	3	2	3									3	3		3
4	3	2	3							3		3	3		3
5	3	2	3									3	3		3
CO (W.A)	3	2	2.8							3		3	3		3



22CYP01- CHEMISTRY LABORATORY
(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches)

L	T	P	C
0	0	2	1

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To explain the origin of hardness, alkalinity, and chloride and dissolved oxygen in water.	1.1	The students will be able to acquire practical skills in the determination of water quality parameters through volumetric analysis
2.0	To determine the copper in brass in the given solution.	2.1	The students will be able to evaluate the amount of copper in the given analyze by titration method.
3.0	Enable the students to acquire knowledge of conductometric titrations and their calculations.	3.1	The students will be able to gain the knowledge about conductance of ions.
4.0	To perform a potentiometric titration and pH of an acidic solution of known Normality.	4.1	The students will be able to analyze and gain experimental skill about activity of hydrogen ions and measures the voltage.
5.0	To know about pH of the solution and how to measure pH using pH meter.	5.1	The students will be able to utilize the fundamental laboratory techniques for analyses such as pH of acidic, basic and neutral solution.

LIST OF EXPERIMENTS

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of DO content of water sample by Winkler's method.
5. Estimation of copper in brass by EDTA.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Determination of strength of given hydrochloric acid using pH meter.

TOTAL (30 P) = 30 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1		1	1	1					1	1	1	
2	2	1		1		1	2				1	1		
3	2			1		1	2				1	1		
4	2			1	2	1	2				1	1	1	
5	2	2		1		1	2					1		
CO (W.A)	2	1.3		1	1.5	1	2				1	1	1	

**Ratified by Eleventh Academic Council*

22MAN01 - INDUCTION PROGRAMME
(For Common To All Branches)

L	T	P	C
-	-	-	-

PRE REQUISITE : NIL

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

REFERENCES:

I. Guide to Induction program from AICTE



2MAN02 - SOFT/ANALYTICAL SKILLS – I (Common to All Branches)					
		L	T	P	C
		1	0	2	0
PREREQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To understand the basic concepts of grammar and apply them in a structured manner.	1.1	The students will be able to intensify their awareness on correct usage of grammar in writing and speaking		
2.0	To evaluate various real-life situations by resorting to an analysis of key issues and factors.	2.1	The students will be able to solve the real-time problems for performing job functions easily.		
3.0	To solve mathematical problems and thereby reducing the time taken for performing job functions.	3.1	The students will be able to enhance their aptitude round clearing ability in interview process.		

UNIT I – VERBAL ABILITY	(5+10)
Tenses - One word substitution- Articles – Preposition - Conjunction	
UNIT II – BASIC APTITUDE	(5+10)
Percentage – Ratio and Proportion – Blood Relations – Analogy	
UNIT III – LOGICAL REASONING	(5+10)
Probability – Profit and Loss - Syllogism - Statement Assumptions.	
TOTAL (L:15, P: 30) :45 PERIODS	

REFERENCES:
1. Dr. Aggarwal R S, “A Modern Approach to Verbal & Non-Verbal Reasoning”, S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, “Quick Arithmetic”, S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, “English Grammar in Use”, 4th Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2		
2		3	2	2			1		2			3		
3		3	2	2			1		2			3		
CO (W.A)		3	2	2			1		2.3	3		2.6		

P. Anand

22MAN03 - YOGA - I
(For Common To All Branches)

L	T	P	C
0	0	1	0

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To make students in understanding the importance of yoga in shaping mental and physical wellness.	1.1	Student will be able to understand the importance of yoga for physical and mental goodness.
2.0	To provide awareness about the significance of leading a peaceful life by following yoga exercises and principles.	2.1	Student will be able to perform the yoga exercises for hand, leg, eye and sun salutation etc.
3.0	To develop mental wellbeing through meditation and breathing exercises.	3.1	Student will be able to learn and practice meditation techniques for keeping good mental health
4.0	To strengthen the body through physical exercises.	4.1	Student will be able to develop their body by performing yoga exercises.
5.0	To inculcate the knowledge about different types of Asanas and their benefits	5.1	Students will be able to demonstrate different types of yoga Asanas for improving their personal fitness.

UNIT I – INTRODUCTION TO YOGA	(3)
Meaning and Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra.	
UNIT II - YOGA AND LIFE STYLE	(3)
Asanas as Preventive measures – Hypertension:Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana – Obesity: Procedure, Benefits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana – Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana - Diabetes: Procedure, Benefits and contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana – Asthema: Procedure, Benefits and contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	
UNIT III – MIND EXERCISES	(3)
Naadi sudhi – Thanduvada sudhi – Breathing meditation – Silent meditation – Relax meditation.	
UNIT IV – PHYSICAL EXERCISES (PART– I)	(3)
Hand Exercises – Leg Exercises – Eye Exercises – Sun Salutation.	

UNIT V – ASANAS (PART-I)	(3)
Asanas –Tadasana – Yegapadhasana – Chakrasana – Udkaddasana – Thirikosana – Thandasana – Paschimottanasana.	
TOTAL (P:15) : 15 PERIODS	

TEXT BOOK /REFERENCE:
I. Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						2	2	3	2	2		3		
2						2	2	3	2	2		3		
3						2	2	3	2	2		3		
4						2	2	3	2	2		3		
5						2	2	3	2	2		3		
CO (W.A)						2	2	3	2	2		3		

**Ratified by Eleventh Academic Council*

22EYA02 - PROFESSIONAL COMMUNICATION - II
(Common to All Branches)

L	T	P	C
2	0	2	3

PREREQUISITE : 22EYA01 - PROFESSIONAL COMMUNICATION – I

Course Objectives		Course Outcomes	
1.0	To familiarize the students with the basic structures of English and to train them to use these elements correctly in speaking and writing	1.1	Students will be able to frame sentences both in written and spoken forms with accuracy and fluency.
2.0	To acquire proficiency in LSRW skills on par with the expectations of the industry.	2.1	Students will be able to attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing.
3.0	To enable students to adopt strategies for enhancing vocabulary, language and fluency and to deliver professional presentations.	3.1	Students will be able to gain essential competency to express one's thoughts orally and in writing in a meaningful way.
4.0	To communicate effectively in an academic setting using the language skills as tools.	4.1	The students will be able to use linguistic structures to read and understand well-structured texts encountered in academic or social contexts.
5.0	To acquire necessary language skills to follow and comprehend discourse such as lectures, conversations, interviews, and discussions.	5.1	Students will be able to perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation

UNIT I – LANGUAGE RUDIMENTS	(6+6)
Grammar – Active and Passive Voice – Impersonal Passive Voice – Numerical Expressions - Listening – Listening for Specific Information and Match / Choose / Fill in the texts - Speaking – Describing a Person - Making Plans - Reading – Intensive Reading - Writing – Job Application with Resume	
UNIT II - RHETORIC ENHANCERS	(6+6)
Grammar – Reported Speech – Infinitive and Gerund - Listening – Listening to Iconic Speeches and making notes - Listening news / documentaries - Speaking –Talking over Phone – Narrating Incidents - Reading – Extensive Reading (Motivational Books) - Writing – Recommendation	
UNIT III – TECHNICAL CORRESPONDENCE	(6+6)
Grammar – If Conditionals – Blended Words - Listening – Listening to business conversation on audio and video of Short Films, News, Biographies - Speaking – Synchronous communication and Asynchronous communication – Opportunities and threats in using digital platform- Reading - Finding key information in a given text - Writing –Netiquettes- Inviting Dignitaries - Accepting & Declining Invitation	

UNIT IV - CORPORATE COMMUNICATION	(6+6)
Grammar – Concord – Compound Words - Listening – Listening to Roles and Responsibilities in Corporate - Listening to technical videos - Speaking – Introduction to Technical Presentation - Story Telling - Reading – Reading and Understanding Technical Articles - Writing – Report Writing (Accident, Survey and feasibility)	
UNIT V - LANGUAGE BOOSTERS	(6+6)
Grammar - Idiomatic Expressions – Relative Clauses – Confusable words - Listening – Listening to different kinds of Interviews - Listening to Group Discussion - Speaking – Group Discussion - Reading – Reading and Interpreting Visual Materials - Writing – Analytical Paragraph Writing	
LIST OF SKILLS ASSESSED IN THE LABORATORY	
<ol style="list-style-type: none"> 1. Grammar 2. Listening Skills 3. Speaking Skills 4. Reading Skills 5. Writing Skills 	
TOTAL (L:30 , P:30) = 60 PERIODS	
TEXT BOOK:	
1. Sudharshana, N.P and Saveetha.C, “English for Technical Communication”, Cambridge University Press, New Delhi, 2016 (Reprint 2017).	
REFERENCES:	
1. Rizvi, M Ashraf, “Effective Technical Communication”, Second Edition, McGraw Hill Education India Pvt Ltd, 2017.	
2. Rodney Huddleston, Geoffrey K. Pullum and Brett Reynolds, “A Student's Introduction to English Grammar”, Second Edition, Cambridge University Press, New Delhi, 2022	
WEB REFERENCE:	
1. http://youtu.be/URtdGiutVew	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2	1	
2									3	3		2	1	
3									3	3		2	1	
4									3	3		2	1	
5									3	3		2	1	
CO (W.A)									3	3		2	1	



22MYB04 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to BME and ECE Branches)					
		L	T	P	C
		3	1	0	4
PRE REQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To understand the concept of Fourier series and enhance the problem solving skill	1.1	The students will be able to analysis the Fourier series problem		
2.0	To develop the skills of the students in the areas of Transforms and Partial Differential Equations	2.1	The students will be able to know the formation of partial differential equations		
3.0	To introduce the effective mathematical tools for the solutions of partial differential equations	3.1	The students will be able to apply the partial differential equations to solve the various electrical and electronics application		
4.0	To acquaint the student with Fourier transform techniques used in wide variety of situations	4.1	The students will be able to solve the problems using Fourier integral theorem and convolution theorem technique		
5.0	To develop Z-transform techniques for discrete time systems	5.1	The students will be able to formulate Z - Transform techniques		

UNIT I - FOURIER SERIES	(9+3)
Dirichlet's Condition – Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – RMS value – Harmonic Analysis	
UNIT II - PARTIAL DIFFERENTIAL EQUATIONS	(9+3)
Formulation of partial differential equations by eliminating arbitrary constants and functions – Solution of standard types first order partial differential equations of the type $f(p,q)=0$, Clairaut's form – Lagrange's linear equations – Linear partial differential equation of second and higher order with constant coefficient of homogeneous types	
UNIT III - APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	(9+3)
Classification of second order Quasi linear partial differential equations – Solution of one dimensional wave equation (Zero and non-zero velocity) – One dimensional heat equation (Temperature reduced to zero and non zero boundary conditions) – Steady state solution of two dimensional heat equation (Finite and infinite plate)	
UNIT IV - FOURIER TRANSFORM	(9+3)
Fourier integral theorem (Statement only) – Fourier transform pair - Sine and Cosine transforms – Properties -Transforms of simple functions – Convolution theorem – Parseval's identity(Excluding proof)	

UNIT V - Z-TRANSFORM AND DIFFERENCE EQUATIONS	(9+3)
Z-transforms – Elementary properties – Inverse Z-transform (Partial fraction method and Residue method) – Convolution theorem (Excluding proof) – Formation of difference equations – Solution of difference equation using Z transform	
TOTAL (L:45+T:15) :60 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Veerajan. T, “Engineering Mathematics (for semester III)”, 3rd Edition, Tata Mc Graw Hill, New Delhi. 2. Kandasamy. P, Thilagavathy. K, and Gunavathy. K., “Engineering Mathematics”, Volume III, S. Chand & Co Ltd., 2008. 3. Grewal B. S, “Higher Engineering Mathematics”, 42nd Edition, Khanna Publishers, New Delhi, 2012.
REFERENCES:
<ol style="list-style-type: none"> 1. Goyal Manish and Bali. N.P, “A Text book of Engineering mathematics”, 6th Edition, Laxmi Publication (P) Ltd., New Delhi, 2012. 2. Kreyszig, Erwin, “Advanced Engineering Mathematics”, 9th Edition, Wiley Publications, New Delhi, 2006. 3. Singaravelu. A, “Transforms and Partial Differential Equations”, Reprint Edition 2013, Meenakshi Publications, Tamilnadu.
WEB REFERENCES:
<ol style="list-style-type: none"> 1. https://youtu.be/B025yIUWkvl 2. https://youtu.be/lkAvgVUvYvY 3. https://youtu.be/RtVE2Gt-KQ4 4. https://youtube.com/playlist?list=PLs7oDAL8_ouKSagWiC_lwrEsRwvD2WJ73

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1					1	1		2	1	
2	3	2	1	1					1	1		2	1	
3	3	2	1	1					1	1		2	1	
4	3	2	1	1					1	1		2	1	
5	3	2	1	1					1	1		2	1	
CO (W.A)	3	2	1	1					1	1		2	1	

*Ratified by Eleventh Academic Council

22PYB03 – SOLID STATE PHYSICS (Common to ECE, EEE & BME)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To expose the concepts of semiconducting materials	1.1	Predict the importance of conducting materials in the communication field		
2.0	To gain fundamental concepts of dielectric materials in the engineering field	2.1	Acquire knowledge about the fundamentals of dielectric materials		
3.0	To acquire the knowledge of magnetic and superconducting materials	3.1	Identify the importance of magnetic and superconducting materials		
4.0	To understand the knowledge of Fabrication process of integrated circuits	4.1	Update the knowledge of Integrated circuits and its fabrication		
5.0	To acquire the knowledge about recent development in advanced materials and nano technology	5.1	Explore the knowledge about recent development in advanced materials and nano materials		

UNIT I – SEMICONDUCTING MATERIALS	(9)
Introduction to Semiconducting Materials – Fermi-Diract Distribution Function – Effect of Temperature on Fermi Function – Elemental and Compound Semiconductors – Intrinsic Semiconductor – Carrier Concentration Derivation – Variation of Fermi Level with Temperature – Electrical Conductivity – Band gap Determination – Extrinsic Semiconductors (qualitative) – Hall effect – Determination of Hall Coefficient – Applications	
UNIT II – DIELECTRIC MATERIALS	(9)
Electrical Susceptibility – Dielectric Constant – Electronic, Ionic, Orientation and Space Charge Polarization – Frequency and Temperature Dependence of Polarization – Internal Field – Claussius – Mosotti Relation (derivation) – Dielectric Loss – Dielectric Breakdown – Uses of Dielectric Materials (Capacitor and Transformer) – Ferro Electricity and Applications	
UNIT III – MAGNETIC AND SUPERCONDUCTING MATERIALS	(9)
Origin of Magnetic Moment – Bohr Magneton – Types of Magnetic Materials – Domain Theory – Hysteresis – Soft and Hard Magnetic Materials – Ferrites – Applications – Superconductivity – Properties – Types of Superconductors – BCS Theory of Superconductivity (qualitative) – High T_c Superconductors – Application of Superconductors – Magnetic Levitation	
UNIT IV – FABRICATION PROCESS OF INTERGATED CIRCUITS	(9)
Bulk Crystal Growth – Epitaxial Growth – Masking and Etching - Diffusion of Impurities - Selective Diffusion – Formation of PN Junction – Resistors – Capacitors – Inductors – Isolation Methods – Metal Semiconductor Contact – Introduction to Integrated Circuit – Monolithic and Hybrid Circuits – Thin Film and Thick Film Technology – Definition of LSI, MSI, VLSI Circuits	

UNIT V – ADVANCED MATERIALS AND NANO TECHNOLOGY	(9)
Metallic Glasses: Preparation, Properties and Applications – Shape Memory Alloys (SMA): Characteristics, Properties of NiTi Alloy, Application – Nano Materials: Properties, Preparation – Pulsed Laser Deposition – Chemical Vapour Deposition of Nano Particles and Applications – Carbon Nano Tubes: Fabrication – Arc Method – Structure – Properties and Application.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. M. N. Avadhanulu and P. G. Kshirsagar, “A Text Book of Engineering Physics”, S. Chand and Company, New Delhi, 2019. 2. A. Marikani, “Materials Science”, PHI Learning Private Limited, Eastern Economy Edition, 2017. 3. M. A. Wahab, “Solid State Physics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., 2016.
REFERENCES:
<ol style="list-style-type: none"> 1. B. Rogers, J. Adams and S. Pennathur, “Nanotechnology: Understanding Small System” CRC Press, 2017. 2. Jacob Millman, Charistos C Halkilas, Satyabratajit “Electronic Devices & Circuits”, 3rd Edition, Tata McGraw Hill Education Private Limited, 2016. 3. Subrahmanyam N, Brijlal, “A Text Book Of Optics” S. Chand & Co. Ltd, New Delhi, 2019.
WEB REFERENCES:
<ol style="list-style-type: none"> 1. https://bayanbox.ir/view/7764531208313247331/Kleppner-D.-Kolenkow-R.J.-Introduction-to-Mechanics-2014.pdf. 2. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf. 3. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/ 4. https://zenodo.org/record/243407#.ZEgPZXZBzIU 5. https://farside.ph.utexas.edu/teaching/qmech/qmech.pdf. 6. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3						1	1		2	1	
2	3	2	3						1	1		1	1	
3	3	3	3						1	1		2	1	
4	3	3	3						1	1		1	1	
5	3	2	2						1	1		2	1	
CO (W.A)	3	2.6	2.8						1	1		1.6	1	

Handwritten signature

22CSC02 – DATA STRUCTURES USING C
(Common to AIDS,CSE,CSE(CS),CSE(IoT),IT,BME,ECE, and EEE)

L	T	P	C
3	0	0	3

PREREQUISITE : 22CSC01

Course Objectives		Course Outcomes	
1.0	To learn the concept of pointers and strings	1.1	The student will be able to perform array and string operations using pointers
2.0	To be able to implement the abstract data type list as a linked list using the node and reference pattern	2.1	The student will be able to manipulate different operations using linked list
3.0	To understand the Stack and Queue ADT	3.1	The student will be able to deploy different operations on stack and queue.
4.0	To gain knowledge on tree data structure	4.1	The student will be able to determine the structure and operations on trees
5.0	To understand the various operations on graph	5.1	The student will be able to implement the various operations on graph

UNIT I - POINTERS USING ARRAYS AND STRINGS

(9)

Pointers: Introduction – Pointers and arrays– passing an array to a function– returning an array from function – NULL pointers –Array of pointers – Pointer-to-pointer – Dangling Pointer. Function pointers: calling a function using function pointer- Using pointer as a function argument

UNIT II - LIST

(9)

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT

UNIT III - STACKS AND QUEUES

(9)

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues

UNIT IV – TREE

(9)

Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap.

UNIT V - GRAPHS	(9)
Definitions – Representation of Graphs – Types of Graph – Graph Traversal: Depth-First Search (DFS) – Breadth-First Search (BFS) – Topological Sort – Applications of DFS: Bi-connectivity – Euler Circuits – Finding Strongly Connected Components – Applications of BFS: Bipartite Graph.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> Sumitabha Das, “Computer Fundamentals & C Programming”, 1st Edition, McGraw Hill Education (India) Private Limited, 2018. Weiss M. A., “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2016.
REFERENCES:
<ol style="list-style-type: none"> Yashavant Kanetkar, “Pointers in C”, BPP Publications, 4th Edition, 2017. Pradip Dey, Manas Ghosh, “Programming in C”, Oxford Higher Education, 2nd Edition, 2016.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	2	1			2		2	3		3
2	3	3	2	2	2	2			1		2	3		3
3	2	3	2	2	2	2			2		2	3		3
4	3	3	2	2	2	1			1		2	3		3
5	3	3	2	2	2	1			2		2	3		3
CO (W.A)	2.8	3	2	2	2	1.4			1.6		2	3		3

*Ratified by Eleventh Academic Council

22ECC04 - ELECTRONIC DEVICES AND CIRCUITS (Common to BME and ECE Branches)					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To make students to examine the basics of Semiconductor Diodes and its characteristics	1.1	The students will be able to examine Semiconductor Diodes and its characteristics		
2.0	To enable the student to analyze the characteristics of Bipolar Junction Transistor and FET	2.1	The students will be able to analyze characteristics of BJT for various operations and FET.		
3.0	To make the students to analyze the operation of Special semiconductor diodes.	3.1	The students will be able to analyze the operation of Special semiconductor diodes		
4.0	To make students to examine the basics of Electrical circuits	4.1	The students will be able to apply the Ohm's law and Kirchhoff's law and investigates the behavior of electric circuits by analytical techniques		
5.0	To enable the student to design simple network by exploring circuit theorems	5.1	The students will be able to design simple network by exploring circuit theorems		

UNIT I - PN DIODE AND BJT	(9)
Formation of PN junction – Working Principle – VI Characteristics – PN Diode Currents – Switching Characteristics. NPN and PNP Transistors – Current Equations – Input and Output Characteristics of CE, CB, CC Configurations	
UNIT II - FET AND SPECIAL DIODES	(9)
JFET – Drain and Transfer Characteristics - MOSFET – Characteristics. Zener Diode, Varactor Diode, Tunnel Diode, PIN Diode, LDR	
UNIT III - BASICS OF CIRCUIT ANALYSIS	(9)
Ohms Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Resistors in Series and Parallel, Voltage and Current Division, Nodal Analysis, Mesh Analysis. Delta-Wye Conversion	
UNIT IV - NETWORK THEOREMS FOR DC	(9)
Linearity and Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem	

UNIT V - NETWORK THEOREMS FOR AC	(9)
Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem	
TEXT BOOKS:	
<ol style="list-style-type: none"> Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 2nd Edition, Pearson Education, 2019. Charles K. Alexander, Matthew N. O. Sadiku, "Fundamentals of Electric Circuits", 2nd Edition, McGraw- Hill Education, 2017. 	
REFERENCES:	
<ol style="list-style-type: none"> Salivahanan S, Suresh kumar N and Vallavanraj A, "Electronic Devices and Circuits", 3rd Edition, Tata McGraw Hill, 2013. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", 8th Edition, Tata McGraw Hill Publishers, New Delhi, 2013. 	

LIST OF THE EXPERIMENTS:
<ol style="list-style-type: none"> Plot the Characteristics of PN Junction Diode and Zener Diode. Plot the Input-Output characteristics of common Emitter and common Base configuration. Plot FET Characteristics. Verification of KVL and KCL. Verification of Thevenin and Nortons Theorem. Verification of Superposition Theorem and Reciprocity Theorem.
TOTAL (L:45+P30) : 75 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1										2	
2	3	3	2	1								1	2	
3	1	2	1			1	1				1	2	2	
4	3	3	2	2									2	
5	3	3	2	2		1					1	2	2	
CO (W.A)	2.6	2.6	1.6	1.6		1	1				1	1.6	2	



22CSP02 – DATA STRUCTURES LABORATORY
(Common to AIDS, CSE, CSE(CS), CSE(IoT), IT, BME, ECE and EEE)

L	T	P	C
0	0	4	2

PREREQUISITE : 22CSP01

Course Objectives		Course Outcomes	
1.0	To learn the concept of pointers	1.1	The students will be able to perform array operations using pointers
2.0	To learn the implementation of all types linked list with its different operations.	2.1	The students will be able to explore various operations on linked list.
3.0	To impart the basic stack and queue concepts and its applications.	3.1	The students will be able to work with stack and queue concepts.
4.0	To explore the concepts of tree data structures	4.1	The students will be able to construct and manipulate various tree operations.
5.0	To understand the various operations on graph	5.1	The students will be able to deploy different operations on graphs.

LIST OF EXPERIMENTS:

1. Pointer using 1D, 2D array
2. Implementation of singly linked list and its operations
3. Implementation of doubly linked list and its operations
4. Implementation of circular linked list and its operations
5. Implementation of Infix to postfix conversion using stack ADT
6. Implement the application for evaluating postfix expressions using array of stack ADT
7. Implementation of reversing a queue using stack
8. Binary Search Tree
9. AVL Tree
10. Priority Queues (Heaps)
11. Implementation of Graph Traversals(BFS, DFS)

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

Hardware:

LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.

Software:

Compiler – C

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	2	1			2		2	3		3
2	3	3	3	3	1	2	1	2	1	1	1	2		2
3	2	3	2	2	1		3		2		3	1		2
4	3	3	3	1	1	2		1	1		1			2
5	3	2	3	3	2	1		1		1	2	2		2
CO (W.A)	2.8	2.8	2.6	2.2	1.4	1.5	2	1.3	1.5	1	1.8	2		2.2

**Ratified by Eleventh Academic Council*

22PYP01 - PHYSICS LABORATORY
(Common to All Branches)

L	T	P	C
0	0	2	1

PREREQUISITES: NIL

Course Objectives		Course Outcomes	
1.0	To provide the basic practical exposure to all the engineering and technological streams in the field of physics.	1.1	The students will be able to apply the concept of stress, strain and elastic limit for a given sample to find their properties.
2.0	To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.	2.1	The students will be able to gain the basic knowledge about handling the laser light and Identify the basic parameters of an optical fibre.
3.0	To enable the students to correlate the theoretical principles with application oriented studies.	3.1	The students will be able to analyze the properties of matter with sound waves.
4.0	To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics	4.1	The students will be able to recall the knowledge of properties of light through spectrometer grating and fiber optic cable.
5.0	To analyze the behavior and characteristics of solar cells and LED	5.1	The students will be able to acquire the knowledge in semiconducting devices such as solar cells and LED.

PHYSICS LABORATORY (Any Five)

1. Determination of Young's modulus by non-uniform bending method
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of V-I characteristics of solar cell.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3							1		3	1	
2	3	3	2									2	1	
3	3	3	2						1			2	1	
4	3	2	3									3	1	
5	3	2	2							1		3	1	
CO (W.A)	3	2.6	2.4						1	1		2.6	1	

**Ratified by Eleventh Academic Council*

22MEP01 - ENGINEERING GRAPHICS LABORATORY					
<i>(Common to AI & DS, BME, CSE, CSE (IoT), CSE (CS), ECE and IT Branches)</i>					
		L	T	P	C
		0	0	4	2
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To Construct various plane curves drawing by Modeling software with dimensions	1.1	The students will be able to construct various plane curves drawing by Modeling software with dimensions		
2.0	To Construct the concept of first angle projection of points, lines and plane drawing by Modeling software with dimensions	2.1	The students will be able to construct the projection of points, lines and planes drawing by Modeling software with dimensions		
3.0	To Develop the projection of solids drawing by Modeling software with dimensions	3.1	The students will be able to develop projection of solids drawing by Modeling software with dimensions		
4.0	To Solve problems in sectioning of solids and developing the surfaces drawing by Modeling software with dimensions	4.1	The students will be able to solve problems in sections of solids and development of surfaces drawing by Modeling software with dimensions		
5.0	To Apply the concepts of orthographic and isometric drawing by Modeling software with dimensions	5.1	The students will be able to apply the concepts of isometric in engineering practice drawing by Modeling software with dimensions		

LIST OF EXPERIMENTS
<ol style="list-style-type: none"> 1. Study of basic tools, commands and coordinate systems (absolute, relative, polar, etc.) used in 2D software. 2. Draw the conic curves and special curves by using drafting software. 3. Draw the front view, top view, side view of objects from the given isometric view. 4. Draw the projections of straight line inclined to both the principal planes. 5. Draw the projections of polygonal surface. 6. Draw the projections of prism, pyramid inclined to anyone of the principal plane. 7. Draw the sectional view and the true shape of the given cylinder and cone. 8. Draw the development of surfaces like prism and pyramid. 9. Draw the isometric projections of cylinder and cone. 10. Draw the isometric projections of Prism and Pyramid.
TOTAL (P:60) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1		3	1				2		3	1	
2	3	2	1		3	1				2		3	1	
3	3	2	1		3	1				2		3	1	
4	3	2	1		3	1				2		3	1	
5	3	3	2		3	1				2		3	1	
CO (W.A)	3	2.2	1.2		3	1				2		3	1	

22MAN04 - SOFT/ANALYTICAL SKILLS – II						
			L	T	P	C
PREREQUISITE : NIL			1	0	2	0
Course Objectives		Course Outcomes				
1.0	To acquire satisfactory competency in use of Verbal Reasoning	1.1	The students will be able to enhance their vocabulary which in turn will be helpful in developing their speaking skills.			
2.0	To develop skill to meet the competitive examinations for better job opportunity.	2.1	The students will be able to solve the problems easily by using Short-cut method with time management.			
3.0	To enrich their knowledge and to develop their logical reasoning thinking ability.	3.1	The students will be able to analyze the problems logically and approach the problems in a different manner.			

UNIT I – VERBAL COMPETENCY	(10)
Voice - Modal Verbs – Synonyms & Antonyms - Confusable Words	
UNIT II – NUMERICAL REPRESENTATION	(10)
Average – Data Interpretation – Simple Interest and Compound Interest – Venn Diagram.	
UNIT III - RESOLUTION TENDENCY	(10)
Time and Work – Pipes and Cistern – Number Series and Odd man Out – Cube Problems.	
TOTAL(L :10,P:20) : 30 PERIODS	

REFERENCES:
1. Ashish Aggarwal, “Quick Arithmetic”, S Chand and Company Limited, New Delhi, 2014.
2. Dr. R.S. Aggarwal, “A Modern Approach to Verbal & Non-Verbal Reasoning”, S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, “English Grammar in Use”, 4th Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2		
2		3	2	2			1		2			3		
3		3	2	2			1		2			3		
CO (WA)		3	2	2			1		2.3	3		2.6		

22MAN05 - YOGA – II
(For Common To All Branches)

L	T	P	C
0	0	1	0

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To strengthen the body through physical exercises.	1.1	Student will be able to perform physical exercises like spine exercises, massage and acupressure.
2.0	To understand the importance of value system and ethics.	2.1	Student will be able to learn the human values, ethics, time management and the importance of introspection.
3.0	To know the life philosophy of yogis and maharishis.	3.1	Student will be able to analyze various life philosophies of yogi's and rishi's.
4.0	To understand the nature laws, cause and effect theory.	4.1	Student will be able to understand life lessons and nature laws.
5.0	To inculcate knowledge about different types of Asanas and their benefits.	5.1	Students will be able to demonstrate different types of yoga Asanas and improve their personal fitness.

UNIT I – PHYSICAL EXERCISES (PART-II)	(3)
Breathing Exercises – Kapalpathi – Maharasanam (Spine Exercises) – Massage and Acupressure.	
UNIT II – HUMAN VALUE	(3)
Divine power – Life force (Bio magnetism) – Importance of Introspection – Time Management – Punctuality – Self Confidence – Mind Control.	
UNIT III – PHILOSOPHY OF LIFE	(3)
Basic Needs for Life – Hunger and Thirst – Climatic/Weather Changes – Body Wastes – Pressure of Excretory Organs – Safety Measures – Protection from Natural Disaster – Protection from Enmity – Protection from Accidents – Ethics – Morality – Duty – Charity – Wisdom of Perfection Stages – Faith – Understanding – Realization.	
UNIT IV – NATURE'S LAW OF CAUSE AND EFFECT	(3)
Food Transformation into Seven Minerals – Natural Actions – Pattern – Precision – Regularity – Required Skills – Planned Work – Awareness – Introspection.	
UNIT V – ASANAS (PART-II)	(3)
Ustrasana – Vakrasana – Komugasana – Padmasana – Vajrasana – Sukhasana – Yogamudra – mahamudra.	
TOTAL (P:15) : 15 PERIODS	

TEXT BOOK/REFERENCE:

Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						1	2	3	3	2	1	3		
2						1	2	3	3	2	1	3		
3						1	2	3	3	2	1	3		
4						1	2	3	3	2	1	3		
5						1	2	3	3	2	1	3		
CO (W.A)						1	2	3	3	2	1	3		

**Ratified by Eleventh Academic Council*

22MYB06 – PROBABILITY AND RANDOM PROCESSES (Common to BME and ECE Branches)				
		L	T	P
		3	1	0
PRE REQUISITE :NIL				
Course Objectives		Course Outcomes		
1.0	To understand the concepts of probability, conditional probability and independence	1.1	The students will be able to understand the fundamental knowledge of the basic probability concepts.	
2.0	To obtain the distributions of functions of random variables.	2.1	The students will be able to well-found in knowledge of standard distributions which can describe real life phenomena	
3.0	To understand the classification of random processes.	3.1	The students will be able to acquire skills in handling situations involving more than one random variable and functions of random variables.	
4.0	To understand the concepts as strict stationary, wide sense stationary and Ergodic.	4.1	The students will be able to understand and characterize phenomena which evolve with respect to time in probabilistic manner.	
5.0	To understand the concepts of correlation function and power spectral density.	5.1	The students will be able to apply concept and properties of spectral density function and cross correlation functions.	

UNIT I – ONE DIMENSIONAL RANDOM VARIABLES	(9+3)
Probability: Random Variable – Probability Mass Function – Probability Density Functions – Properties – Moments – Moment Generating Functions and their Properties	
UNIT II - STANDARD DISTRIBUTIONS	(9+3)
Discrete Distributions: Binomial, Poisson and Geometric Distribution – Continuous Distributions: Uniform, Exponential and Normal Distribution and its Properties.	
UNIT III – TWO DIMENSIONAL RANDOM VARIABLES	(9+3)
Joint Distributions – Marginal Distributions and Conditional Distribution – Covariance – Correlation and Regression – Transformation of Random Variables – Central Limit Theorem (Excluding proof).	
UNIT IV – RANDOM PROCESSES	(9+3)
Definition and Examples – First Order, Second Order Strictly Stationary, Wide-sense Stationary and Ergodic Process- Markov Process – Binomial, Poisson Processes.	
UNIT V – CORRELATION AND SPECTRAL DENSITIES	(9+3)
Auto Correlation – Cross Correlation – Properties – Power Spectral Density – Cross Spectral Density – Properties – Wiener – Khintchine Relation (statement only) – Relationship between Cross Power Spectrum and Cross Correlation Function.	
TOTAL (L:45+T:15) :60 PERIODS	

TEXT BOOKS:

1. Veerarajan.T, "Probability, Statistics and Random Processes," 3rd Edition, New Delhi, Tata McGraw-Hill, 2008
2. Venkatarama Krishnan, "Probability and Random Process," 2nd Edition, John Wiley & Sons, New Jersey, 2016
3. Scott L. Miller and Donald Childers, "Probability and Random Processes with Applications to Signal Processing and Communications," Elsevier, 2012.

REFERENCES:

1. Gubner A. John, "Probability and Random Processes for Electrical and Computer Engineers", Cambridge University press, Newyork, 2006.
2. Charles W. Therrien, Murali Tummala, "Probability and random process for electrical and computer Engineers", CRC Press, Newyork, 2012.
3. Singaravelu. A, Sivasubramanian, Ramaa, "Probability, Statistics and Random Processes," 2nd Edition, Meenakshi Publication, Chennai, 2003.

WEB REFERENCES:

1. <https://youtu.be/82AdIorN-NA>
2. https://youtube.com/playlist?list=PLOgMKE5DWMGLZcBxYJBFAikdhAaAXJI_U

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2		1					1	1		2	1	
2	3	2	2	1					1	1		2	1	
3	3	2	2						1	1		2	1	
4	2	2	2		1				1	1		2	1	
5	2	2			1				1	1		2	1	
CO (W.A)	2.6	2	2	1	1				1	1		2	1	

22BMC01 - ANALOG AND DIGITAL ELECTRONICS (BIOMEDICAL ENGINEERING)				
		L	T	P
		3	0	0
PREREQUISITE : 22ECC04 - ELECTRONIC DEVICES AND CIRCUITS (THEORY + LAB)				
Course Objectives		Course Outcomes		
1.0	To study the circuit configuration and introduce practical applications of linear integrated circuits	1.1	The students will be able to design analog linear circuits	
2.0	To introduce the concept of ADC and DAC in real time systems	2.1	The students will be able to apply the concept of ADC and DAC in real time systems	
3.0	To study the various number systems and logic gates and their reduction techniques	3.1	The Students can apply the Boolean laws and theorems to minimize the Boolean expressions	
4.0	To introduce the design of various combinational digital circuits using logic gates	4.1	The students will be able to design various combinational digital circuits using logic gates	
5.0	To bring out the analysis and design procedures for synchronous and asynchronous sequential circuits	5.1	The students will be able to design synchronous and asynchronous sequential circuits	

UNIT I – INTRODUCTION TO OPERATIONAL AMPLIFIERS AND ITS APPLICATIONS	(9)
Operational amplifier – Ideal Characteristics, Performance Parameters, Voltage Follower, Inverting Amplifier, Non-inverting Amplifiers, Differentiator, Integrator, Voltage to Current Converter, Current to Voltage Converter, Differential Amplifier, Instrumentation amplifier, Low pass, High pass and Band Pass Filters, Comparator.	
UNIT II – DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS	(9)
Analog Switches, High Speed Sample and Hold Circuit and IC's, Types of D/A converter - Weighted Resistor, R-2R ladder DAC, D/A Accuracy and Resolution. A/D converter - Flash, Dual Slope, Successive Approximation, A/D Accuracy and Resolution.	
UNIT III – NUMBER SYSTEMS, LOGIC GATES AND LOGIC FAMILIES	(9)
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, 8421, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of Products and Product of Sums, Minterms and Maxterms, Karnaugh map and Tabulation methods.	
UNIT IV – COMBINATIONAL LOGIC CIRCUITS	(9)
Problem Formulation and Design of Combinational Circuits - Code - Converters, Half and Full Adders, Half and Full Subtractors, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux. Parity Generator and Checker.	

UNIT V – SEQUENTIAL LOGIC CIRCUITS	(9)
Flip Flops – SR, JK, T, D, Master/Slave FF, Analysis and Design of Clocked Sequential Circuits – State Minimization, State Assignment, Circuit Implementation. Counters – Ripple & Ring counter, Shift registers – SISO, SIPO, PISO, PIPO.	
TOTAL (L:45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. D. Roy Choudhury and Shail B. Jain, “Linear Integrated Circuits”, 4th Edition, New Age International Publishers, 2018. 2. M. Morris Mano and Michael D.Ciletti, “Digital Design”, Pearson, 5th Edition, 2013. 3. John.F.Wakerly, “Digital design principles and practices”, Pearson Education, 5th Edition, 2018. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Taub and Schilling, “Digital Integrated Electronics”, Mc Graw Hill, 2017. 2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Edition, Mc Graw Hill Education, 2017. 3. Charles H.Roth, Jr, “Fundamentals of Logic Design”, 7th Edition, Jaico Books, 2013. 4. S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, 3rd Edition, McGraw Hill Education, 2018. 	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2	1						1	1	2	
2	3	2	2	2	1						1	1	2	
3	3	3	2	2	2						1	1	1	
4	3	3	3	2	2						1	2	2	
5	3	3	3	2	2						1	2	2	
CO (W.A)	3	2.6	2.4	2	1.6						1	1.4	1.8	

22BMC02 - ANATOMY AND HUMAN PHYSIOLOGY					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To integrate the individual functions of all the cells and tissues and organs into functional whole, the human body.	1.1	Students will be able to identify and explain basic elements of human body		
2.0	To understand functional anatomy of skeletal and muscular system	2.1	Students will be able to explain the functions of skeletal and muscular system		
3.0	To emphasize on the cardiovascular, respiratory and their interrelatedness.	3.1	Students will be able to describe the structure, function of cardiovascular system and respiratory system		
4.0	To understand the basic functioning of digestive and excretory system and the resultant unified organization.	4.1	Students will be able to describe the structure of digestive and excretory system.		
5.0	To stimulate to understand the structure and functions of Nervous and sensory system	5.1	Students will be able to describe the physiological process of Nervous and sensory system		

UNIT I - BASIC ELEMENTS OF HUMAN BODY	(9)
Cell – Cell Structure and organelles - Functions of each component in the cell. Cell membrane –Transport across membrane - Action potential (Nernst, Goldman equation), Homeostasis. Tissue: Types, Functions.	
UNIT II - SKELETAL AND MUSCULAR SYSTEM	(9)
Skeletal: Types of Bone and function – Physiology of Bone formation – Division of Skeleton -Types of joints and function – Types of cartilage and function. –Types of muscles – Structure and Properties of Skeletal Muscle- Changes during muscle contraction- Neuromuscular junction.	
UNIT III - CARDIOVASCULAR AND RESPIRATORY SYSTEM	(9)
Cardiovascular System: Structure – Conduction System of heart – Cardiac Cycle – Cardiac output. Blood: Composition – Functions - Haemostasis – Blood groups and typing. Blood Vessels – Structure and types - Blood pressure - Respiratory system: Parts of respiratory system – Respiratory physiology – Lung volumes and capacities – Gaseous exchange.	
UNIT IV - DIGESTIVE AND EXCRETORY SYSTEMS	(9)
Structure and functions of gastrointestinal system - secretory functions of the alimentary tract - digestion and absorption in the gastrointestinal tract - structure of nephron - mechanism of urine formation - skin and sweat gland - temperature regulation.	
UNIT V - NERVOUS AND SENSORY SYSTEM	(9)
Structure and function of nervous tissue – Brain and spinal cord – Functions of CNS – Nerve conduction and synapse – Reflex action – Somatic and Autonomic Nervous system. Physiology of Vision, Hearing, Integumentary, Olfactory systems. Taste buds.	
TOTAL (L:45) : 45 PERIODS	

LIST OF EXPERIMENTS

1. Identification of Blood Collection Tubes and Phlebotomy Equipments
2. Collection of Blood Samples
3. Identification of Blood Group
4. Determination of Bleeding and Clotting Time
5. Estimation of Haemoglobin
6. Total RBC Count
7. Total WBC Count
8. Differential Count of Different WBC
9. Visual Activity- Snellen's Chart and Jaeger's Chart
10. Hearing Test – Tuning Fork

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Guyton & Hall, "Text Book of Medical Physiology", 13th Edition, Saunders, 2015. 2. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", 9th Edition, Pearson Education, New Delhi, 2018. 3. Gopal B. Saha "Physics and Radiobiology of Nuclear Medicine", 3rd Edition, Springer, 2006. (Unit 2, 3, 4).
REFERENCES:
<ol style="list-style-type: none"> 1. Ranganathan T S, "Text Book of Human Anatomy", S. Chand & Co. Ltd., New Delhi, 2012. 2. Sarada Subramanyam, K Madhavan Kutty, Singh H D, "Textbook of Human Physiology", S. Chand and Company Ltd, New Delhi, 2012.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1									2	2	
2	3	3	2	2			1					2	2	
3	3	3	2	2			1					2	2	
4	3	3	2	2			1					2	2	
5	3	3	2	2			1					2	2	
CO (W.A)	3	2.8	1.8	2			1					2	2	

22BMC03 - SENSORS AND MEASUREMENTS					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : 22ECC02 – BASICS OF ELECTRICAL & INSTRUMENTATION ENGINEERING					
Course Objectives		Course Outcomes			
1.0	To make students to know the principle of transduction and characteristics of photoelectric and piezo electric sensors.	1.1	The students will be able to narrate principle of operation and working of various photoelectric and piezo electric sensors.		
2.0	To enable the student to know the principle and operation of different bio potential electrodes.	2.1	The students will be able to explicate the concepts, types, working and practical applications of various electrodes for acquiring and recording various physiological parameters.		
3.0	To make the students to understand various types of biosensors.	3.1	The students will be able to demonstrate the concepts, types, working and applications of biosensors.		
4.0	To make the students to learn about functionalities of signal conditioning circuits and different bridges for measurement.	4.1	The students will be able to demonstrate the various functional elements of signal conditioning circuits and employ AC and DC bridges for relevant parameter measurement.		
5.0	To make the students to know the different display and recording devices.	5.1	The students will be able to employ multimeter, DSO and different types of recorders for appropriate display and recording.		

UNIT I - 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 II - BIO POTENTIAL ELECTRODES	(9)
Electrodes Electrolyte Interface, Half-Cell Potential, Polarization, Polarizable and Non Polarizable Electrodes, Calomel Electrode, Electrode Circuit Model, Electrode Skin-Interface and Motion Artifact. Body Surface Electrodes. Ion Exchange Membrane Electrodes, Oxygen Electrodes, CO ₂ Electrodes, Enzyme Electrode, ISFET for Glucose, Urea.	
UNIT III - BIOSENSORS	(9)
Biosensors: Introduction, Advantages and Limitations, Various Components of Biosensors, Biocatalysts based Biosensors, Bio-affinity based Biosensors & Microorganisms based Biosensors, Types of Membranes used in Biosensor Constructions, Electronic Nose.	
UNIT IV - SIGNAL CONDITIONING CIRCUITS	(9)
Functions of Signal Conditioning Circuits, Preamplifiers, Concepts of Passive Filters, Impedance Matching Circuits, Isolation Amplifier. AC and DC Bridges – Wheat stone Bridge, Kelvin, Maxwell, Hay, Schering.	

UNIT V - DISPLAY AND RECORDING DEVICES	(9)
Multimeter, DSO, LCD/LED displays, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Sawhney A K and Puneet Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai and Company, New Delhi, 2015. 2. John G. Webster, "Medical Instrumentation Application and Design", 4th Edition, Wiley India Pvt. Ltd., New Delhi, 2015.
REFERENCES:
<ol style="list-style-type: none"> 1. Kalsi H S, "Electronic Instrumentation and Measurement", Tata McGraw Hill, 2011. 2. Nandini K. Jog, "Electronics in Medicine and Biomedical Instrumentation, 2nd Edition, PHI, 2013. 3. Harry N, Norton, "Biomedical Sensors: Fundamentals and Application", Noyes Publications, 2001. 4. Tatsuo Togawa, Toshiyo Tamma and P. Ake Å–berg, "Biomedical Transducers and Instruments", CRC Press, 2018.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		1			1	2					2	3	
2	3		1			1	2					3	3	
3	3	1	2			3	2					3	3	
4	3	1	1			2	2					2	3	
5	3	1	1			3	2					3	3	
CO (W.A)	3	1	1.2			2	2					2.6	3	

22ECC06 – SIGNALS AND SYSTEMS (Common to ECE & BME Branches)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : 22MYB01 - CALCULUS AND LINEAR ALGEBRA 22MYB04 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS					
Course Objectives		Course Outcomes			
1.0	To understand the basic properties of signal & systems and its various methods of classification.	1.1	The students will be able to incorporate various operations on continuous time & discrete time signals.		
2.0	To learn the characterization of continuous time domain LTI systems.	2.1	The students will be able to analyze the characterization of continuous time domain LTI systems.		
3.0	To recognize various transforms and their properties applied in continuous time signal analysis.	3.1	The students will be able to apply Laplace transform, Fourier transform and Fourier series in continuous time signal analysis.		
4.0	To learn the characterization of discrete time domain LTI systems.	4.1	The students will be able to identify the characterization of discrete time domain LTI systems.		
5.0	To recognize various transforms and their properties applied in discrete time signal analysis.	5.1	The students will be able to design discrete time LTI system using DTFT and Z transform.		

UNIT I - CLASSIFICATION OF SIGNALS AND SYSTEMS	(9)
Standard Signals: Unit Impulse, Unit Step, Unit Ramp, Exponential, and Sinusoidal Signals, Classification of Continuous and Discrete Time Signals, Types of Signals: Power, Energy, Periodic, Even and Odd, Basic Operations on Signals, Basic System Properties: Linearity, Time Invariant, Causality, Stability and Invertibility, LTI.	
UNIT II - TIME DOMAIN CHARACTERISATION OF CONTINUOUS TIME LTI SYSTEM	(9)
Classification of Systems - CT Systems and DT Systems - Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable - Convolution Integral, Properties of Continuous Time LTI system - Causality, Stability, Causal Continuous Time LTI System described by Differential Equations.	
UNIT III - FREQUENCY DOMAIN REPRESENTATION IN CT SIGNALS	(9)
Fourier Series Representation - Exponential, Fourier Transform of Continuous Time Aperiodic Signals and Periodic Signals, Properties of Continuous Time Fourier Transform, Laplace Transform, Region of Convergence, Inverse Laplace transform.	
UNIT IV – TIME DOMAIN CHARACTERISATION OF DISCRETE TIME LTI SYSTEM	(9)
Sampling Theorem (Low Pass) – Reconstruction of a Signal from its Samples, Aliasing, Convolution sum, Properties of Discrete Time LTI system, Causal Discrete Time LTI System described by Difference Equations.	

UNIT V - FREQUENCY DOMAIN REPRESENTATION IN DT SIGNALS	(9)
Fourier Transform of Discrete Time Signals (DTFT) - Properties of DTFT-Z Transform, Inverse Z transform – Long division – Partial Fraction, ROC, Properties of Z Transform: Linearity, Time Shifting, Change of Scale, Z-domain Differentiation, Differencing, Accumulation, Convolution in Discrete Time, Initial And Final Value Theorems.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
1. Simon S. Haykin and Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley India, 2008 (Reprint).
REFERENCES:
1. B. P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009. 2. R. E. Zeimer, W. H. Tranter and R. D. Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	1	2	1							1		
2	2	3	1	3	1							1		
3	3	3	1	3	1							1	1	
4	3	3	1	3	1							1	1	1
5	2	3	1	3	1							1		1
CO (W.A)	2.4	3	1	2.8	1							1	1	1

22CYB06 - ENVIRONMENTAL SCIENCE AND SUSTAINABILITY (Common to CHEM-2 nd , BME-3 rd , ECE-4 th AND EEE-4 th SEM)					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To recognize the basic concepts of environment, ecosystems and biodiversity	1.1	Students will be able to know the importance of environment and functions ecosystems and biodiversity		
2.0	To impart knowledge on the causes, effects and control measures of environmental pollution	2.1	Students will be able to identify the causes, effects of environmental pollution and contribute the preventive measures to the society		
3.0	To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them.	3.1	Students will be able to identify and understand the renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations		
4.0	To familiarize the concept of sustainable development goals, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management	4.1	Students will be able to recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development		
5.0	To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyzes the role of sustainable urbanization	5.1	Students will be able to demonstrate the sustainability practices and identify green materials, energy cycles		

UNIT I - ENVIRONMENT AND BIODIVERSITY	(9)
Environment - Scope and Importance - Eco-system- Structure and Function of an Ecosystem - Types of Biodiversity- Genetic - Species and Ecosystem Diversity- Values of Biodiversity - India as a Mega-diversity nation – Hot-spots of Biodiversity – Threats to Biodiversity - Habitat Loss - Poaching of Wildlife - Man-wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity - In-situ and Ex-situ	
UNIT II - ENVIRONMENTAL POLLUTION	(9)
Pollution – Causes - Effects and Preventive Measures of Water – Soil - Air - Noise Pollution - Solid Waste Management - Methods of Disposal of Solid Waste – Various Steps of Hazardous Waste Management - E-Waste Management - Environmental Protection – Air Acts – Water Acts	
UNIT III - RENEWABLE SOURCES OF ENERGY	(9)
Energy Management and Conservation - New Energy Sources - Different Types New Energy Sources – Hydrogen Energy – Geothermal Energy - Solar Energy – Wind Energy – Biomass Energy - Applications of Hydrogen Energy - Ocean Energy Resources -Tidal Energy Conversion	

UNIT IV – SUSTAINABILITY AND MANAGEMENT	(9)
Development – Factors Affecting Development – Advantages – Disadvantages – GDP – Sustainability - Needs – Concept from Unsustainability to Sustainability - Millennium Development Goal - Sustainable Development Goals - Climate Change – Concept of Carbon Credit – Carbon Footprint - Environmental Management	
UNIT V – SUSTAINABILITY PRACTICES	(9)
Zero Waste and R Concept - ISO 14000 Series - Environmental Impact Assessment - Sustainable Habitat - Green Buildings - Green Materials - Sustainable Energy - Non-conventional Sources - Energy Cycles- Carbon Cycle and Carbon Emission - Green Engineering - Sustainable Urbanization	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
<ol style="list-style-type: none"> 1. Dr. A.Ravikrishan, “Environmental Science and Engineering”, 15th Edition, Sri Krishna Hitech Publishing Co. Pvt.Ltd., Chennai, 2023. 2. Anubha Kaushik and C. P. Kaushik’s “Perspectives in Environmental Studies”, 6th Edition, New Age International Publishers, 2018.
REFERENCES:
<ol style="list-style-type: none"> 1. Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, 3rd Edition, Oxford University Press, 2015. 2. Erach Bharucha “Textbook of Environmental Studies for Undergraduate Courses”, Orient Blackswan Pvt. Ltd., 2013.
WEB LINK:
<ol style="list-style-type: none"> 1. http://www.jnkvv.org/PDF/08042020215128AmitI.pdf 2. https://www.conserve-energy-future.com/types-of-renewable-sources-of-energy.php 3. https://ugreen.io/sustainability-engineering-addressing-environmental-social-and-economic-issues/

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	1			3	3	2	1		1	2		
2	2	1	2			3	3	2	1		1	2		
3	2	1	2			3	3	2	1		1	2		
4	2	1	2			3	3	2	1		1	2		
5	2	1	1			3	3	2	1		1	2		
CO (W.A)	2	1	1.6			3	3	2	1		1	2		

22BMP01 - ANALOG AND DIGITAL ELECTRONICS LABORATORY					
		L	T	P	C
		0	0	4	2
PRE-REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To understand the applications of operation amplifier.	1.1	The students will be able to design and implement arithmetic circuits for different applications using op-amp.		
2.0	To enable the students to learn about active filters.	2.1	The students will be able to Implement filter circuits using op-amp.		
3.0	To enable the student to design the combinational logic circuits.	3.1	The Students will be able to design the combinational circuits like adder, subtractor, code convertors, magnitude comparator, mux and demux.		
4.0	To understand the operation of flip-flops.	4.1	The students will be able to design and analyze Flip flops.		
5.0	To make the students to learn and practice with design of sequential logic circuits.	5.1	The students will be able to design Sequential Circuits using logic gates.		

LIST OF EXPERIMENTS	
<ol style="list-style-type: none"> 1. Inverting and Non-inverting amplifier 2. Integrator and Differentiator 3. Design and analysis of active filters using op-amp 4. Study of logic gates. 5. Design of Half adder and Full adder 6. Design of Code Converters 7. Design of Magnitude Comparator. 8. Multiplexer and Demultiplexer using Digital ICs 9. Design of Flip flops – SR, JK, T, D 10. Design of counters. 	
Total (60 P) = 60 periods	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	1	1				1	1			1	
2	3	3	1	1	1				1	1			1	
3	3	3	1	1	1				1	1	1		1	
4	3	3	1	1	1				1	1	1		1	
5	3	3	1	1	1				1	1	1		1	
CO (W.A)	3	3	1	1	1				1	1	1		1	

Handwritten signature

22BMP02 - SENSORS AND MEASUREMENTS LABORATORY					
		L	T	P	C
		0	0	4	2
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To make students understand about the different transducers	1.1	The students will be able to explain the working of different types of transducers and select a transducer for particular applications		
2.0	To enable students to learn about the characteristics of temperature sensors	2.1	The students will be able to choose the temperature sensors for an application based on their characteristics		
3.0	To impart knowledge about photodiodes, phototransistors and LDR	3.1	The students will be able to explain the working and applications of photodiodes, phototransistors and LDR		
4.0	To make students to understand the characteristics of bridge circuits	4.1	The students will be able to analyze the characteristic of various bridges and its responses		
5.0	To make students to understand about the various measurements methods using Hall effect transducer, Strain Gauge and Load Cell	5.1	The students will be able to demonstrate the various measurements methods Hall effect transducer, Strain Gauge and Load Cell		

LIST OF EXPERIMENTS	
<ol style="list-style-type: none"> 1. Characteristics of Potentiometric Transducer. 2. Characteristics of Thermistor. 3. Characteristics of Thermocouple. 4. Characteristics of LDR. 5. Characteristics of Photo Diode and Photo Transistors. 6. Characteristics of RTD. 7. Characteristics of LVDT. 8. Measurement of unknown Resistance using Kelvin Double Bridge and Wheatstone Bridge. 9. Measurement of unknown Capacitance using Schering Bridge. 10. Measurement of unknown Inductance using Anderson Bridge. 11. Characteristics of Hall effect Transducer. 12. Characteristics of strain gauge and Load cell. 	
Total (60 P) = 60 periods	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1		1	1	1	3	3	1	1	2	
2	3	2	1	1		1	1	1	3	3	1	1	2	
3	3	2	1	1		1	1	1	3	3	1	1	2	
4	3	2	1	1		1	1	1	3	3	1	1	2	
5	3	2	1	1		1	1	1	3	3	1	1	2	
CO (W.A)	3	2	1	1		1	1	1	3	3	1	1	2	

22MAN07 - SOFT / ANALYTICAL SKILLS - III				
<i>(Common to All Branches)</i>				

	L	T	P	C
	1	0	2	0

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To Improve overall language proficiency for personal or professional reasons	1.1	The students will be able to enhance their writing skills
2.0	To develop problem solving skills across all levels	2.1	The students will be able to develop problem solving skills across all levels
3.0	To develop students to workout solutions for problems that involving general reasoning	3.1	The students will be able to solve reasoning problems with ease

UNIT I – Verbal Competency	(10)
Sentence Selection, Paragraph Formation, Sentence Correction, Spellings.	
UNIT II - Aptitude	(10)
Clocks, Calendar, Age Problems, Problem on Trains, Problems on Numbers - Partnerships.	
UNIT III – Logical & Reasoning	(10)
Coding & Decoding, Logical Equivalent, Venn Diagram Problem.	
TOTAL (L:10, P:20) : 30 PERIODS	

REFERENCES:

1. Dr. R. S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English Grammar in Use", 4th Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2		
2		3	2	2			1		2			3		
3		3	2	2			1		2			3		
CO (W.A)		3	2	2			1		2.3	3		2.6		

22MAN09 - INDIAN CONSTITUTION (Common to All Branches)				
		L	T	P
		1	0	0
PRE REQUISITE : NIL				
Course Objectives		Course Outcomes		
1.0	To educate students to learn about the Constitutional Law of India	1.1	The students will be able to Gain Knowledge about the Constitutional Law of India	
2.0	To motivate students to Understand the role of Union Government	2.1	The students will be able to know the Union Government and role of President and Prime Minister	
3.0	To make students to understand about State Government	3.1	The students will be able to acquire knowledge about State Government and role of Governor, Chief Minister	
4.0	To understand about District Administration, Municipal Corporation and Zila Panchayat	4.1	The students will be able to understand the District Administration, Municipal Corporation and Zila Panchayat	
5.0	To encourage students to understand about the election commission	5.1	The students will be able to understand the role and function of election commission	

Module I: The Constitution – Introduction	(9)
<ul style="list-style-type: none"> • The History of the Making of the Indian Constitution • Preamble and the Basic Structure, and its interpretation • Fundamental Rights and Duties and their interpretation • State Policy Principles 	
Module II: Union Government	(9)
<ul style="list-style-type: none"> • Structure of the Indian Union • President – Role and Power • Prime Minister and Council of Ministers • Lok Sabha and Rajya Sabha 	
Module III: State Government	(9)
<ul style="list-style-type: none"> • Governor – Role and Power • Chief Minister and Council of Ministers • State Secretariat 	
Module IV: Local Administration	(9)
<ul style="list-style-type: none"> • District Administration • Municipal Corporation • Zila Panchayat 	

Module V: Election Commission	(9)
<ul style="list-style-type: none"> • Role and Functioning • Chief Election Commissioner • State Election Commission 	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Rajeev Bhargava, “Ethics and Politics of the Indian Constitution”, Oxford University Press, New Delhi, 2008. 2. B.L. Fadia, “The Constitution of India”, Sahitya Bhawan, 2017. 3. DD Basu, “Introduction to the Constitution of India”, 23rd Edition, Lexis Nexis, 2018.
REFERENCES:
<ol style="list-style-type: none"> 1. Steve Blank and Bob Dorf, “The Startup Owner’s Manual: The Step-by-Step Guide for Building a Great Company”, K & S Ranch ISBN – 978-0984999392 2. Eric Ries, “The Lean Startup: How Today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses”, Penguin UK ISBN – 978-0670921607 3. Adrian J. Slywotzky with Karl Weber, Demand: Creating What People Love Before They Know They Want It, Headline Book Publishing ISBN – 978-0755388974 4. Clayton M. Christensen, “The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business”, Harvard business ISBN: 978-142219602
WEB LINKS:
<ol style="list-style-type: none"> 1. https://www.fundable.com/learn/resources/guides/startup 2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/ 3. https://www.finder.com/small-business-finance-tips 4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						3		3		2		3		
2						3		3		2		3		
3						3		3		2		3		
4						3		3		2		3		
5						3		3		2		3		
CO (W.A)						3		3		2		3		

22ITC06 - JAVA PROGRAMMING (Common to 22AIC04 ,22CSC07, 22CCC06 and 22CIC06)						
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL						
Course Objectives			Course Outcomes			
1.0	To understand Object oriented programming concepts and characteristics of Java	1.1	The students will be able to develop Java programs using basic programming elements in Java			
2.0	To know the principles of Inheritance, abstraction and interfaces	2.1	The students will be able to develop Java programs with the concepts of inheritance			
3.0	To define exceptions and use I/O streams	3.1	The students will be able to construct applications with exception handling			
4.0	To understand threads concepts	4.1	The students will be able to develop Java applications using threads			
5.0	To design and build simple GUI programs using AWT and Swings	5.1	The students will be able to develop interactive Java applications using GUI components			

UNIT I - INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	(9)
Object Oriented Programming - Abstraction – Objects and Classes – Encapsulation - Inheritance – Polymorphism - OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining Classes in Java – Constructors, Methods - Access Specifiers - Static Members - Comments, Data Types, Variables, Operators, Control Flow, Arrays, Strings, Packages - JavaDoc comments.	
UNIT II - INHERITANCE AND INTERFACES	(9)
Inheritance – Super Classes- Sub Classes – Protected Members – Constructors in Sub Classes- the Object Class – Abstract Classes and Methods - Keywords: Static-final-this-final methods and classes – Method Overloading - Method Overriding - Interfaces – Defining an Interface, Implementing Interface, Differences between Classes and Interfaces and Extending Interfaces.	
UNIT III - EXCEPTION HANDLING AND I/O	(9)
Exceptions - Exception Hierarchy - Throwing and Catching Exceptions – Built-in Exceptions, Creating Own Exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing File.	
UNIT IV – THREADS	(9)
Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads — Thread Priorities – Synchronization – Inter Thread Communication – Suspending, Resuming, and Stopping Threads – Using Multithreading.	

UNIT V - EVENT DRIVEN PROGRAMMING	(9)
Graphics Programming - Frame – Components Basics of Event Handling - Event Handlers - Adapter Classes - Actions - Mouse Events - AWT Event Hierarchy - Introduction to Swing – Layout Management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists – Choices - Scrollbars – Windows – Menus – Dialog Boxes.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw Hill Education, New Delhi, 2019 (Units I, II, III, IV). 2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015 (Unit V).
REFERENCE:
<ol style="list-style-type: none"> 1. Cay. S. Horstmann, Gary Cornell, “Core Java-JAVA Fundamentals”, 10th Edition, Prentice Hall, 2016. 2. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015. 3. SCJP Sun Certified Programmer for Java 6 Study Guide, 6th Edition, McGraw Hill.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1		1				1			1		3
2	3	1	1		1				1			1		3
3	3	1	1		1				2			1		3
4	3	2	1		1				2			2		3
5	3	2	2	2	1				3	1	3			3
CO (W.A)	3	1.6	1.2	2	1				1.8	1	3	1.25		3

22MEC13 - ENGINEERING MECHANICS FOR BIOMEDICAL ENGINEERS					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To get exposed to the fundamental principles of mechanics	1.1	Solve the problems on static equilibrium of particles		
2.0	To analyse the behaviour of the rigid body under the action of force	2.1	Calculate the effect of force on rigid bodies		
3.0	To get exposed to the dynamics concepts and fundamental concepts of friction	3.1	Apply the dynamic equilibrium equation and demonstrate the fundamental concept of friction		
4.0	To introduce the concept of stress and properties of surfaces.	4.1	Determine the stress induced in the material and centroid, moment of inertia and principal moment of inertia of various surfaces.		
5.0	To learn basics of fluid mechanics and relate it to bio-fluids	5.1	Demonstrate the fluid properties and relate it to bio-fluids		

UNIT I - BASICS AND STATICS OF PARTICLES	(9)
Introduction – Units and Dimensions – Laws of Mechanics – Principle of Transmissibility – Lami’s Theorem, Parallelogram and Triangular Law of Forces — Coplanar Forces – Rectangular Components – Equilibrium of a Particle – Equivalent Systems of Forces.	
UNIT II - EQUILIBRIUM OF RIGID BODIES	(9)
Free Body Diagram – Types of Supports and its Reaction Forces – Stable Equilibrium – Moments and Couples – Varignon’s Theorem – Single Equivalent Force - Equilibrium of Rigid Bodies in Two Dimensions - Resolution of a Force into a Force - Couple System.	
UNIT III - DYNAMICS OF PARTICLES	(9)
Displacements, Velocity and Acceleration, Their Relationship – Newton’s Laws of Motion – Work Energy Equation. Frictional Force – Laws of Colomb Friction.	
UNIT IV - MECHANICS OF SOLIDS	(9)
Rigid Bodies and Deformable Solids – Tension, Compression and Shear Stresses – Deformation of Non-rigid Bodies- Stress-Strain Curve. Centroids – Moment of Inertia – Principal Moments of Inertia of Composite Plane Areas.	
UNIT V - BASICS OF FLUID MECHANICS	(9)
Fluids – Density – Pressure – Blood Pressure and Gravity – Buoyancy – Moments of Force and Stability – Movement in Water –Newton’s Laws of Viscosity – Definitions and simple problems on Newtonian fluid, Non-Newtonian fluid, Euler equations and Navier Stoke’s equations, Viscoelasticity, Laminar Flow, Couette Flow, Turbulent Flow and Hagen-Poiseuille equation.	
TOTAL (L) = 45 PERIODS	

TEXT BOOK:

1. Dr. N. Kottiswaran, "Engineering Mechanics", 10th Edition, Sri Balaji Publisher, 2020 (Unit I, II, III, IV)
2. Dr. R. K. Bansal, A Text Book of Fluid Mechanics, 10th Edition, Laxmi Publications (P) Ltd., New Delhi, 2019 (Unit V)

REFERENCES:

1. Beer, F. Pand Johnston Jr. E. R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2004.
2. Dr. R. K. Bansal, "A Text Book of Strength of Materials", 5th Edition, Laxmi Publications (P) Ltd., New Delhi, 2012.
3. Frank Bell, "Principles of Mechanics and Biomechanics", Stanley Thorne (Publishers) Ltd., 1998.
4. Lee Waite, "Biofluid Mechanics in Cardiovascular Systems", 1st Edition, McGraw-Hill Companies, 2006.

WEB RESOURCES

1. <https://archive.nptel.ac.in/courses/112/106/112106286/>
2. <https://nptel.ac.in/courses/112105171>

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3								2		2	3	
2	3	3								2		2	3	
3	3	3								2		2	3	
4	3	3								2		2	3	
5	3	3	2							2		2	3	
CO (W.A)	3	3	2							2		2	3	

22BMC04 - BIOMEDICAL INSTRUMENTATION					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : 22BMC03 – SENSORS AND MEASUREMENTS					
Course Objectives			Course Outcomes		
1.0	To understand the basic theory of Bio potential Electrodes and Bio potential measurement	1.1	The Students will be able to describe the electrode behaviour and circuit models		
2.0	To understand the fundamentals of Bio potential recording	2.1	The Students will be able to describe the fundamentals of Bio potential recording		
3.0	To design Bio potential amplifiers for acquisition of bio signals	3.1	The Students will be able to design various bio amplifiers		
4.0	To study the various non-electrical physiological parameter measurement	4.1	The Students will be able to measure various nonelectrical physiological parameters		
5.0	To study the various biochemical measurements	5.1	The Students will be able to measure various biochemical parameters		

UNIT I - BIOPOTENTIAL ELECTRODES	(9)
Origin of Bio potential and its Propagation: Nernst equation for Membrane Resting Potential, Generation and Propagation of Action Potential, Conduction through Nerve to Neuromuscular Junction. Bio Electrodes: Electrode-electrolyte Interface, Electrode–skin Interface, Half-cell Potential, Impedance, Polarization effects of Electrode – Non Polarizable Electrodes, Types of Electrodes - Surface, Needle and Micro electrodes and their equivalent circuits. Recording problems - Measurement with two electrodes.	
UNIT II - BIOPOTENTIAL MEASUREMENTS	(9)
Bio Signal Characteristics – Frequency and Amplitude ranges. ECG – Einthoven’s Triangle, Standard 12 lead system, Block Diagram. Measurements of Heart Sounds - PCG. EEG – 10-20 electrode system, Unipolar, Bipolar and Average Mode, Functional Block Diagram. EMG – Unipolar and Bipolar mode, Block Diagram, EOG and ERG.	
UNIT III - BIOPOTENTIAL AMPLIFIER	(9)
Need for Bio-amplifier - Single ended Bio-amplifier, Instrumentation Amplifier, Differential Bio-amplifier, Right leg driven ECG amplifier. Bandpass Filtering, Isolation Amplifiers – Transformer, Optical Isolation, Isolated DC Amplifier and AC Carrier Amplifier, Artifacts and Removal.	
UNIT IV - NON-ELECTRICAL PHYSIOLOGICAL PARAMETER MEASUREMENT	(9)
Temperature, Respiration Rate and Pulse Rate Measurements, Plethysmography, Pulse Oximetry, Blood Pressure: Direct Methods - Pressure Amplifiers - Systolic, Diastolic, Mean Detector Circuit, Indirect Methods - Auscultatory Method, Oscillometric Method, Ultrasonic Method. Blood flow - Electromagnetic and Ultrasound Blood flow Measurement. Cardiac output Measurement- Indicator dilution, Dye dilution and Thermodilution method.	

UNIT V - BIOCHEMICAL MEASUREMENT	(9)
Biochemical Sensors - pH, pO ₂ and pCO ₂ , Ion Selective Field Effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood Glucose Sensors - Blood Gas Analyzers, Spectrophotometer, Blood Cell Counter, Auto analyzer.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", 4th Edition, Pearson Education, 2014. 2. John G. Webster, "Medical Instrumentation Application and Design", 4th Edition, John Wiley and Sons, New York, 2009.
REFERENCES:
<ol style="list-style-type: none"> 1. Khandpur R. S, "Handbook of Biomedical Instrumentation", 3rd Edition, Tata McGraw Hill, New Delhi, 2014. 2. L.A Geddes and L. E. Baker, "Principles of Applied Biomedical Instrumentation", 3rd Edition Reprint, John Wiley and Sons, 2008. 3. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, Pearson Education India, 2015. 4. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", McGraw-Hill Publisher, 2003.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	1		1	1					1	3	
2	3	1	2	1		1	1					2	3	
3	3	1	2	1		1	1					2	3	
4	3	1	2	1		1	1					1	3	
5	3	1	2	1		1	1					1	3	
CO (W.A)	3	1	2	1		1	1					1.4	3	

22BMC05 - BIOSIGNAL PROCESSING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : 22ECC05 – SIGNALS AND SYSTEMS					
Course Objectives			Course Outcomes		
1.0	To learn Discrete Fourier transforms and Fast Fourier Transform and its properties		1.1	The students will be able to apply DFT and FFT for the analysis of biomedical signals	
2.0	To understand the characteristics and design of IIR filters		2.1	The students will be able to design and implement digital IIR filters in biosignal analysis	
3.0	To know the characteristics and design of FIR filters		3.1	The students will be able to design and implement digital FIR filters in the field of biomedical signal analysis	
4.0	To acquire knowledge about various biomedical signals and difficulties in signal analysis		4.1	The students will be able to identify the biomedical signals and difficulties in signal analysis	
5.0	To illustrate the PCG and EEG signals using adaptive segmentation technique		5.1	The students will be able to analyze the PCG and EEG signals using adaptive segmentation technique	

UNIT I – DISCRETE AND FAST FOURIER TRANSFORM	(9)
Introduction to DFT – Efficient Computation of DFT – Properties of DFT – FFT Algorithms – Decimation in Time (DIT) and Decimation in Frequency (DIF) Algorithms – Linear and Circular Convolution – Overlap Save and Add Methods.	
UNIT II - IIR FILTER DESIGN	(9)
Analog Filter Design – Discrete time IIR filter from analog filter (Butterworth Filter, Chebyshev Filter) – IIR Filter Design: Impulse Invariance, Bilinear Transformation Technique – Realization using Direct form – Cascade and Parallel forms.	
UNIT III - FIR FILTER DESIGN	(9)
Linear phase FIR filters – Filter design: Windowing Techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling Techniques – Realization of FIR filters Transversal – Linear phase.	
UNIT IV - INTRODUCTION TO BIOMEDICAL SIGNALS	(9)
Biosignal Characteristics of Electro Cardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Phonocardiogram (PCG), Electrogastragram (EGG), Objectives of Biomedical Signal Analysis, Difficulties in Biomedical signal analysis.	
UNIT V - ANALYSIS OF NONSTATIONARY AND MULTICOMPONENT SIGNALS	(9)
Time-variant Systems - Fixed Segmentation - Adaptive Segmentation - Application of Adaptive Segmentation in EEG and PCG Signals - Introduction to Wavelets.	
TOTAL (L) = 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. John G. Proakis & Dimitris G Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, 4th Edition, Pearson Education / Prentice Hall, 2007. 2. Rangaraj M. Rangayyan, “Biomedical Signal Analysis - A Case Study Approach”, Wiley, 2nd Edition, 2016.
REFERENCES:
<ol style="list-style-type: none"> 1. Emmanuel C. Ifeachor, Barrie W. Jervis, “Digital Signal Processing - A Practical Approach”, Pearson Education Ltd., 2004. 2. Arnon Cohen, “Bio-Medical Signal Processing Vol I and Vol II”, CRC Press Inc., Boca Rato, Florida, 2019. 3. Willis J. Tompkins, “Biomedical Digital Signal Processing”, Prentice Hall of India, New Delhi, 2003. 4. D C Reddy, “Biomedical Signal Processing – Principals and Techniques”, Tata Mc Graw Hill Publications, 2007

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	3							2	3	1
2	3	2	3	3	2							2	3	1
3	3	2	2	3	3							2	3	1
4	3	3	3	3	3							2	3	1
5	2	3	3	3	3							2	3	1
CO (W.A)	2.8	2.6	2.8	2.8	2.8							2.0	3.0	1

22BMC06 - BIOCONTROL SYSTEM					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To study the mathematical techniques for analysis of given system	1.1	The students will be able to develop mathematical model for a given system		
2.0	To study the given system in time domain analysis	2.1	The students will be able to determine and analyze the time domain specifications of different systems		
3.0	To study the stability analysis of the given system	3.1	The students will be able to perform stability analysis of the given system using various techniques		
4.0	To study the given system in frequency domain analysis	4.1	The students will be able to determine and analyze the frequency domain specifications of the different systems		
5.0	To study the concept of physiological control system	5.1	The students will be able to explain the concept and model of physiological control systems		

UNIT I - CONTROL SYSTEM MODELING	(9)
Terminology and Basic Structure of Control System, Example of a Closed Loop System, Transfer Function, Modeling of Electrical Systems, Translational and Rotational Mechanical Systems, Block Diagram and Signal Flow Graph Representation of Systems, Reduction of Block Diagram and Signal Flow Graph, Conversion of Block Diagram to Signal Flow Graph. Need for Modeling Physiological System.	
UNIT II - TIME RESPONSE AND STABILITY ANALYSIS	(9)
Step and Impulse Responses of First Order and Second Order Systems - Time Domain Specifications of First and Second Order Systems - Steady State Error Constants. Introduction to PI, PD and PID Controllers.	
UNIT III - STABILITY ANALYSIS	(9)
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)
Frequency Response, Nyquist Stability Criterion, Nyquist Plot and Determination of Closed Loop Stability, Definition of Gain Margin and Phase Margin, Bode plot, Determination of Gain Margin and Phase Margin using Bode plot, use of Nichol's chart to compute Frequency and Bandwidth.	
UNIT V - PHYSIOLOGICAL CONTROL SYSTEM	(9)
Example of Physiological Control System, Difference between Engineering and Physiological Control Systems, Generalized System Properties, Models with Combination of System Elements, Linear Models of Physiological Systems - Examples, Introduction to Simulation. Illustration with Real Time Applications.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. J. Nagarath and M. Gopal, "Control Systems Engineering", New Age International Publishers, September, 2021.
2. Michael C K Khoo, "Physiological Control Systems", IEEE Press, Prentice Hall India, 2005.

REFERENCES:

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

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2								1	2	1
2	3	2	2	2								1	2	1
3	3	2	2	2								1	2	1
4	3	2	2	2	1							1	2	1
5	3	2	2	2	1							2	2	1
CO (W.A)	3	2	2	2	1							1.2	2	1

22BMC07 - BIOMATERIALS AND ARTIFICIAL ORGANS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : 22BMC02 – ANATOMY AND HUMAN PHYSIOLOGY					
Course Objectives			Course Outcomes		
1.0	To study the characteristics and classification of biomaterials	1.1	The students will be able to understand the structure and mechanical properties of biomaterials		
2.0	To understand the response of biomaterials in living system	2.1	The students will be able to interpret various metallic and ceramic implant materials in medical field		
3.0	To learn about the polymeric materials and composites in tissue replacements	3.1	The students will be able to implement various polymeric implant materials according to the need for treatment		
4.0	To study the soft and hard tissue replacement in biomedical applications	4.1	The students will be able to analyze soft and hard tissue replacement implants in biomedical applications		
5.0	To know the compatibility and functioning of artificial organs inside the living system	5.1	The students will be able to assess compatibility and functioning of artificial organs inside the living system		

UNIT I – BIO-MATERIALS STRUCTURE AND BIO-COMPATIBILITY	(9)
Definition and Classification of Bio-materials, Mechanical Properties of Biomaterials, Structure Property Relationship of Biological and Biomaterials Viscoelasticity, Wound Healing Process, Body Response to Implants, Blood Compatibility, Carcinogenicity.	
UNIT II – IMPLANT MATERIALS I	(9)
Metallic Implant Materials: Stainless Steels, Cobased Alloys, Ti-Based Alloys, Dental Metals, Deterioration of Metallic Implant Materials. Ceramic Implant Materials: Structure–Property Relationship of Ceramics, Aluminum Oxides, Zirconia, Hydroxyapatite, Glass Ceramics, Carbons. Bio Dissolvers.	
UNIT III – IMPLANT MATERIALS II	(9)
Polymerization, Polyamides, Acrylic Polymers, Rubbers, High Strength Thermoplastics, Deterioration of Polymers, Bio Polymers: Collagen and Elastin. Composites – Structure, Mechanics, Biocompatibility, Applications. Materials for Ophthalmology: Contact Lens, Intraocular Lens.	
UNIT IV – TISSUE REPLACEMENT IMPLANTS	(9)
Soft Tissue Replacements, Sutures, Surgical Tapes, Adhesive, Percutaneous and Skin Implants, Maxillofacial Augmentation, Vascular Grafts, Hard Tissue Replacement Implants, Internal Fracture Fixation Devices, Joint Replacements.	
UNIT V – ARTIFICIAL ORGANS	(9)
Blood Substitutes, Artificial Skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial Lung (Oxygenator), Artificial Kidney (Dialyser Membrane), Artificial Pancreas, Dental Implants.	
TOTAL (L) = 45 PERIODS	

TEXT BOOKS:
1. Sujata V. Bhatt, "Biomaterials", 7th Edition, Narosa Publishing House, 2005. 2. Michael Lysaght, Thomas J Webster, "Biomaterials for Artificial Organs", Elsevier Science, 2018.
REFERENCES:
1. Park Joseph D.Bronzino, "Biomaterials-Principles and Applications", CRC Press, 2003. 2. J. Park, "Biomaterials: An Introduction", Springer Science & Business Media, 2012. 3. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", McGraw-Hill, 2003.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	1	2		2	2					2	2	
2	3	2	2	2		2	1					1	2	
3	3	2	2	2		2	1					1	2	
4	3	3	2	3		2	2					2	3	
5	3	3	2	3		3	2					2	3	
CO (W.A)	2.8	2.2	1.8	2.4		2.2	1.6					1.6	2.4	

22ITP04 - JAVA PROGRAMMING LABORATORY
(Common to 22AIC04 ,22CSC07, 22CCC06 and 22CIC06)

		L	T	P	C
		0	0	4	2
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes			
1.0	To impart fundamental concepts of OOP using java	1.1	The students will be able to understand the basics of object oriented concepts in java.		
2.0	To gain exposure about inheritance, packages and Interfaces	2.1	The students will be able to develop applications using inheritance, packages and interfaces.		
3.0	To explore about the exception handling mechanism	3.1	The students will be able to construct applications with exception handling.		
4.0	To understand threads concepts	4.1	The students will be able to build applications using threads and collection framework		
5.0	To know about Event handling using swing components.	5.1	The students will be able to create GUIs and event driven programming applications for real world problems		

LIST OF EXPERIMENTS:

1. Write simple Java programs using operators, arrays and control statement
2. Programs using Static, final and this keywords.
3. Demonstrate the concepts of inheritance
4. Programs illustrating overloading and overriding methods in Java
5. Programs to use packages and Interfaces in Java.
6. Implement exception handling and creation of user defined exception.
7. Implement program to demonstrate multithreading and inter thread communication.
8. Write a program to perform file operations.
9. Develop applications using swing layouts.

HARDWARE OR SOFTWARE REQUIREMENT:

HARDWARE:

1. LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
2. Printers – 3 Nos.

SOFTWARE:

1. Java / Equivalent Compiler

TOTAL (P) = 60 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3			2		3	2	2	2	3	3		3
2	2	2	3	3	3	1	3	3	2	2	3	3		3
3	2	2	3	3	3	1	3	3	2	2	3	3		3
4	2	2	3	3	3	1	3	3	2	2	3	3		3
5	2	2	3	3	3	2	3	3	2	2	3	3		3
CO (W.A)	2.2	2.2	3	3	2.8	1.25	3	2.8	2	2	3	3		3

22BMP04 - BIOSIGNAL PROCESSING LABORATORY

	L	T	P	C
	0	0	4	2

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To acquire knowledge of various biomedical signals and sampling techniques	1.1	The students will be able to identify the various biomedical signals and sampling techniques
2.0	To learn DFT and FFT for computation of biosignals	2.1	The students will be able to apply DFT and FFT for the analysis of biomedical signals
3.0	To understand the characteristics and design of IIR filters	3.1	The students will be able to design and simulate digital IIR filters for biosignals
4.0	To study the characteristics and design of FIR filters for biosignals	4.1	The students will be able to design and simulate digital FIR filters for biosignals
5.0	To analyze the ECG and EEG Signal Processing	5.1	The students will be able to associate ECG and EEG data acquisition and processing

LIST OF EXPERIMENTS

1. (a)Representation of Basic Signals (Sine, Cosine, Unit impulse, Unit Step, Square, Exponential, Sawtooth)
(b) Introduction of various Biomedical Signals (ECG, EEG, EMG).
2. DFT and FFT computation of Biosignals.
3. Digital IIR Butterworth filter-LPF & HPF.
4. Digital IIR Chebyshev filter-LPF & HPF.
5. FIR Filter Design Using Windowing Technique.
6. Up sampling and down sampling.
7. Design of IIR filter for ECG signal.
8. Event Detection: QRS in ECG.
9. Event Detection: Alpha activity in EEG.
10. Separation of Mixtures of Signals using PCA and ICA.

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	2	2	3	1	1		1			1	1	2
2	2	1	2	2	3	1	1		1	1		1	1	2
3	2	1	2	2	3	1	1		1	1		1	1	2
4	2	2	2	2	3	1	1		1			1	1	2
5	2	2	2	2	3	1	1		2	1		1	1	2
CO (W.A)	2	1.4	2	2	3	1	1		1.2	1		1	1	2

22BMP04 - BIOMEDICAL INSTRUMENTATION LABORATORY						
			L	T	P	C
			0	0	4	2
PRE REQUISITE : NIL						
Course Objectives			Course Outcomes			
1.0	To design preamplifiers and amplifiers for various bio signal recordings		1.1	The students will able to design preamplifiers and amplifiers for various bio signal recordings		
2.0	To learn measurement of physiological parameters		2.1	The students will able to measure physiological parameters		
3.0	To understand the measurement of biochemical parameters		3.1	The students can analyze biochemical parameters		
4.0	To impart knowledge on designing of bio signal acquisition system		4.1	The students can design PCB layout for any bio amplifier		
5.0	To measure various non-electrical parameters using suitable sensors/transducers		5.1	The students can able to measure various non-electrical parameters using suitable sensors/transducers		

LIST OF EXPERIMENTS	
<ol style="list-style-type: none"> 1. Design a suitable circuit to detect QRS complex and measure heart rate. 2. Design of pre amplifiers to acquire bio signals along with impedance matching circuit using suitable ICs. 3. Design of ECG amplifiers with appropriate filter to remove power line and other artifacts. 4. Design of EMG amplifier. 5. Design of frontal EEG amplifier. 6. Design and study the characteristics of optical isolation amplifier. 7. Measurement of blood pressure using sphygmomanometer. 8. Design a Multiplexer and Demultiplexer for any two bio signals. 9. Measurement of pulse rate using photo transducer. 10. Measurement of pH and Conductivity. 11. Measurement of SPO₂ 	
TOTAL (P:60) : 60 PERIODS	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	2	2		1	1		2	1		1	2	1
2	2	1	2	2		1	1		2	1		1	2	1
3	2	1	2	2		1	1		2	1		1	2	1
4	2	2	2	2		1	1		2	1		1	2	1
5	2	2	2	2		1	1		2	1		1	2	1
CO (W.A)	2	1.4	2	2		1	1		2	1		1	2	1

22MAN08 – SOFT / ANALYTICAL SKILLS - IV (Common to All Branches)					
		L	T	P	C
		1	0	2	0
PRE REQUISITE : NIL					
Course Objectives			Course Outcomes		
1.0	To recollect the functional understanding of basic grammar and its structure	1.1	The students will be able to apply the knowledge of basic grammar to construct the sentences		
2.0	To develop students to workout solution for problems that involves mathematics aptitude	2.1	The students will be able to solve aptitude problems with ease		
3.0	To enrich their knowledge and to develop their logical reasoning ability	3.1	The students will be able to solve reasoning problems with ease		

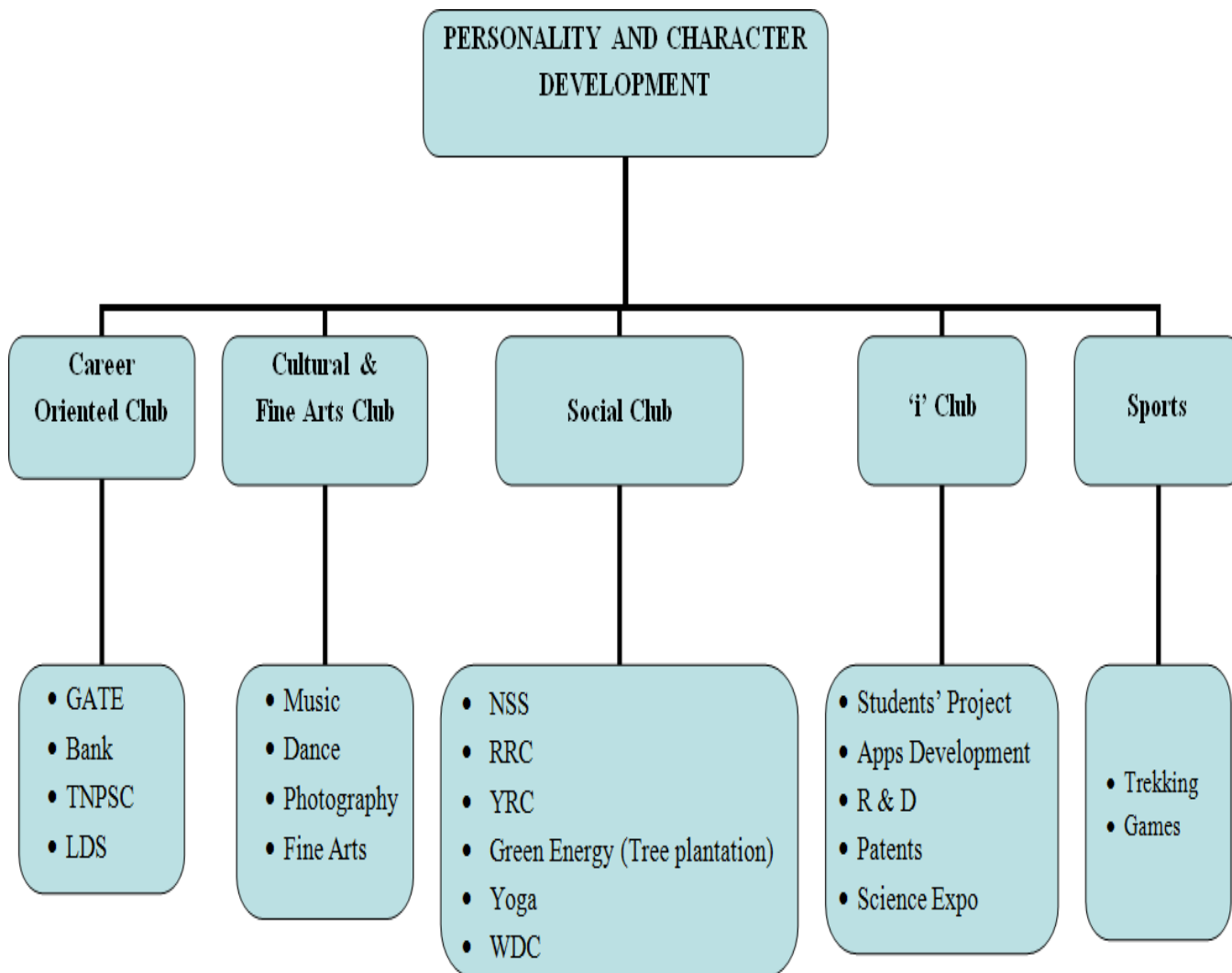
UNIT I – Verbal	(10)
Articles , Fill in the blanks , Grammatical Error , Sentence improvement	
UNIT II – Aptitude	(10)
Speed and Distance, Time and Work, Mixture And Alligations, Permutation and Combinations	
UNIT III - Logical and Reasoning	(10)
Seating Arrangement, Directions and Distance, Non verbal Reasoning	
TOTAL (L:10, P:20) : 30 PERIODS	

REFERENCES:
1. Dr. R.S. Aggarwal, “A Modern Approach to Verbal & Non-Verbal Reasoning”, S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, “Quick Arithmetic”, S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, “English Grammar in Use”, 4th Edition, Cambridge University, 2012.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2		
2		3	2	2			1		2			3		
3		3	2	2			1		2			3		
CO (W.A)		3	2	2			1		2.3	3		2.6		

22GEC01 – PERSONALITY AND CHARACTER DEVELOPMENT
(Common to All Branches)

L	T	P	C
0	0	1	0



*LDS - Leadership Development Skills

OBJECTIVES :

Career Oriented Club	Cultural & Fine Arts Club	Social Club	'i' club	Sports
<ul style="list-style-type: none"> •To provide support for identifying specific career field of interests and career path •To provide support for preparing for competitive exams 	<ul style="list-style-type: none"> •To bring out the hidden talent of students in music, dance and other fine arts. •To promote photography skill among the students •To develop and enhance the performance of students by participating in various events •To inculcate managerial capabilities such as event management and stage organization 	<ul style="list-style-type: none"> •To create social awareness and develop a sense of social and civic responsibility •To inculcate socially and environmentally sound practices and be aware of the benefits •To encourage the students to work along with the people in rural areas, thereby developing their character, social consciousness, commitment, discipline and being helpful towards the community. 	<ul style="list-style-type: none"> •To inculcate the basic concepts of innovation •To foster the networking between students, build teams, exchange ideas, do projects and discuss entrepreneurial opportunities •To enrich the academic experience, build competencies and relationships beyond the classroom 	<ul style="list-style-type: none"> •To provide opportunities to excel at sports •To promote an understanding of physical and mental well-being through an appreciation of stress, rest and relaxation. •To develop an ability to observe, analyze and judge the performance of self and peers in sporting activities. •To develop leadership skills and nurture the team building qualities. <p style="text-align: center;"><u>Trekking:</u></p> <ul style="list-style-type: none"> •To provide opportunities to explore nature and educating about the purity of nature •To improve physical and mental health.

OUTCOMES : At the end of this course, the students will be able to				
<ul style="list-style-type: none"> •Find a better career of their interest. •Make use of their knowledge during competitive exams and interviews. 	<ul style="list-style-type: none"> •Take part in various events •Develop team spirit, leadership and managerial qualities 	<ul style="list-style-type: none"> •Develop socially responsive qualities by applying acquired knowledge •Build character, social consciousness, commitment and discipline 	<ul style="list-style-type: none"> •Apply the acquired knowledge in creating better solutions that meet new requirements and market needs • Develop skills on transforming new knowledge or new technology into viable products and services on commercial markets as a team 	<ul style="list-style-type: none"> • Demonstrate positive leadership skills that contribute to the organizational effectiveness •Take part an active role in their personal wellness (emotional, physical, and spiritual) that supports a healthy lifestyle •Create inclination towards outdoor activity like nature study and Adventure.

TOTAL [2 x (P : 15)] = 30 PERIODS

(Cumulatively for Two Semesters)



22GYA01 HERITAGE OF TAMILS
(For Common To All Branches)

	L	T	P	C
	1	0	0	1
PRE REQUISITE : NIL				

UNIT I - LANGUAGE AND LITERATURE	(3)
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART - SCULPTURE	(3)
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	
UNIT III - FOLK AND MARTIAL ARTS	(3)
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	
UNIT IV - THINAI CONCEPT OF TAMILS	(3)
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	(3)
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	
TOTAL (L:15) : 15 PERIODS	

TEXT-CUM-REFERENCE 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.	பொருளுத – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22GYA01 தமிழர் மரபு
(அனைத்து பாடப்பிரிவினருக்கும்)

L	T	P	C
I	0	0	I

முன் தேவை: இல்லை

அலகு 1 மொழி மற்றும் இலக்கியம் **(3)**

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

அலகு 2 மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை: **(3)**

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

அலகு 3 நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: **(3)**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டாம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 தமிழர்களின் திணைக் கோட்பாடுகள்: **(3)**

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

அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: **(3)**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிிகள் - தமிழ் புத்தகங்களின் அச்ச வரலாறு.

TOTAL (L:15) : 15 PERIODS

TEXT-CUM-REFERENCE 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)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22GYA02 TAMILS AND TECHNOLOGY
(For Common To All Branches)

L	T	P	C
1	0	0	1

PRE REQUISITE : NIL

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

UNIT III - MANUFACTURING TECHNOLOGY

(3)

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

UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY

(3)

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoempu 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 (L:15) : 15 PERIODS

TEXT-CUM-REFERENCE 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. பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**22GYA02 தமிழரும் தொழில்நுட்பமும்
(அனைத்து பாடப்பிரிவினருக்கும்)**

L	T	P	C
I	0	0	I

முன் தேவை: இல்லை

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்:

(3)

சங்ககாலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:

(3)

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் 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 3 உற்பத்தி தொழில் நுட்பம்:

(3)

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எக்கு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுருமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்:

(3)

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் 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 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:

(3)

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL (L:15) : 15 PERIODS

TEXT-CUM-REFERENCE 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)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.