

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur, Chengalpattu Dt.-603203, Tamil Nadu.

(Approved by AICTE, Affiliated to Anna University
'A' Grade Accredited by NAAC, ISO 9001: 2015 Certified)



CURRICULA AND SYLLABI

B.E – MEDICAL ELECTRONICS

REGULATION 2023

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. MEDICAL ELECTRONICS

REGULATIONS – 2023

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To prepare students to succeed in employment/profession and/or to pursue post graduate and research educations in Electronics and Communication Engineering discipline in particular and allied engineering disciplines in general.
2. To provide students with a solid foundation in mathematical, Scientific and engineering fundamentals required to formulate, analyze and solve engineering problems requiring knowledge of Electronics and Communication Engineering.
3. To prepare students with engineering breadth to innovate, design, develop electronics products and to contribute in providing solutions related to multidisciplinary real life problems.
4. To inculcate in students professional and ethical attitude, effective communication skills and teamwork to become a successful professional.
5. To provide students with an academic environment that makes them aware of excellence and life-long learning in emerging technologies.

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Electronics and Communication Engineering Graduates will exhibit ability to:

PO#	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with the 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.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	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.

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Medical Electronics program, the student will have following Program specific outcomes

1. Ability to apply the acquired knowledge of basic skills, mathematical foundations, principles of electronics, Modeling and design of electronics-based systems in solving engineering Problems in healthcare.
2. Ability to use the advanced technology for measurement and develop innovative sustained solutions in health care.
3. Ability to examine indigenous clinical gadgets through the application of their core area ideas and emerging ICTs
4. Ability to perform effectively as a part of a team with professional behavior and ethics to achieve a successful career.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
I	3	3	3	4	2	-	-	-	2	1	2	3
II	3	3	2	2	2	2	-	-	-	-	-	3
III	3	3	3	3	2	-	-	3	-	-	-	2
IV	-	-	-	-	2	2	2	2	-	-	-	-
V	3	2	3	3	3	-	-	-	2	2	-	3

Contribution: 1 – Reasonable, 2 – Significant, 3 – Strong

MAPPING – UG – MEDICAL ELECTRONICS

		Subject Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4		
Year I	Sem I	EN3111- Professional English – I	2.2	2.6	2	2	2		2			2.8	1	1	-	-	-	-		
		MA3122 - Matrices and Calculus	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-	
		PH3123 - Engineering Physics	2.8	1.4	1.4	1	1.25	1	1	-	-	-	-	-	1	-	-	-	-	
		CH3124 - Engineering Chemistry	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	-	0.8	-	0.2	-	-	
		GE3131 - Basic Electrical and Electronics Engineering	2.8	2.8	1.7	1.6	3	2	2	2	-	-	-	-	-	1.8	1.5	2.5	2	
		GE3111 - தமிழர் மரபு / Heritage of Tamils																		
		EN3119 - English Language Learning Laboratory	2	1	1	1	2	-	2	-	-	-	3	-	1	-	-	-	-	
		GE3121 - Physics and Chemistry Laboratory	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
		GE3134 - Engineering Practices Laboratory	3	2	2.3	2	2.3	1	-	-	1	-	1	1	1	1.7	2	2.5	2	
Year I	Sem II	EN3211 - Professional English – II	2	2	1.4	2	2		2			2.8	1	1						
		MA3222 - Statistics and Numerical Methods	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
		PH3226 – Medical Physics	2.4	1.6	1.5	1.5	1.6	1.5	1	-	-	-	-	-	1	-	-	-	-	
		CH3226 - Chemistry for Bio-Medical Engineering	2.6	2.6	2.4	1.8	1.8	0.4	0.2	-	-	-	-	-	0.4	0.6	0.8	0.2	-	
		GE3231 - Problem Solving and Python Programming	2.4	2.6	3	2.8	1.8	-	-	-	-	-	-	1.6	2	2.5	-	2	1	
		GE3211 – தமிழரும் தொழில்நுட்பமும் / Tamils and Technology																		
		GE3233 - Engineering Graphics and Design	3	1	2	-	2	-	-	-	-	-	3	-	2	2	1	-	1	
		GE3221 - Engineering Sciences Laboratory	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
		GE3232 - Problem Solving and Python Programming Laboratory	2.6	2.6	3	2.8	2.2	-	-	-	-	-	-	2	2	1	3	1.7	2	
GE3251 - NSS / YRC / NSO / Club Activities#																				

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
Year II	Sem III	MA3321 - Transforms and Partial Differential Equations	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	
		EC3363 - Signals and Systems	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1	-	
		EE3363 - Electric Circuit Analysis	1	1	1	2	2	-	-	3	-	-	3	2	1	1	2	3	
		EI3361 – Electronic Devices and Circuits	2.6	2.6	2.2	2	-	-	-	1		1	-	-	1.2	-	-	-	2
		CS3361 -Object Oriented Programming	2	1.4	2.2	2	2	-	-	-	2.2	1.8	1.2	2.4	3	1.8	2.2	1.6	
		MD3361 – Sensors and Measurements	3	2.8	2	1.2	1.4	2	2	2	2	1.4	2.6	1.3	2.2	2	1.8	2.7	
		EI3365- Electronics Devices and Circuits Laboratory	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	-	1.4
		CS3364 - Object Oriented Programming Laboratory	2	2	2	2	2	-	-	-	2	2	2	2	2	2	2	2	2
Year II	Sem IV	MA3427 - Applied Mathematics for Bio-Medical Engineering	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-	
		MD3461 – Human Anatomy and Physiology	3	-	-	2	-	-	-	2.2	-	-	-	2	2	2	-	-	
		MD3462 – Bio Control Systems	3	2	2	2	1.3	2	1		1	1	1	2	2	1	-	-	
		MD3463 – Analog and Digital Integrated Circuits	3	3	3	1	1	1	-	-	-	-	2.2	2.2	1.4	1	1	-	
		EC3464 - Microprocessors, Microcontrollers and Interfacing	2	1.2	2	1.7	3	1	-	2	-	-	2.5	2	2	1	3	2	
		GE3451 - NCC Credit Course Level – I																	
		MD3464 – Medical Instrumentation	2	2.7	2.7	2.5	3	2.5	2.5	2	2	2	-	2	2	3	3	-	
		MD3465 – Analog and Digital Integrated Circuits Laboratory	3	2	1	1	1.4	-	-	-	-	1	2	3	1.8	1.2	-	-	
EC3467 - Microprocessors, Microcontrollers and Interfacing Laboratory	1.7	2	3	2	3	2	2	2	1.8	2	-	2.2	2	2	3	3			

Contribution: 1 – Reasonable, 2 – Significant, 3 – Strong

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(AN AUTONOMOUS INSTITUTION)

REGULATION-2023

CHOICE BASED CREDIT SYSTEM

B.E – MEDICAL ELECTRONICS

CURRICULUM FOR SEMESTER I TO IV

SEMESTER I								
S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3111	Professional English – I	HSMC	3	3	0	0	3
2.	MA3122	Matrices and Calculus	BSC	4	3	1	0	4
3.	PH3123	Engineering Physics	BSC	3	3	0	0	3
4.	CH3124	Engineering Chemistry	BSC	3	3	0	0	3
5.	GE3131	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
6.	GE3111	தமிழர் மரபு/Heritage of Tamils	HSMC	1	1	0	0	1
PRACTICAL								
7.	EN3119	English Language Learning Laboratory	EEC	2	0	0	2	1
8.	GE3121	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
9.	GE3134	Engineering Practices Laboratory	ESC	4	0	0	4	2
TOTAL				27	16	1	10	22

SEMESTER II								
S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3211	Professional English – II	HSMC	3	3	0	0	3
2.	MA3222	Statistics and Numerical Methods	BSC	4	3	1	0	4
3.	PH3226	Medical Physics	BSC	3	3	0	0	3
4.	CH3226	Chemistry for Bio - Medical Engineering	BSC	3	3	0	0	3
5.	GE3231	Problem Solving and Python Programming	ESC	3	3	0	0	3
6.	GE3211	தமிழ்நூல் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	1	0	0	1
THEORY CUM PRACTICAL								
7.	GE3233	Engineering Graphics and Design	ESC	5	1	0	4	3
PRACTICALS								
8.	GE3221	Engineering Sciences Laboratory	BSC	4	0	0	4	2
9.	GE3232	Problem Solving and Python Programming Laboratory	ESC	4	0	0	4	2
10.	GE3251	NSS/YRC/NSO/ Club Activities#	PCD	0	0	0	0	0
TOTAL				30	17	1	12	24

Conducted after college hours

SEMESTER III								
SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA3321	Transforms and Partial Differential Equations	BSC	3	3	0	0	3
2	EC3363	Signals and Systems	PCC	3	3	0	0	3
3	EE3363	Electric Circuit Analysis	PCC	3	3	0	0	3
4	EI3361	Electronic Devices and Circuits	ESC	3	3	0	0	3
5	CS3361	Object Oriented Programming	ESC	3	3	0	0	3
THEORY CUM PRACTICAL								
6	MD3361	Sensors and Measurements	PCC	5	3	0	2	4
PRACTICAL								
7	EI3365	Electronic Devices and Circuits Laboratory	ESC	3	0	0	3	1.5
8	CS3364	Object Oriented programming Laboratory	ESC	3	0	0	3	1.5
TOTAL				26	18	0	8	22

SEMESTER IV								
SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3427	Applied Mathematics for Bio-Medical Engineering	BSC	2	2	0	0	2
2.	MD3461	Human Anatomy and Physiology	PCC	3	3	0	0	3
3.	MD3462	Bio Control Systems	PCC	3	3	0	0	3
4.	MD3463	Analog and Digital Integrated Circuits	PCC	3	3	0	0	3
5.	EC3464	Microprocessors, Microcontrollers, and Interfacing	PCC	3	3	0	0	3
6.	GE3451	NCC Credit Course Level – I*	PCD	3*	3*	0	0	3*
THEORY CUM PRACTICAL								
7.	MD3464	Medical Instrumentation	PCC	5	3	0	2	4
PRACTICAL								
8.	MD3465	Analog and Digital Integrated Circuits Laboratory	PCC	3	0	0	3	1.5
9.	EC3467	Microprocessors, Microcontrollers, and Interfacing Laboratory	PCC	3	0	0	3	1.5
TOTAL				25	17	0	8	21

* NCC Credit Course level – I is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SUMMARY

Name of the Programme : B.E. Medical Electronics										
S.No	Subject Area	Credits Per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	4	4				2	2		12
2	BSC	12	12	3	2	2				31
3	ESC	5	8	9						22
4	PCC			10	19	16	10.5	8.5		64
5	PEC					6	6	6		18
6	OEC							3		3
7	EEC	1					3	1	10	15
8	Non-Credit / (Mandatory)						0	0		
Total		22	24	22	21	24	21.5	20.5	10	165

OBJECTIVES:

- To upgrade the English language skills of students by introducing communication techniques, speaking and grammar learning activities which are relevant to authentic contexts.
- To improve the basic reading and writing skills of the learners.
- To enhance the communicative competence of the first-year engineering students.
- To enable learners to use language effectively in academic/work contexts.
- To help learners understand content- context in relevant situations.

UNIT – I: INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9

Listening: Podcast watching – Listening for new words and pronunciation.

Speaking: Note of appreciation for classmates /family member – formal appreciation of someone, expression of feelings.

Reading: Books, shorts stories to be read. Filling forms (i.e.) post office or bank.

Writing: Film and series Review / Book Review, Email and Informal letters.

Language and Vocabulary development: WH questions, Yes/No questions, Single Word Substitutes, Pronouns, Parts of Speech, Question tags, Prefixes and Suffixes.

UNIT – II: NARRATION AND SUMMATION 9

Listening: Books – Short Stories to be read aloud in class for listening purpose.

Speaking: Short stories to be read and narrated in the class.

Reading: Reading favourite blogs on Travel, Sports and Food and expressing opinions regarding the same.

Writing: Paragraph writing, Report – field trip / I.V., Autobiography and Comprehension.

Language and Vocabulary development: Tenses – Past, Antonyms, Synonyms, Subject Verb agreement and Prepositions.

UNIT – III: DESCRIPTION OF A PROCESS/PRODUCT 9

Listening: Listening to snippets from celebrities/ National leaders' lives.

Speaking: Narrating personal experiences/ events – Expression of emotions and feelings.

Reading: Reading short biographies – famous people and description of the same.

Writing: Instruction, Product / Process description and Advertisements (classified advertisement and display advertisement)

Language and Vocabulary development: Adjectives- Degrees of Comparison, Tenses – Present, Compound Nouns, Homonyms, Homophones and Discourse markers – connective and sequence words

UNIT – IV: CLASSIFICATION AND INTERPRETATION 9

Listening: Listening to Ted Talks.

Speaking: Recreating a Ted talk session in the class.

Reading: Newspaper Reading (Editorial) and understanding.

Writing: Note making, Blogging, Interpretation of charts and graphs.

Language and Vocabulary development: Articles, Collocations and Phrasal Verbs.

UNIT – V: EXPRESSION OF THOUGHTS AND IDEAS 9

Listening: Listening to audio books and answering questions.

Speaking: Presentation on a non-technical topic.

Reading: Editorials from newspaper.

Writing: Essay writing – Descriptive and Narrative essays.

Language and Vocabulary development: Tenses – future, Negative statements and questions, Punctuations, Cause and Effect, Content and Function words.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: To strengthen the basics of grammar.

CO2: To narrate informal and informal situations.

CO3: To describe a process/product and express opinion.

CO4: To interpret and analyse the content/information given.

CO5: To write short essays, personal letters, and emails in English.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press,2021.
Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis,

Dr.K.N.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.

2. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.

REFERENCES:

1. Effective Communication Skill, Kulbhusan Kumar, R.S.Salaria, Khanna Publishing House.
2. Wings of Fire - An Autobiography by A.P.J Abdul Kalam with Arun Tiwari, Sangam Books Ltd , Edition: 50, 1999
3. World's Most Popular Short Stories Saki Maupassant, Anton Chekhov, O Henry Paperback
4. Professional Speaking skills, Aruna Koneru, Oxford University Press.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English,Anna University,2020.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	2	2	-	-	-	-	3	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	3	1	1	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	3	-	1	-	-	-	-
CO4	3	3	-	2	-	-	2	-	-	3	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
AVG	2.2	2.6	2	2	2	-	2	-	-	2.8	1	1	-	-	-	-

OBJECTIVES:

- To understand and apply matrix techniques for engineering applications.
- To familiarize the student with basic calculus and traditions of traditional calculus.
- To solve the problems in single and multivariable calculus and plays an important role in science, economics, engineering.
- Vector calculus can be widely used for modeling the various laws of physics.
- To familiarize the student with multiple integrals and their usage in find the area and volume of two and three dimensional objects.

UNIT-I: MATRICES**9L+3T**

Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigen vectors - Statement and Applications of Cayley-Hamilton Theorem - Reduction of a quadratic form into canonical form by orthogonal transformation.

UNIT-II: DIFFERENTIAL CALCULUS OF ONE VARIABLE**9L+3T**

Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Rolle's Theorem and Mean Value theorem - Taylor's series- Maxima and Minima of functions of one variable.

UNIT-III: DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES**9L+3T**

Partial derivatives - Total derivatives - Jacobians and properties - Taylor's series for functions of two variables - Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT-IV: MULTIPLE INTEGRALS**9L+3T**

Double integrals in Cartesian and polar coordinates - Change of order of integration - Area enclosed by plane curves - Change of variables in Polar coordinates - Triple integrals - Volume of solids.

UNIT-V: VECTOR CALCULUS**9L+3T**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Vector Integration Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

TOTAL: 45L +15T PERIODS**OUTCOMES:****On completion of the course, student will be able to**

- CO1:** To apply the idea of reducing complex problems into simple form using matrix technique.
- CO2:** Basic application of calculus in engineering problems and to tackle for different geometries.
- CO3:** This course equips the students to have basic knowledge and understanding the Partial derivatives and maxima and minima by Lagrange's method.
- CO4:** Basic application of Double and Triple integrals used in Engineering real life problems
- CO5:** To study the vector differentiation and vector integration by using standard theorems.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.3. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd.,11th Edition, 2005.
2. Veerarajan.T, "Engineering Mathematics", McGrawHill Education(India) Private Ltd 2019.

REFERENCE BOOKS:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt. Ltd., 2011.
2. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015.
3. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I, Second Edition, Pearson Publishing, 2017.

4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO3	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO4	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO5	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
AVG	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-

No Correlation - Low 1 Medium 2 High 3

OBJECTIVES:

- To enhance the fundamental knowledge in crystalline materials and its applications.
- To explore the knowledge in the production of ultrasonic waves and application in the engineering field.
- To familiarize the basics of laser and their technical advances in scientific, industrial and health care areas.
- To understand the principle of fibre optical fibre and its applications.
- To explore basic concept of quantum and dual nature of particle.

UNIT-I: PROPERTIES OF MATERIALS**9**

Elasticity - Hooke's law - Stress-strain and its uses - Poisson ratio - factors affecting elastic modulus and tensile strength.

Single crystalline, polycrystalline and amorphous materials - unit cell - space lattice - crystal systems - Bravais lattice - Miller indices - d-spacing - characteristics of unit cell - SC, BCC, FCC and HCP structure - thermal and mechanical properties of materials - crystal growth techniques - Czochralski and Bridgmann.

UNIT-II: ULTRASONICS**9**

Introduction - Properties - Production: **Magnetostriction method** and **Piezoelectric method** - Acoustical grating - **determination of ultrasonic velocity in liquid** - **Application:** Detection of flaw in materials (Non Destructive Testing) - ultrasonic soldering, welding - SONAR - diagnostic sonography - cars' air bag sensor-dispersion of fog - Probe sonication for 2D material formation.

UNIT-III: LASERS AND ITS APPLICATIONS**9**

Basic concepts and characteristics - Einstein's A and B coefficients (derivation) - population inversion - Pumping methods - Nd-YAG laser - CO₂ laser - Semiconductor lasers: homo junction and heterojunction - applications: laser welding, laser cutting, laser cooling, pattern formation by laser etching, laser bar code scanner - LIDAR - Laser tissue interaction, laser surgery - Holography - NLO - electro-optic effect.

UNIT-IV: FIBRE OPTICS**9**

Structure and principle - Propagation of light through optical fibre - acceptance angle, numerical aperture - fractional index change - Types of optical fibres (material, mode and refractive index) - Attenuation: absorption, scattering and bending - Dispersion - Fibre optic communication system (Block diagram) and advantages over conventional methods - fibre optic sensors: pressure and displacement- Endoscope.

UNIT-V: QUANTUM PHYSICS**9**

Black body radiation and energy distribution spectrum - Planck's theory of radiation - matter waves - de-Broglie wavelength in terms of energy, voltage and temperature - Electron diffraction - G.P.Thomson experiment - wave function and its physical significance - Schrödinger's wave equation - time independent and time dependent equations - Particle in a one-dimensional box- Normalization of wave function - Quantum Tunnelling - Scanning Tunnelling Microscope.

TOTAL: 45 PERIODS**OUTCOMES:****On completion of the course, student will be able to****CO1:** To understand the crystalline material, crystal defects and growth techniques.**CO2:** To understand the basics, generation and application of ultrasonics.**CO3:** To acquire knowledge on the concepts of lasers and their applications in industry and medical field.**CO4:** To conversant on principle behind the fibres and their applications in communication and devices made out of optical fibre.**CO5:** To get knowledge on advanced physics concepts of quantum theory and its applications.**TEXT BOOKS:**

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.
4. Brijlal and Subramanyam, "Properties of Matter", S .Chand publishing, 2002.

5. M.N.Avadhanulu & P.G.Kshirasagar, “A Text Book of Engineering Physics” – IX Edition, S.Chand Publications, 2014.

6.V.Rajendiran, Engineering Physics, Tata McGraw-Hill, New Delhi. 2011.

REFERENCE BOOKS:

1. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics”. Wiley, 2015.

2. Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”. Cengage Learning, 2010.

3. Shatendra Sharma & Jyotsna Sharma, “Engineering Physics”. Pearson, 2018.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	1	-	-	1	1	-	-	-	-	1	-	-	-	-
2	3	1	1	1	2	1	1	-	-	-		1	-	-	-	-
3	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
4	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
5	2	1	1	1	1	1	1	-	-	-	-	1	-	-	-	-
Avg	2.8	1.4	1.4	1	1.25	1	1	-	-	-	-	1	-	-	-	-

1 - low, 2 – medium, 3 – high, ‘-’ – no correlation

OBJECTIVES

- To make the students familiar with boiler feed water requirements, related problems and domestic water treatment techniques.
- To introduce the basic concepts and applications of chemical thermodynamics.
- To acquaint the student with the principles of chemical kinetics and its applications towards engineering.
- To make the student conversant with the basics of surface chemistry and catalysis.
- To inculcate the students with the basics principles and preparatory methods of nanomaterials.

UNIT I WATER TECHNOLOGY 9

Introduction-sources of water-impurities present in water-hard water and hardness - types, Municipal water treatment: primary treatment and disinfection - Desalination of brackish water: Reverse Osmosis, Boiler troubles: scale and sludge, caustic embrittlement, boiler corrosion priming and foaming, Treatment of boiler feed water - Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment: Ion exchange process, cooling waters (Langelier index).

UNIT II CHEMICAL THERMODYNAMICS 9

Introduction-terminology of thermodynamics, the first law of thermodynamics: enthalpy, second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions: Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions, Criteria of spontaneity; Gibbs-Helmholtz equation, Clausius-Clapeyron equation, Maxwell relations, Van't Hoff isotherm and isochore.

UNIT III CHEMICAL KINETICS 9

Introduction-factors influencing the rate of reaction, order and molecularity of a reaction, kinetic equations of different orders (first, second and third order) –

determination of the order of a reaction, the temperature dependence of reaction rates, unimolecular reactions, photochemical reactions and chain reactions, Theories of reaction rates, lasers in chemistry, fast reactions.

UNIT IV SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: classification - adsorption of gases on solids - adsorption from solutions - adsorption isotherms - applications of adsorption - Freundlich's adsorption isotherm - Langmuir's adsorption isotherm, B.E.T isotherm. Catalysis: introduction - types of catalysis - criteria - autocatalysis - catalytic poisoning and catalytic promoters - acid - base catalysis - enzyme catalysis - Michaelis - Menten equation.

UNIT V NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties; Types of nanomaterials: Definition, properties and uses of - nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electrospinning. Applications of nanomaterials in medicine, agriculture, food science and energy resources.

Total Periods: 45

OUTCOMES

At the end of the course, the student should be able:

- CO1:** To infer the quality of water from quality parameter data and propose, Suitable treatment.
- CO2:** To apply the knowledge of chemical thermodynamics for material design and aspects
- CO3:** To recommend the proper chemical kinetics for engineering processes and applications.
- CO4:** To recognize the surface morphology and its engineering applications.
- CO5:** To identify and apply basic concepts of nanoscience and nanotechnology In designing the synthesis of nanomaterials for engineering and technology applications.

TEXTBOOKS

1. Payal B. Joshi and Shashank Deep, "Engineering Chemistry", Oxford University Press, New Delhi, 2019.

2. Shikha Agarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.
3. P. C. Jain and Monica Jain, "Engineering Chemistry", 18th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2021.

REFERENCES

1. R. V. Gadag and A. Nithyananda Shetty, "Engineering Chemistry", 3rd Edition, Wiley & I.K. International (P), LTD, New Delhi, 2019.
2. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company LTD, New Delhi, 2018.
3. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Publishing Company LTD, 2023.
4. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.

CO - PO and CO - PSO MAPPING

Course Out comes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	2	-	1	3	-	-	-	-	2	-	-	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	2	1	-	1	-	-	-	-	2	-	1	-	-
AVG	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.2	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

COURSE OBJECTIVES

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments.

UNIT-I ELECTRICAL CIRCUITS 9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only).

UNIT-II ELECTRICAL MACHINES 9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT-III ANALOG ELECTRONICS 9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

UNIT-IV DIGITAL ELECTRONICS 9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations – minimization using K maps (Simple Problems only).

UNIT-V MEASUREMENTS AND INSTRUMENTATION

9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student should be able:

CO1: Ability to compute the electric circuit parameters for simple problems

CO2: Ability to explain the working principle and applications of electrical machines

CO3: Ability to analyze the characteristics of analog electronic devices

CO4: Ability to explain the basic concepts of digital electronics

CO5: Ability to explain the operating principles of measuring instruments

TEXTBOOKS

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4. James A. Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCE BOOKS

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

CO - PO and CO - PSO MAPPING

	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	2			3						2		2	
CO2	3	2				2		2					1	2		2
CO3	2	3	2	2									3			
CO4	3	3	1		3		2						1		3	
CO5	3	3	2	1			1						2	1		2
Average	2.8	2.8	1.7	1.6	3	2	2	2					1.8	1.5	2.5	2

அலகு I: 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 கருத்துகள்- 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 II: மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் – சிற்பக் கலை**3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை –ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் , பொம்மைகள்- தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள்.

அலகு III: நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**3**

நாட்டுப்புற கதைகள், பாடல்கள்-தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து- ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம்- வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV: தமிழர்களின் திணைக் கோட்பாடுகள்**3**

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

அலகு V: இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியா மற்றும் வெளிநாட்டின் பிற பகுதிகளின் தமிழ்ப் பண்பாட்டின் தாக்கம்- சுயமாரியாதை இயக்கம் – இந்திய

மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிக்கள் – தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு

Total Periods: 15 hours

TEXT CUM REFERENCES:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித்தமிழ் – முனைவர். இல.சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை – 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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.

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 –Tamil Sangam- 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 Periods: 15 hours

TEXT CUM REFERENCES:

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

COURSE OBJECTIVE:

The course aims to

- Enhance the employability and career skills of students.
- Orient the students towards grooming as a professional.
- Make them industry ready.
- Develop their confidence and help them attend interviews successfully.
- Help students to interact confidently in a professional scenario.

UNIT I : PRONUNCIATION 6

Tone- Pronunciation – Intonation- Reading Aloud and Addressing- Syllable- Rhythm- Accent- Wrongly Pronounced words -Poetry Reading.

UNIT II : NON VERBAL COMMUNICATION 6

Non Verbal Communication - Facial expressions- Eye contact - Subtle (and not so subtle) gestures -Tone of voice – Touch- Posture -Personal space.

UNIT III : SELF INTRODUCTION AND PRESENTATION 6

Self-Introduction- Introducing oneself to the audience- Introducing the Topic – answering questions – Individual Presentation Practice – Presenting Visuals effectively -5 Minute Presentations.

UNIT *IV : BASICS OF SOFT SKILLS 6

Recognizing differences between groups and teams – managing time – networking professionally – Respecting social protocols- understanding career management – Developing a long - term career plan- making career changes.

UNIT V : GROUP DISCUSSION 6

Introduction to Group Discussion – Participating in Group discussions – Understanding group dynamics – Brainstorming the Topic – Questioning and Clarifying – GD Strategies – activities to improve GD Skills.

TOTAL: 30 PERIODS

COURSE OUTCOME:

On completion of the course, student will be able to

CO1: Pronounce the words correctly.

CO2: Understand the nonverbal clues.

CO3: Make an effective presentation.

CO4: Adequate soft skills required for the workplace.

CO5: Participate confidently in Group Discussions.

REFERENCES:

1. Professional Communication by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2014.
2. Soft Skills by S. Hariharan , N. Soundarajaran and S.P. Shanmugapriya MJP Publishers, Edition: 2013
3. Soft Skills for Everyone by Butterfield , Jeff, Cengage Learning India Pvt. Ltd.,2015. New Delhi.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-
CO2	1	1	-	-	-	-	1	-	-	2	-	1	-	-	-	-
CO3	2	2	1	2	2	-	-	-	-	3	-	1	-	-	-	-
CO4	2	1	1	-	-	-	3	-	-	3	-	1	-	-	-	-
CO5	-	1	-	1	-	-	-	-	-	3	-	1	-	-	-	-
Avg	1.7	1.3	1	1.3	2	-	2	-	-	2.8	-	1	-	-	-	-

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Calculation of lattice cell parameter – X-ray diffraction method.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
3. (a). Compact disc- Determination of width of the groove using Laser.
(b). Determination of particle size using Laser
4. (a) Determination of wavelength using Laser
(b) Determination of acceptance angle and numerical aperture in an optical fiber.
5. Determination of Planck's constant using LED.
6. Determination of thickness of a thin wire – Air wedge method
7. Determination of wavelength of mercury spectrum – spectrometer grating
8. Determination of rigidity modulus – Torsion pendulum
9. Determination of Young's modulus by non-uniform bending method.

TOTAL: 30 PERIODS**OUTCOMES:**

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

CO1: Understand the functioning of various physics laboratory equipment.

CO2 Use graphical models to analyze laboratory data.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4: Access, process and analyze scientific information.

CO5: Solve problems individually and collaboratively.

REFERENCE

1. Wilson J.D. and Hernaandez Hall C.A.,— Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, A Text Book of Practical Physics, S. Sultan Chand publications. 2005
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Avg	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-

1 - low, 2 – medium, 3 – high, '-' – no correlation

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

OBJECTIVES

- To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, chloride, and chlorine.
- To familiarise the students with electroanalytical techniques like conductometry and flame photometry to determine the impurities in aqueous solution.
- To find the various characteristics of domestic water.
- To understand the Pseudo first-order kinetics reaction.
- To make the students know the synthesis of nanoparticles.

LIST OF EXPERIMENTS

1. Determination of chloride content of water sample by Argentometric method.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
5. Determination of types and amount of alkalinity in water samples.
6. Estimation of available chlorine in bleaching powder solution.

7. Conductometric titration of barium chloride against sodium sulfate (Precipitation titration).
8. Estimation of sodium /potassium present in water using a flame photometer.
9. Estimation of TDS of a water sample by gravimetry.
10. Preparation of nanoparticles (Ag/Au/TiO₂/ZnO/CuO).
11. Pseudo first-order kinetics- ester hydrolysis.

TOTAL: 30 PERIODS

OUTCOMES

At the end of the course, the student should be able:

CO1: To infer the quality of water samples for alkalinity, hardness, DO, TDS, chloride, and chlorine.

CO2: To apply the knowledge on the estimation of metal ions, acidity and its precipitation nature towards their process.

CO3: To recognize the threshold limit for various characteristics of domestic water.

CO4: To identify the simple method of synthesis of nanoparticles.

CO5: To understand the pseudo first-order kinetics reaction from ester hydrolysis.

TEXTBOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).
3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Authortopic Pvt. Ltd., (1st Edition, 2022).

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
CO1	3	2	3	1	1	-	1	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	2	-	-	-	-	-	-	1	-	2	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2.4	2.6	1	1.2	-	0.2	-	-	-	-	0.2	-	0.4	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools
- To gain the skills for making fitting joints and assembling air conditioner
- To develop the skills for making simple electrical wiring connections using suitable tools
- To provide hands on experience for soldering and gain knowledge about the behavior of electronics components.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE****15****Buildings:**

- a) Study of plumbing and carpentry components of residential and industrial buildings safety aspects.

Plumbing Works:

- a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- b) Study of pipe connections requirements for pumps and turbines.
- c) Preparation of plumbing line sketches for water supply and sewage works.
- d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry works:

- a) Study of the joints in roofs, doors, windows and furniture.
- b) Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE

15

Welding:

- a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- b) Gas welding practice - Study

Basic Machining:

- a) Facing
- b) Simple Turning
- c) Step Turning

Sheet Metal Work:

- a) Forming & Bending
- b) Model making – Trays

Demonstration on:

- a) Smithy operations, upsetting, swaging, setting down and bending.
- b) Foundry operations like mould preparation for gear and step cone pulley.
- c) Assembly of centrifugal pump
- d) Assembly of air conditioner

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

15

1. Residential house wiring using Switches, Fuse, Indicator, Lamp and Energy meter.
2. Fluorescent Lamp Wiring.
3. Staircase Wiring.
4. Measurement of Voltage, Current, Power and Power factor in electrical circuit.
5. Measurement of Energy using Analog & Digital Energy meter.
6. Measurement of Earth Resistance.
7. Study of Industrial house wiring.
8. Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.

IV ELECTRONICS ENGINEERING PRACTICE

15

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general Purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

COURSE OUTCOMES:

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

CO1: Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

CO2: Fabricate carpentry components and pipe connections including plumbing Works and use welding equipment's to join the structures.

CO3: Carry out the basic machining operations, make the models using sheet metalworks. Illustrate on centrifugal pump, air conditioner, operations of smithy, foundry and fittings

CO4: Carry out basic home electrical works and measure the electrical quantities

CO5: Elaborate on the electronics components, gates and soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets
4. Models of industrial trusses, door joints, furniture joints 5 each

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.

3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets
7. Moulding table, foundry tools 2 Sets
8. Power Tool: Angle Grinder 2 Nos.
9. Study-purpose items: centrifugal pump, air-conditioner One each
10. Fitting tools, Hack saw frame, 12' file, hack saw blade 15 Nos.

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Fluorescent Lamp 15 Sets
3. Electrical measuring instruments 10 Sets
4. Analog & Digital energy meter 5 Sets
5. Megger 2

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

CO - PO and CO - PSO MAPPING

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	-	-	1	-	-	-	-	-	1	2	-	3	-
2	-	1	2	-	3	-	-	-	-	-	1	-	-	-	2	-
3	-	-	-	3	2	-	-	-	-	-	-	1	1	-	-	2
4	-	2	3	1	2	-	-	-	-	-	-	-	-	2	-	-
5	-	3	2	2		-	-	-	1	-	-	-	2	-	-	-
AVG	3	2	2.3	2	2.3	1	-	-	1	-	1	1	1.7	2	2.5	2

OBJECTIVES

The course prepares the second semester Engineering students

- To develop strategies and techniques to enhance their reading skills.
- To engage them in meaningful activities in order to improve their listening, speaking, reading and writing skills.
- To improve their ability to write effective job application, resumes and draft impressive reports.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To participate in group discussions.

UNIT – I: MAKING COMPARISON**9**

Listening: Clippings of Ted talk, cartoon and interviews of sports personalities for listening and discussion.

Speaking: Descriptions and discussions based on newspaper.

Reading: Learning shades of meaning (using Thesaurus) and inferring the context from general passages.

Writing: Compare & Contrast essays and Jumbled Sentences.

Language and Vocabulary development: Prepositional phrases, contextual meaning of words. Verbal Analogy, Same word used as Noun and Verb.

UNIT – II: EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING**9**

Listening: Anecdotes to be read from books like Chicken Soup books. Evaluative listening – Advertisement and Product description.

Speaking: Marketing a product, persuasive speech

Reading: Description of any product / jewellery, Brochures and Manual.

Writing: Formal letters- letters of complaint, appreciation, and suggestion, Comprehension and E-mail (formal)

Language and Vocabulary development: Active & Passive, Infinitive, Gerund, Purpose Statements, Adverbs and Word formation

UNIT – III: ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 9

Listening: Listen to English songs and find the lyrics/new words

Speaking: Role play and Interviews

Reading: Reading magazine articles, Excerpts from literary texts

Writing: Job Application, Resume, Cover letter, SWOC Analysis and Recommendations.

Language and Vocabulary development: Correction of errors, If conditional, Sentence completion and Connotations.

UNIT – IV: ANALYZING PROBLEMS AND EXPRESSING SOLUTIONS 9

Listening: Watching Stand-up comedies and comprehending ideas expressed there.

Speaking: Speak about the Stand-up comedies viewed and express personal views about the same

Reading: Reading different types of books (novels, short stories, biographies, magazines etc. and speaking about the same.

Writing: Dialogue Writing, Checklist and Problem Solving essays.

Language and Vocabulary development: Reported Speech, Modals, Slogan writing and Conjunctions.

UNIT – V: REPORTING EVENTS 9

Listening: Listening to spot errors, listening to varied dialects and accents of English.

Speaking: Group discussion- Expression of opinions, assertion, coercion etc.

Reading: Reading life experiences of common man from magazines.

Writing: Accident Report / Survey Report and Letters to the Editor.

Language and Vocabulary development: Numerical Adjective, Idioms, Vocabulary – Shades of Meaning.

TOTAL: 45 PERIODS

COURSE OUTCOME

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

CO1: To compare and contrast ideas and information from technical texts.

CO2: To incorporate basic grammar structures to express appreciation, suggestion and complaint in writing.

CO3: To draft effective resumes using appropriate vocabulary and to avoid common errors.

CO4: To analyse problems so as to arrive at appropriate solutions and to communicate relevantly.

CO5: To draft technical reports, letters and to express ideas creatively.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press,2021.
Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis, Dr.K.N.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.
2. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.
3. Technical English for Professional – Advanced by C. Gangalakshmi, B. Rathika and L. Saranraj, Cengage Learning India Pvt. Ltd.,2022.

REFERENCES:

1. Learning to communicate – Dr. V. Chellammal, Oxford Univ.Press,2001 New Delhi.
2. Business Correspondence and Report Writing by Prof. R. C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Developing Communication Skills by Krishna Mohan, Meera Bannerji-Macmillan India Ltd. 1990, Delhi.
4. Improve Your Writing ed. V.N Arora Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English, Anna University,2020.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	1	2	1	-	-	-	-	-	3	-	1	-	-	-	-
CO2	2	2	1	2	2	-	-	-	-	3	1	1	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
CO4	2	3	2	3	-	-	2	-	-	3	-	-	-	-	-	-
CO5	2	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-
AVG	2	2	1.4	2	2	-	2	-	-	2.8	1	1	-	-	-	-

OBJECTIVES:

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

UNIT-I: STATISTICAL HYPOTHESIS TESTS**9L+3T**

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

UNIT-II: EXPERIMENTAL DESIGN FOR ANOVA**9L+3T**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design

UNIT-III: SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS**9L+3T**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton - Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative method of Gauss Seidel – Dominant Eigenvalue of a matrix by Power method.

**UNIT-IV: INTERPOLATION, NUMERICAL DIFFERENTIATION AND
NUMERICAL INTEGRATION****9L+3T**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integrations using Trapezoidal, Simpson's rules.

UNIT-V: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9L+3T

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

TOTAL: 45L+15T PERIOD

OUTCOMES:

- CO1:** Apply the concept of testing of hypothesis for small and large samples in real life problems.
- CO2:** Apply the basic concepts of classifications design of experiments in the field of agriculture.
- CO3:** Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- CO4:** Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- CO5:** Solve the ordinary differential equations with initial and boundary conditions by using certain techniques with engineering application.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning,2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald.C.F., Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia,NewDelhi,2006.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Avg	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-

No Correlation - Low 1 Medium 2 High 3

OBJECTIVES

- To make the students, understand the fundamentals of Electromagnetic spectrum.
- To acquire the knowledge on radiations detection and hazards.
- To educate the concepts of light and sound in medical field.
- To provide information on radiographic imaging techniques.
- To understand and apply different nanophysics concepts in medical field.

UNIT - I: ELECTROMAGNETIC SPECTRUM AND RADIATIONS 9

Introduction-properties and classification of electromagnetic radiation-different sources of radiation-radio waves, microwaves, infrared visible, ultra violet radiation, X-rays, gamma rays - production, physical properties and their interaction with tissues.

UNIT- II: RADIATION SOURCES AND HAZARDS 9

Radiation sources: Gamma chamber - Particle accelerators – Accelerators in medical and industrial applications – safety aspects of accelerators- Radiation hazards: evaluation, control and radiation protection- detection and measurement of contamination on work surface and person - methods of decontamination – planning of medical and industrial radiation installations-radiation scattering-albedo-sky shine.

UNIT- III: MEDIPHOTONICS AND MEDICAL ULTRASOUND 9

Lasers in medicine - applications of ultrafast pulsed lasers - lasers in dermatology - oncology and cell biology - lasers in blood flow measurement - ultrasound production-Bioacoustics-acoustical characteristics of human body - ultrasonic dosimetry-destructive and non-destructive tests - high power ultrasound in therapy.

UNIT- IV: PHYSICS OF MEDICAL RADIOGRAPHY 9

Physics of X-ray production- endoscopes - nuclear imaging techniques- nanotech based imaging techniques: Magnetic resonance imaging (MRI) - Computed tomography (CT) - Positron emission tomography (PET) - Single photon emission computed tomography (SPECT)- Fluorescence imaging.

Molecular Engineering - Nanoscale structures as Biological tags - nanoparticles and microorganisms - nano materials in bone substitutes and dentistry- metallic, ceramic and polymeric implant materials – nanoparticles in cosmetics - drug delivery and applications.

TOTAL: 45 PERIODS

OUTCOMES:

After the completion of the course, students should be able

CO1: To understand the Electromagnetic spectrum and its applications.

CO2: To get an idea of radiation sources and its hazards and control of radiation.

CO3: To differentiate the various applications of lasers and ultrasonic in medicine.

CO4 :To know the importance of various imaging techniques.

CO5 :To apply the nanophysics in biomedical applications.

TEXT BOOKS:

1. B.N.Sankar,S.O.Pillai, “ A text book of Engineering Physics”, New Age International (P) Limited, 2007.
2. S.Webb, “The Physics of Medical Imaging”, “Taylor and Francis,Newyork, London,2010.
3. A.K.JHA, “A text book of Applied Physics”, IK International Publishing house, 2011.
4. Knoll GF, “Radiation Detection and Measurements”, Wiley, New York, 1989.

REFERENCE BOOKS:

1. Charles P. Poole Jr., Frank J. Ownes, ‘Introduction to Nanotechnology’, Wiley Interscience, 2003.
2. R.Pratesi and C.A.Sacchi, Lasers in photo medicine and photobiology, Springer Verlag, West Germany,1980.
3. J.P. Woodcock, Ultrasonic, Medical Physics Handbook Series I, Adam Higher, Bristor, 2002.
4. Hannah Sathyaseelan, “Textbook of Applied Physics”, New Age International (P) Limited, 2000.

E-BOOKS:

1. J.R.Greening, Medical Physics, North Holland Publishing Co., Newyork,1999.
2. E.B.Podgarsak, Radiation Physics for Medical Physicists, Springer Verlag, 1st Edition (1996).

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	2	1	1	1	1	2	1	-	-	-	-	1	-	-	-	-
CO3	3	2	2	2	2	1	1	-	-	-	-	1	-	-	-	-
CO4	3	2	2	2	2	1	1	-	-	-	-	1	-	-	-	-
CO5	1	1	1	-	-	2	1	-	-	-	-	1	-	-	-	-
Avg	2.4	1.6	1.5	1.5	1.6	1.5	1	-	-	-	-	1	-	-	-	-

1 - low, 2 – medium, 3 – high, ‘-’ – no correlation

OBJECTIVES

- To familiarize the students with the structure and role of carbohydrates, lipids and proteins.
- To impart the knowledge of the molecular structure, function and organization of nucleic acids, vitamins and enzymes.
- To introduce various materials used in bone and joint replacement.
- To know about dental materials and dental implants.
- To introduce the basic knowledge of the importance of spectroscopy and biosensors.

UNIT-I CARBOHYDRATES, LIPIDS, AND PROTEINS 9

Carbohydrates, lipids, fat, amino acids, proteins: types, structure, physical and chemical properties. Nucleic acid: structural aspects - components of DNA and RNA, nucleosides & nucleotides (introduction, structure & bonding), double helical structure of DNA (Watson-Crick model).

UNIT-II VITAMINS AND CO-ENZYMES 9

Vitamins: structure, importance and stability, water-soluble vitamins, Fat-soluble vitamins. Enzymes & co-enzymes: classification, characteristics and mechanism of action (Lock and key, Induced fit), enzyme specificity, enzyme inhibitors, drugs inhibiting enzyme activity, and medical uses.

UNIT- III ORTHOPAEDIC MATERIALS 9

Bone composition and properties - temporary fixation devices - joint replacement - biomaterials used in bone and joint replacement: metals and alloys - stainless steel, cobalt-based alloys, titanium-based materials - ceramics: carbon, alumina, zirconia, bioactive calcium phosphates, bioglass and glass ceramics - polymers: PMMA, UHMWPE/HDPE, PTFE - bone cement - composites.

UNIT-IV DENTAL MATERIALS 9

Teeth composition and mechanical properties - impression materials - bases, liners and varnishes for cavities - fillings and restoration materials - materials for oral and maxillofacial surgery - dental cements and dental amalgams - dental adhesives.

Introduction, absorption of radiation, types of spectra, UV-Visible, IR and fluorescence spectrophotometer: Instrumentation and applications. Biosensors: Classification (biochemical sensors), antibody, antigen, peptide, ECG sensor, gyroscope, glucometer, pulse oximeter, biometrics, biochips - applications.

OUTCOMES

At the end of the course, the student should be able:

CO1: To identify the structure, physical and chemical properties of carbohydrates, lipids and proteins.

CO2: To infer an understanding of the basic concepts of vitamins and enzyme activity and also medical uses of enzymes.

CO3: To know and prepare various materials used in bone and joint replacement and their applications.

CO4: To prepare impression materials and dental cements, and know about dental implants.

CO5: To recognize the concepts of spectroscopic techniques for structural determination and biosensors.

TEXTBOOKS

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2019.
2. Donald Voet & Judith G. Voet, "Biochemistry" 4th Edition, John Wiley and Sons Publication, 2010.
3. Veena K. Subbarao, Koteswararao Pachava, "Dental Materials" 7th Edition, Paras Medical Publisher, 2020.

REFERENCES

1. S. S. Dara and S. S. Umare, "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company LTD, New Delhi, 2018.
2. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Publishing Company LTD, 2023.

3. B.D.Ratner, A.S.Hoffman, F.J.Schoen & J.E.Lemons. "Biomaterials Science: An Introduction to Materials in Medicine", Academic Press, 2004.
4. Q. Chen and G. Thouas. Biomaterials. A Basic Introduction. CRC Press, 2015.

CO - PO and CO - PSO MAPPING

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
CO1	2	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	2	2	1	1	-	-	-	-	1	1	-	-	-	-
CO4	3	3	2	2	2	1	1	-	-	-	-	1	1	-	-	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-	1	1	1	-	-
AVG	2.6	2.6	2.4	1.8	1.8	0.4	0.2	-	-	-	-	0.4	0.6	0.8	0.2	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

OBJECTIVES:

- To know the basics of Python programming
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures and its implementation – lists, tuples, dictionaries.
- To understand Object Oriented Concept in Python.

UNIT I: PYTHON BASICS 9

Introduction to Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions – Modes of python. Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration, Illustrative programs: Basic Arithmetic Operations, GCD of numbers, Square root (Newton’s Method).

UNIT II FUNCTIONS, LIST, TUPLES 9

Functions, function definition and use. **Fruitful functions:** return values, parameters, local and global scope, recursion. **Lists:** list operations, list slices, list methods, list loop, mutability, list parameters; **Tuples:** tuple assignment, tuple as return value. Comparison of Lists and tuples. Illustrative programs: exchange the values of two variables, square root, Linear and Binary search. Fibonacci series using functions.

UNIT III STRINGS, DICTIONARY, SET 9

Strings: string slices, immutability, string functions and methods, string module. **Dictionaries:** Operations (create, access, add, remove) and methods. (Insert, delete). Set operation (Access, Add, Remove). Illustrative programs: creates a dictionary of radius of a circle and its circumference.

UNIT IV FILES, EXCEPTIONS, MODULES AND PACKAGES 9

Files and exception: Text Files, Reading and Writing files, Format operator; Errors and Exceptions, Handling Exceptions, Multiple Except blocks, Modules, Packages;

Illustrative programs: word count, copy file, Creating user defined Exceptions.

UNIT V CLASSES AND OBJECTS

9

Classes and Objects: Introduction, Classes and Objects, Defining Classes, Creating Objects, Data Abstraction and Hiding, The Class Method and Self Argument, The `_init_()` method, Class Variables and Object Variables, Public and Private data members, Private Methods. Illustrative Programs: Creating Student Class and Objects.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Develop simple computational problems using control flow statements.

CO2: Decompose a Python program into functions, Modules and Packages.

CO3: Represent compound data using Python lists, tuples, Strings, Set and dictionaries.

CO4: Read and write data from/to files and Exception handling in Python Programs.

CO5: Understand the concepts of Object-Oriented Programming to develop real time applications.

TEXT BOOKS:

1. Reema Thareja, “**Python Programming using Problem solving Approach**”, Oxford Higher Education, 2018.
2. Allen B. Downey, “**Think Python: How to Think Like a Computer Scientist**”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
3. Guido van Rossum and Fred L. Drake Jr, “**An Introduction to Python**” – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, “**Introduction to Computer Science using Python: A Computational Problem-Solving Focus**”, Wiley India Edition, 2013.

2. John V Guttag, “**Introduction to Computation and Programming Using Python**”, Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, “**Fundamentals of Python: First Programs**”, CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, “**Practical Programming: An Introduction to Computer Science using Python 3**”, Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “**Introduction to Programming in Python: An Inter-disciplinary Approach**”, Pearson India Education Services Pvt. Ltd., 2016.

WEB REFERENCES:

1. <http://greenteapress.com/wp/think-python/>
2. www.docs.python.org
3. <https://nptel.ac.in/courses/106/106/106106182/>

CO's	PO's												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	3	2	-	-	-	-	-	2	2	2	-		1
2	3	3	3	3	2	-	-	-	-	-	2	2	-	-	3	-
3	3	3	3	3	2	-	-	-	-	-	2	-	-	-	1	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	2	-
5	1	2	-	-	1	-	-	-	-	-	1	-	-	-	-	1
AVg.	2.4	2.6	3	2.8	1.8	-	-	-	-	-	1.6	2	2.5	-	2	1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் :**3**

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

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**3**

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

அலகு III உற்பத்தித் தொழில்நுட்பம் :**3**

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாகச் செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் :**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 V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :**3**

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

TOTAL : 15 PERIODS

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 Vaigal’ (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.

- UNIT I WEAVING AND CERAMIC TECHNOLOGY 3**
Weaving Industry during sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.
- UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3**
Designing and Structural construction House & Designs in house hold 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 Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.
- UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3**
Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

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. பொருதை – 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 Vaigal’ (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.

GE3233	ENGINEERING GRAPHICS AND DESIGN	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	1	0	4	3

OBJECTIVES:

The main learning objective of this course is to impart knowledge

1. To draw the conics curves & special curves, use BIS conventions, and specifications for engineering drawing.
2. To draw the orthographic projection of lines and plane surfaces.
3. To draw the projections and solids and Isometric projection of simple solids.
4. To draw the projections and solids and Isometric projection of simple solids.
5. To draw free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments · BIS conventions and specifications – Size, layout and folding of drawing sheets · Lettering and dimensioning.

UNIT-I: PLANE CURVES AND SPECIAL CURVES 11

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid (Rolling Circle rolls on flat surface only). construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT-II: PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

Orthographic projection- Principles-Principal planes - First angle projection-projection of points at the First Quadrant only. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) which inclined to both the principal planes by rotating object method.

UNIT-III: PROJECTION OF SOLIDS AND ISOMETRIC PROJECTION 12

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one of the principal planes by the rotating object method. Principles of isometric projection – isometric scale – Isometric projections of simple solids - Prisms, pyramids, cylinders, cones - isometric view of the object from the 2D coded plan.

UNIT-IV: PROJECTION OF SECTIONED SOLIDS & DEVELOPMENT OF SURFACES 12

Sectioning of the above solids in the simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining the true shape of the section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT-V: FREE-HAND SKETCHING AND PERSPECTIVE PROJECTIONS 12

Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects. Perspective projection of simple solids-Prisms and pyramids by visual ray method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- CO1:** To construct the conics curves & special curves, use BIS conventions, and specifications for engineering drawing.
- CO2:** To construct the orthographic projection of lines and plane surfaces.
- CO3:** To construct the projections and solids and Isometric projection of simple solids.
- CO4:** To construct projections of section of solids and development of surfaces.
- CO5:** To construct free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

TEXTBOOKS:

1. N.D.Bhatt, “Engineering Drawing (Plane and Solid Geometry)”, Charotar Publishing House PVT. LTD. 53rd Edition 2019 (Fifth Reprint)
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 15th Edition 2018.

REFERENCE BOOKS:

1. T. Jeyapoovan, “Engineering Graphics Using Auto CAD”, Vikas Publishing House Pvt. LTD, seventh Edition, 2015.
2. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing

with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2011.
4. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2011.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scales to fit solutions within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

CO's- PO's & PSO's MAPPING

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
2	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
3	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
4	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
5	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
Avg	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

PHYSICS LABORATORY: (Any five experiments to be conducted)**OBJECTIVES:**

- To gain practical knowledge and to co-relate with the theoretical studies.
- To achieve perfectness in experimental skills and the study of practical applications.
- To bring more confidence and ability to develop and fabricate engineering and technical equipment.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS

1. Determination of the electrical conductivity of metals by plotting a current-voltage characteristic curve.
2. Determination of band gap of a semiconductor.
3. Determination of Fermi energy. (Measurement of Fermi energy in copper).
4. Study of I-V characteristics of solar cell and determination of its efficiency
5. Determination of electrical resistivity of metal and alloy –Carey foster Bridge.
6. Measurement of susceptibility of paramagnetic solution by Quinke's method.
7. Study of magnetic Hysteresis-B-H curve.
8. Determination of the dark resistance of light detective resister (LDR).
9. Measurement of Temperature using LM35.

TOTAL: 30 PERIODS**OUTCOMES:**

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

CO1:To understand the functioning of various physics laboratory equipment.

CO2:To use graphical models to analyze the laboratory data and to solve problems individually and collaboratively.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4: Access, process and analyze scientific information.

CO5: Solve problems individually and collaboratively.

TEXTBOOKS:

1. Wilson J.D. and Hernandez C.A., —Physics Laboratory Experimentsll, Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, A Text Book of Practical physics, S. Sultan Chand publications. 2005
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

CO's- PO's & PSO's MAPPING

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

OBJECTIVES

- To train the students in basic experimental skills in water contaminants such as copper and chromium.
- To familiarise the students with electroanalytical techniques such as pH metry, potentiometry, and conductometry to determine impurities in aqueous solutions.
- To familiarize the students with the determination of the molecular weight of a polymer by a viscometer.
- To make the student up-to-date with the properties and nature of alloys experimentally.
- To demonstrate the analysis of coal.

LIST OF EXPERIMENTS:

1. Estimation of copper content of the given solution by Iodometry.
2. Determination of strength and amount of acids in a mixture of acids using a conductivity meter.
3. Determination of strength and amount of HCl present in the whole of the given solution using a conductivity meter.
4. Estimation of the iron content of the given solution using a potentiometer.
5. Determination of chromium by EDTA titration.
6. Determination of strength of given hydrochloric acid using a pH meter.
7. Determine the molecular weight of the polyvinyl alcohol using an Ostwald viscometer.
8. Estimation of Nickel in steel.
9. Proximate Analysis of Coal.
10. Corrosion experiment-weight loss method.
11. Determination of COD value of industrial effluents.

TOTAL: 30 PERIODS

OUTCOMES

At the end of the course, the student should be able:

CO1:To find the quality of water samples for copper and chromium present in water.

CO2:To recognize the amount of various ions present in the water sample through volumetric and instrumentation techniques.

CO3:To identify the molecular weight of the polymer using an Ostwald viscometer.

CO4:To recognize an environmental hazardous and threshold limit for industrial effluents.

CO5:To recommend quality of coal and steel when it is exposed to various environment.

TEXT BOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).

3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Authortopic Pvt. Ltd., (1st Edition, 2022).

CO's- PO's & PSO's MAPPING

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
CO1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-	-	-
CO3	2	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	1	1	2	2	2	-	-	-	-	-	-	-	-	-
CO5	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	1.4	1	1	1.2	0.4	0.6	0.4	-	-	-	-	-	0.4	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

COURSE OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries and read and write data from/to files in Python.
- Knowing about Object Oriented Concepts.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number. (Newton's method)
3. Find exponentiation of a number. (power of a number)
4. Find the maximum of a list of numbers.
5. Program for basic calculator operations using functions.
6. Generate Fibonacci series using function.
7. Program for Armstrong number.
8. Program for check the number is Palindrome or Not.
9. Program for sum of array of numbers.
10. How to create, slice, change, add, delete and index elements using list.
11. Linear search and Binary search.
12. Find First n prime numbers.
13. Program to remove duplicate elements from a list.
14. Program for addition and transpose of a matrix.
15. How to create, slice, change, delete and index elements using Tuple.
16. Write a program to reverse the string.
17. How to change, delete, add and remove elements in Dictionary.
18. Create a dictionary of radius of circle and its circumference.
19. Program for count the number of words in a file.
20. Find the most frequent words in a text read from a file.
21. Program for student information system using class and objects.
22. Program for Employee Payroll Processing using class and objects.

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

COURSE OUTCOMES:

CO1: Develop solutions to simple computational problems using Python programs.

CO2: Solve problems using conditionals and loops in Python.

CO3: Develop Python programs by defining functions and calling them.

CO4: Use Python lists, tuples and dictionaries for representing compound data.

CO5: Develop Python programs using files and OOPS concept.

CO's- PO's & PSO's MAPPING

CO's	PO's												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	3	3	-	-	-	-	-	3	2	1	3		
2	3	3	3	3	3	-	-	-	-	-	3	2			2	
3	3	3	3	3	2	-	-	-	-	-	2	-		3		2
4	3	2	-	2	2	-	-	-	-	-	1	-			1	
5	1	2	-	-	1	-	-	-	-	-	1	-	1		2	2
6	2	-	-	-	2	-	-	-	-	-	1	-	1		1	
AVG	2.6	2.6	3	2.8	2.2	-	-	-	-	-	2	2	1	3	1.7	2

Unit – 1 : NATIONAL SERVICE SCHEME (NSS)

Objectives:

The main objectives of this course are:

- To help learners know about NSS in the context of youth, community and voluntary service.
- To teach the importance of health, hygiene and sanitation for a healthy Nation.
- To understand the community in which they work.
- To identify the problems of the community and involve them in problem-solving.
- To develop the capacity to meet emergencies and natural disasters.
- To practice the National integration and social harmony.
- To utilize their knowledge in finding practical solutions to individual and community

Credit:

Total Lecture Hours / Semester	Total Tutorial Hours / Semester	Total Practical Hours / Semester	Credit
6	0	18	1*

* To be conducted after college hours and week ends

Outcome:

Learners will have the knowledge about NSS and its role in the fields of health, hygiene, emergencies & natural disasters and involve them in problem-solving of the nearest community so as to build a strong country.

Syllabus:

Semester : I&II Attendance weightage : 50 Activities weightage : 50

Topic -I :Introduction and Basic Concepts of NSS [8]

- a. History – Aim – Objectives of NSS
- b. Emblem – Motto – Badge - Song
- c. Organizational structure - Roles and Responsibilities of NSS

- d. Regular activities
- e. Any approved indoor / outdoor programs by the Principal

Topic-II : Youth Leadership, Social Harmony and National Integration[8]

- a. Meaning and types of Leadership
- b. Qualities of good leaders and leadership
- c. Importance and role of youth leadership
- d. Role of youth in peace and Nation building
- e. Any approved indoor / outdoor programs by the Principal

Topic-III :Health, Hygiene and Sanitation and Youth Health [8]

- a. Definition, Needs and Scope of Health Education
- b. Swachh Bharat Abhiyan
- c. Healthy Lifestyles
- d. HIV, AIDS, Drugs abuse
- e. Any approved indoor / outdoor programs by the Principal

Topic-IV :Environment Issues, Emergencies and Disaster Management [8]

- a. Environment conservation, enrichment and sustainability
- b. Waste management
- c. Natural resource management [Rain water harvesting and Energy conservation]
- d. Introduction to Disaster Management, Classification of Disasters
- e. Any approved indoor / outdoor programs by the Principal

References:

1. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
2. National Youth Policy, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
3. <https://nss.gov.in/>

NSS/NSO/YRC/CLUB ACTIVITIES

YOUTH RED CROSS – Social Service based activities

OBJECTIVES:

- To enhance the societal awareness
- To upgrade the Personality

ACTIVITIES

5

1. **HEALTH PROMOTION**- Activities that promotes health (2)
2. **SOCIETAL SERVICE**-Social Service activities(2)
3. **FRIENDSHIP BUILDING** - Friendship building activities between communities (1)

COURSE OUTCOME

1. Enhanced Social Awareness
2. Personality development of the individual

References:

1. IRCS/YRC Handbook
2. <https://www.indianredcross.org/youth/Guidelines-for-JYRC-LR.pdf>

NSS/NCC/NSO/YRC/CLUB ACTIVITIES

National Sports Organization (NSO)

OBJECTIVES:

- To create awareness about basic fitness and mental strength
- To promote the development of physical fitness
- To develop the sporting activities of the youth
- To create the social responsibilities and social interaction through participation

ACTIVITIES

5

INTRODUCTION - Introduction of NSO & Physical Fitness and games Skills Test (1)

PHYSICAL FITNESS ACTIVITIES - Importance of Basic Physical Fitness - MDI

Calculation - Identification of deformities, (2)

SPORTS PRACTICE - Games and fitness activities Physical Fitness Activities (2)

COURSE OUTCOMES:

- Get basic knowledge about physical and mental fitness
- NSO create self-esteem and self confidence
- NSO provide opportunity get social interaction
- Development of character and personality through participation

REFERENCES:

1. www.google.com
2. <https://scholar.google.com/>
3. <https://www.medindia.net/patients/lifestyleandwellness/five-essential-components-of-physical-fitness-references.htm>
4. <https://pubmed.ncbi.nlm.nih.gov/>

NSS/NSO/YRC/CLUB ACTIVITIES

தமிழ் மன்றம்

பாடத்திட்டத்தின் நோக்கங்கள்

- மாணவர்களை சிறந்த மேடைப்பேச்சாளர்களாக உருவாக்குவது
- தாய்மொழியின் மேன்மையை பாதுகாப்பது..

பயிற்சித்திட்டம்

1. பேச்சுக்கலைப் பயிற்சி
2. கவிதை மற்றும் கட்டுரைகள் எழுதும் பயிற்சி
3. அறிவியல் பொறியியல் தொழில்நுட்பங்களைத் தமிழில் எழுதுதல்.
4. பட்டிமன்ற மேடைகளில் பேசும் பயிற்சி.
5. நாட்டுப்புறப்பாடல்கள் பாடுதல் மற்றும் கதைகள் எழுதும் பயிற்சி.

கற்றல் முடிவு

1. பேச்சுக்கலைப் தேர்ச்சி
2. நாட்டுப்புறப்பாடல்கள் பற்றிய புரிதல்

மேற்கோள்கள்

1. <https://eegarai.darkbb.com/t63483-topic>
2. <https://poriyari.in/>

NSS/NSO/YRC/CLUB ACTIVITIES

RESONANCE – SKILL BASED ACTIVITIES

OBJECTIVES:

- To know the basics and general principles of Physics.
- To provide knowledge of the current trends in Physics.
- To develop a solid scientific and technical competence for investigating and applying the relationships of Physics phenomena in *various fields of Physics*.

ACTIVITIES

5

1. **QUIZ** - Basics and general principle (1)
2. **PAPER PRESENTATION** - Current trends (2)
3. **PROJECTS** - Fun with Physics (2)

COURSE OUTCOME

Students were able to:

- recollect the general principles of Physics.
- to explore the topics in the current trends in Physics.
- *develop practical expertise in various areas of Physics.*

REFERENCES:

1. Principles of Physics, 10Ed, 1st ed by Robert Resnick, Jearl Walker, David Halliday (2015)
2. 'The Feynman Lectures on Physics' (Volume I, II and III) , Matthew Sands, Richard Feynman, and Robert B. Leighton.
3. <https://www.science-sparks.com/top-5-physics-experiments-you-can-try-at-home>
4. <https://www.electronicsforu.com/category/electronics-projects/hardware-diy>.

NSS/NCC/NSO/YRC/CLUB ACTIVITIES

Eclectic Lingua – Skill based activities

OBJECTIVES:

- To enhance the communicative competence of the first-year engineering students by means of creating opportunity for impromptu/ spontaneous speeches.
- To upgrade the English language skills of students by introducing appropriate vocabulary in different situations.

ACTIVITIES

5

1. **Extempore**- Giving expression to thoughts (2)
2. **Building Vocabulary**-Using relevant set of words for different contexts (2)
3. **Pronunciation**- Speaking accurately and fluently (1)

COURSE OUTCOME

1. To enable students to express themselves easily and coherently.
2. To help students to speak the language using the right words and pronouncing them correctly.

References

<https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=pronunciation>

<https://www.quillsandquotes.ca/post/12-fun-games-to-get-students-public-speaking>

NSS/NCC/NSO/YRC /CLUB ACTIVITIES

EULER.COM – Skill based activities

OBJECTIVES:

- To enhance the Logical reasoning of the first-year engineering students by means of creating opportunity to improve the aptitude skill.
- To explore the applications of Mathematics in the field of Engineering, Science and Technology and to utilize this skill for their academic activities.

ACTIVITIES

5

1. OLYMPIAD- The students will be provided with 25 questions in Engineering Mathematics. This should be completed in one hour. **(1)**

2. MATHEMATICAL MODELLING- The students are expected to present physical models (Working as well as static models) based on the application of Engineering Mathematics **(2)**

3. PAPER PRESENTATION- Students will be provided 5-7 minutes of time to present their findings in application of Mathematics. **(2)**

COURSE OUTCOME

1. To enable students to explore their mathematical reasoning skills.
2. To motivate the students to apply Mathematics in Engineering and Technology and demonstrate their work by means of Physical model and present their research article.

References:

1. Advanced Engineering Mathematics , Erwin Kreyszig, 10th Edition, Wiley India Pvt Ltd.
2. <https://www.stewartcalculus.com/>

NSS/NCC/NSO/YRC/CLUB ACTIVITIES

Fine Arts Club VECTORIANS – Skill based activities

OBJECTIVES:

- To enhance the inbuilt talents in arts and crafts and fine arts activities.
- To explore and exhibit their qualities in cultural activities as well as in the leadership.

ACTIVITIES

5

- 1. ARTS & CRAFTS** - The students will be given with innovative Theme, they have to Show their talents in one hour time with basic facilities provided. **(1)**
- 2. SINGING & DANCING** - The students are expected to present their talents on spot or With given Theme, either solo or group performance. **(2)**
- 3. MIME & DRAMA** - Students will be given 5 - 7 minutes of time to present their variety Entertainments in way of Mono acting or Drama . **(2)**

COURSE OUTCOME

1. To enable students to explore their inbuilt talents in fine arts activities.
2. To motivate the students to show case their cultural and leadership qualities.

References:

1. <https://www.youtube.com/watch?v=1mkESRWiSKc> – Teach your own crafts.
2. <https://www.youtube.com/watch?v=YHqwrDGywH4> – How to teach Arts & Crafts

NSS/NCC/NSO/YRC/CLUB ACTIVITIES

Catalysis – Skill-based activities

Objectives:

- To inculcate a scientific attitude and temper.
- To provide an opportunity to develop constructive, explorative & inventive ideas among the students.
- To develop training in the scientific method of problem-solving for engineering

1. **Quiz/debate**- the latest advancement in Chemistry towards engineering (2)
2. **Essay competition/Chart preparation** - Environmental sustainability (2)
3. **Nature Study - field visit to eco-parks etc.** (1)

COURSE OUTCOME

1. To promote inquisitiveness among the students and inculcate Scientific mind mapping.
2. To develop students, interest and participation in the practical applications of the knowledge related to environmental sciences.
3. Take part in practical, hands-on science activities close to nature.

REFERENCE

1. M. Senapati, Advanced Engineering Chemistry, Infinity science press, New Delhi, 2007.
2. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/environmental-sustainability>
3. <https://www.indiabix.com/general-knowledge/chemistry>.

OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To model several physical problems to develop Z transform techniques for discrete time systems.

UNIT-I: PARTIAL DIFFERENTIAL EQUATIONS 9L

Solutions Lagrange's linear equation — linear partial differential equations of second and higher order with constant coefficients of homogeneous type.

UNIT-II: FOURIER SERIES 9L

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Harmonic analysis.

UNIT-III: LAPLACE TRANSFORMS 9L

Existence conditions – Transforms of elementary functions – Basic properties – Inverse transforms – Convolution theorem – Transform of periodic functions.

UNIT-IV: FOURIER TRANSFORMS 9L

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

UNIT-V: Z – TRANSFORMS AND DIFFERENCE EQUATIONS 9L

Z- Transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Solution of difference equations using Z – transform.

TOTAL: 45L PERIODS

OUTCOMES:

- CO1:** Understand the fundamental concept of the concepts of Partial differential Equations.
- CO2:** Understand the basic concepts of mathematical principles on Fourier & Z-transforms.
- CO3:** Laplace transform and inverse transform of simple functions, properties, are studied.
- CO4:** Apply the concept of Understand the concept Fourier series and apply the concept in solving PDE.
- CO5:** Understand the fundamental concept of the concepts of Solution of difference equations

TEXT BOOKS:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S. Viswanathan Publishers Pvt. Ltd.1998.

REFERENCE BOOKS:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, NewDelhi, 2008.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
6. P.Sivaramakrishna Das, C.Vijayakumari, Transforms and Partial Differential Equations, Pearson India Education Services Pvt. Ltd, 2019.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

Course Outcomes	PROGRAM OUTCOMES												Program Specific			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO2	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO3	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO4	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO5	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Avg	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-

No Correlation -

Low 1

Medium 2

High 3

OBJECTIVES:

- To understand the basic properties of Signals and Systems.
- To explore the Fourier transform and Laplace transform in continuous time signal analysis.
- To analyze continuous time LTI systems using Fourier and Laplace transforms.
- To apply DTFT and Z-transform in discrete time signal analysis.
- To analyze the discrete time LTI systems using DTFT and Z transform.
- To examine convolution operation for continuous and discrete time systems.

UNIT-I: CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids -Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT-II: ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series for periodic signals - Fourier Transform – Inverse Fourier Transform - properties- Laplace Transforms – Inverse Laplace Transform - and properties.

UNIT-III: LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT-IV: ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) - Inverse DTFT- Properties of DTFT - Z Transform Inverse Z Transform - & Properties.

UNIT-V: LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Impulse response – Convolution sum - Difference equations- - Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1:** Emphasizing the basic properties of signals and systems used for signal Processing
- CO2:** Characterizing the Continuous time signal using Fourier and Laplace transform.

- CO3:** Analyzing the Continuous time LTI systems using Fourier and Laplace transforms.
- CO4:** Compute the output of a Discrete time LTI system in the time and frequency domains.
- CO5:** Estimating the DTFT and Z transform in discrete time signal analysis.
- CO6:** Understanding the principles of convolution for Continuous and discrete time systems.

TEXTBOOKS:

1. Simon Haykin, Adaptive Filter Theory, Pearson Prentice Hall, 5th edition, 2014
2. D.G. Manolakis, V.K. Ingle and S.M. Kogon, Statistical and Adaptive Signal Processing, Artech House Publishers, 2005.

REFERENCE BOOKS:

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

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

COs	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	3	-	3	2	-	-	-	-	-	3	-	-	1	-
CO2	3	-	3	-	-	2	-	-	-	-	-	3	-	3	-	-
CO3	3	3	-	-	3	2	-	-	-	-	-	3	2	-	-	-
CO4	3	3	-	-	3	2	-	-	-	-	-	3	-	3	1	-
CO5	3	3	3	3	3	2	-	-	-	-	-	3	-	3	1	-
CO6	3	3	3	3	-	2	-	-	-	-	-	3	2	3	1	-
Avg	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1	-

COURSE OBJECTIVES

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To educate the transient response of circuits.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of single & three phase circuits

UNIT-I BASIC CIRCUITS ANALYSIS 9

Ohm's Law -Kirchhoff 's Laws – DC Circuits – Resistors in series and parallel circuits - A.C Circuits – Average and RMS Value –Complex Impedance – Phasor diagram - Real and Reactive Power, Power Factor, Energy -Mesh current and node voltage methods of analysis D.C and A.C Circuits

UNIT-II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Theorems – Superposition, Thevenin's and Norton's Theorem – Maximum power transfer theorem –Reciprocity Theorem – Millman's theorem.

UNIT-III TRANSIENT RESPONSE ANALYSIS 9

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input –Characterization of two port networks in terms of Z, Y and h parameters.

UNIT-IV THREE PHASE CIRCUITS 9

Three phase balanced / unbalanced voltage sources –analysis of three phase 3-wire and 4-wirecircuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents –power and power factor measurements in three phase circuits.

UNIT-V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance –frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling Analysis of coupled circuits– Single Tuned circuits.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1:** To acquire knowledge on Ohm's Law and Kirchhoff 's laws.
- CO2:** Ability to determine behavior of the DC and AC circuit by using mesh analysis/ nodal analysis / network theorems
- CO3:** Ability to Compute the transient response of first order and second order systems to step and sinusoidal input.
- CO4:** To acquire knowledge on line/ phase voltage and currents of the three-phase circuit
- CO5:**To understand the concepts of the frequency response of series and parallel RLC circuits

TEXTBOOKS

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCE BOOKS

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai & Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
3. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
4. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc. 2018.
5. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraHill , 2015.

CO - PO and CO - PSO MAPPING

	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	1	1	-	-	-	-	-	-	-	-	3	-	1	-	2	-
CO2	1	-	1	2	-	-	-	-	-	-	-	3	1	-	-	-
CO3	1	-	1	-	2	-	-	3	-	-	-	-	1	-	2	3
CO4	1	1	1	-	-	-	-	-	-	-	3	1	1	1	-	-
CO5	1	1	-	-	2	-	-	-	-	-	-	-	1	-	-	3
Average	1	1	1	2	2	-	-	3	-	-	3	2	1	1	2	3

COURSE OBJECTIVES:

- To understand the structure, operation and applications of electronic devices.
- To familiarize Characteristics & Small signal Model of BJT.
- To explore the Characteristics & Small signal Model of Field Effect Transistor and Operation of Thyristor
- To learn the function of Differential amplifier and power
- To provide adequate knowledge in negative feedback amplifiers and to design RC and LC tuned oscillators for a given frequency.

UNIT - I PN JUNCTION DEVICES 9

PN junction diode – Structure, Operation and V-I characteristics, Diffusion and Transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier – Zener diode - Zener Reverse characteristics – Zener diode as voltage regulator - Display devices- LED, Laser diodes, Photo diode.

UNIT - II BJT AND SMALL SIGNAL AMPLIFIERS 9

BJT - structure, operation of NPN and PNP transistor, Input and output characteristics of CE, CB and CC configurations. Two port Devices and Hybrid Model of BJT for CE, CB and CC configurations - small signal model – Analysis of CE, CB, CC amplifiers.

UNIT - III FIELD EFFECT TRANSISTORS AND THYRISTORS 9

JFET, MOSFET and IGBT - Structure, operation and characteristics - FET small signal model - Analysis of CS, CG and CD amplifier. Thyristor - SCR operation and characteristics, UJT - operation and characteristics.

UNIT - IV DIFFERENTIAL AMPLIFIER AND POWER AMPLIFIERS 9

Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response –Power amplifiers –

Types:- Class A, B, AB and C Power amplifiers-Push-Pull amplifiers (Qualitative analysis only).

UNIT - V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of Negative feedback – voltage / current, Series, Shunt feedback – Positive feedback – Condition for oscillations, RC Phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO 1:** Explain the operation and characteristics of Semiconductor Diodes.
- CO 2:** Formulate the expression for voltage gain, current gain, input resistance and output resistance of BJT CE, CB and CC amplifier using h-parameter model.
- CO 3:** Formulate the expression for voltage gain, input resistance and output Resistance of FET amplifier under CS, CG and CD and operation of Thyristor.
- CO 4:** Explain the operation of differential amplifier, single tuned amplifier and power amplifiers.
- CO 5:** Analyze the operation of negative feedback amplifiers and to design RC and LC tuned Oscillators for a given frequency range.

TEXT BOOKS:

1. David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”,8th Ed., Oxford University Press 2020.
3. R.S.Sedha,”A textbook of Electronic circuits “, S.Chand and Company Ltd.4/e , 2010.
4. S. Salivahanan, N. Suresh Kumar, “Electronic Devices and Circuits”, McGraw Hill Education (India)Private Limited,4th Edition, 2017.

REFERENCES BOOKS:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited,2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall,10th Edition, 2017.

3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition,2003.
4. Robert Boylestad and Louis Nashelsky., "Electron Device and Circuit Theory" Prentice HallPrivate Limited,11th edition, 2017.
5. Jacob Millman, Christos C Halkias, SatyabrataJit, 'Electronic Devices and circuits',McGraw Hill education, 4th edition, 2015.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	1	1	-	-	-	1		1	-	-	1	-	-	2
2	3	3	3	3	-	-	-	1		1	-	-	1	-	-	3
3	3	3	3	3	-	-	-	1		1	-	-	1	-	-	1
4	2	2	1	1	-	-	-	1		1	-	-	2	-	-	2
5	3	3	3	2	-	-	-	1		1	-	-	1	-	-	2
Avg.	2.6	2.6	2.2	2	-	-	-	1		1	-	-	1.2	-	-	2

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT – I: INTRODUCTION TO OOP AND JAVA**9**

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors - Methods -Access specifiers - Static members- Java Doc comments.

UNIT – II: INHERITANCE, PACKAGES AND INTERFACES**9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword - Method Overriding –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT – III: EXCEPTION HANDLING AND MULTITHREADING**9**

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading.

UNIT – IV: I/O, GENERICS, STRING HANDLING**9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded

Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT – V: JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1:** Apply the concepts of classes and objects to solve simple problems
- CO2:** Develop programs using inheritance, packages and interfaces
- CO3:** Make use of exception handling mechanisms and multithreaded model to solve real world problems
- CO4:** Build Java applications with I/O packages, string classes, Collections and generics concepts
- CO5:** Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

TEXT BOOKS:

1. Herbert Schildt, “Java: The Complete Reference”, 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1 st Edition, McGraw Hill Education, New Delhi, 2015.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO's	PO's												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1	1	3	1	3	–	–	–	3	2	2	2	3	1	2	2
2	2	1	3	2	1	–	–	–	2	1	1	3	3	3	2	1
3	3	3	1	2	2	–	–	–	3	2	1	2	3	1	3	2
4	3	1	2	2	2	–	–	–	1	2	1	3	3	1	1	2
5	1	1	2	3	2	–	–	–	3	2	1	2	3	3	3	1
Avg.	2	1.4	2.2	2	2	–	–	–	2.2	1.8	1.2	2.4	3	1.8	2.2	1.6

OBJECTIVES:

- To study the purpose, methods, errors associated with the measurements.
- To learn the principle of transduction, classifications and the characteristics of different transducers
- To understand the knowledge of the different bridges used for the measurements.
- To identify the concepts of display and recording devices.
- To explore the types of biosensors.

UNIT – I: FUNDAMENTALS OF MEASUREMENTS 9

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

UNIT – II: DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS 9

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

UNIT – III: PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS 9

Phototube, scintillation counter, photo multiplier tube (PMT), photovoltaic, photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers. Optical displacement sensors and optical encoders. Piezoelectric active transducer- Equivalent circuit and its characteristics.

UNIT – IV: SIGNAL CONDITIONING CIRCUITS AND METERS 9

Functions of signal conditioning circuits, Preamplifiers, Concepts of passive filters, Impedance matching circuits, AC and DC Bridges - wheat stone bridge, Kelvin,

Maxwell, Hay, Schering, Q-meter, PMMC, MI and dynamometer type instruments - DC potentiometer- Digital voltmeter – Multi meter.

UNIT – V: RECORDING DEVICES AND ADVANCED SENSORS 9

CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder. Biosensors: transduction mechanism in a biosensor and Classification - Electronic nose.

PERIODS: 45

LIST OF EXPERIMENTS

- 1 Characteristics of thermistor and thermocouple
- 2 Characteristics of LDR , Photo Diode and Photo transistor
- 3 Characteristics of RTD and LVDT
- 4 Measurement of unknown Resistance using Kelvin Double Bridge and Wheatstone bridge
- 5 Measurement of unknown Capacitance using Schering Bridge
- 6 Measurement of unknown Inductance using Maxwell's & Hay's Bridge
- 7 Characteristics of strain gauge.
- 8 Demonstration of CRO
- 9 Characteristic of A/D and D/A converter

PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

On completion of the course, student will be able to

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

CO2: Understand the basic principles of sensors and transducers.

CO3: Select appropriate light sensors for measurement of physical phenomenon

CO4: Use AC and DC bridges for relevant parameter measurement.

CO5: Employ multimeter, CRO and different types of recorders for appropriate measurement.

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS

S.No	Description of Equipment	Quantity Required
1	Strain gauge Trainer Ki	1
2	Loads for measurement	1
3	LVDT trainer kit	1
4	LVDT sensor	1
5	Thermocouple trainer kit	1
6	Thermocouple	1
7	Thermistor Trainer kit	1
8	Thermistor	1
9	RTD Trainer Kit	1
10	RTD	1
11	Thermometer	3
12	Heater with water bath	2
13	LDR, Photo Diode, Photo Transistor trainer kit	1
14	Light Source	1
15	Wheatstone bridge, Kelvin's Bridge, Schering Bridge, Maxwell Bridge	Each 1
16	Decade resistance Box, Decade Inductance Box, Decade Capacitance Box	Each 3
17	Voltmeter, Multi meter	Each 10
18	Regulated power supply	10
19	ICs – A/D and D/A	1
20	CRO	10
21	Connecting wires	1

TEXT BOOKS:

1. A.K.Sawhney, "Electrical & Electronics Measurement and Instrumentation", 10th edition, Dhanpat Rai & Co, New Delhi, 19th Revised edition 2011, Reprint 2014.
2. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.
3. Ernest O Doebelin, Dhanesh N.Manik "Measurement Systems – Applications and Design", seventh Edition, McGraw-Hill, 2019

REFERENCE BOOKS:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition, Tata McGraw-Hill, New Delhi, 2014.
2. Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, 2015.
3. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 1st edition, 2016.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	2	1	1	-	-	2	2	1	1	1	2	-	-	-
CO2	3	3	2	1	3	-	-	2	2	-	3	1	3	-	2	3
CO3	3	3	2	1	-	2	2	2	2	1	3	-	2	2	2	-
CO4	3	3	3	2	-	-	-	2	2	2	3	-	2	-	2	2
CO5	3	3	3	1	3	-	-	2	2	3	3	2	2	2	3	3
Avg	3	2.8	2	1.2	1.4	2	2	2	2	1.4	2.6	1.3	2.2	2	1.8	2.7

COURSE OBJECTIVES:

- To understand the behavior of semiconductor devices and rectifiers experimentally.
- To implement the characteristics of BJT under different configurations.
- To get familiarized on JFET, SCR and UJT.
- To design the amplifiers.
- To develop oscillators.

LIST OF EXPERIMENTS

1. Characteristics of PN Junction diode.
2. Single phase half wave and full wave rectifiers with capacitive filters.
3. Characteristics of Zener diode and Zener as series voltage regulator.
4. Characteristics of photo diode, Study of light activated relay circuit.
5. Characteristics of Bipolar Junction Transistor under common emitter configuration.
6. Characteristics of BJT under common base configuration.
7. Characteristics of JFET.
8. Study the characteristics of SCR.
9. Study the Characteristics of UJT and generation of saw tooth waveforms.
10. Differential amplifiers using FET.
11. Design and testing of Feedback amplifiers (Any one type)
12. Design and testing of RC phase shift, LC oscillators.
13. Simulation of rectifier circuits using SIMULINK.

TOTAL: 60 PERIODS**COURSE OUTCOMES****On completion of the course, student will be able to****CO 1:** Determine the Breakdown voltage, forward and reverse resistance of PN junction diode and Zener diode and Calculate the ripple factor of rectifier circuits

with filters.

CO 2: Analyze the characteristics of BJT under CE and CB configuration.

CO 3: Obtain the UJT, SCR and JFET parameters from the characteristics.

CO 4: Calculate the gain of differential amplifier using FET.

CO 5: Design the RC and LC tuned oscillators for a given oscillating frequency and develop feedback amplifiers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl. No.	Description of Equipment	Required numbers
1	Regulated Power Supply – Dual, 0-30V, variable	10
2	Cathode Ray Oscilloscope, 0-30 MHz	8
3	Digital Multimeter	10
4	Function Generator, 0 – 20 MHz	8
5	Breadboard	10
6	PN Junction diode – 1N4007	20
7	Zener diode – FZ5.6 / FZ9	10
8	Photo diode – S7184	10
9	BJT – BC107 / BC547	10
10	JFET – BFW10 / BFW11	10
11	UJT – 2N2646	10
12	SCR - 2N2324	10
13	Step-down transformer – 230V/12-0-12V	10
14	Capacitors, assorted	10 each
15	Resistors 1/4W, assorted	10 each
16	Single-strand wires, different colours	10 each
17	MATLAB Software	Few Licenses

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	1
2	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	2
3	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	1
4	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	1
5	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	2
Avg.	3	2	1	-	-	2	-	2	2	1	-	-	-	-	-	1.4

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS:

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.
5. Solve the above problem using an interface.
6. Implement exception handling and creation of user defined exceptions.
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number
8. Write a program to perform file operations.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using JavaFX controls, layouts and menus.
11. Develop a mini project for any application using Java concepts.

TOTAL: 45 PERIODS

COURSE OUTCOMES:**On completion of the course, student will be able to****CO1** : Design and develop java programs using object oriented programming concepts**CO2** : Develop simple applications using object oriented concepts such as package, exceptions**CO3:** Implement multithreading, and generics concepts**CO4** : Create GUIs and event driven programming applications for real world problems**CO5:** Implement and deploy web applications using Java**Lab Requirements:**

For a batch of 30 students

1. Operating Systems: Linux / Windows
2. Front End Tools: Eclipse IDE / Netbeans IDE
- 3.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO's	PO's												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	1	2	1	-	-	-	-	1	2	2	2	1	2	3	2
2	2	1	3	1	-	-	-	-	2	3	3	2	1	3	1	2
3	2	2	1	2	1	-	-	-	1	2	1	3	2	3	2	1
4	2	2	1	3	-	-	-	-	3	1	1	1	2	1	2	1
5	1	3	3	1	3	-	-	-	1	1	1	1	2	1	2	2
AVg.	2	2	2	2	2	-	-	-	2	2	2	2	2	2	2	2

OBJECTIVES:

- To understand the basic concepts of probability, one dimensional random variables
- To understand the basic concepts of probability, two dimensional random variables
- To provide basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To introduce the basic notions of vector spaces this will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations.

UNIT-I: PROBABILITY AND RANDOM VARIABLES 6L

Axioms of probability – Conditional Probability-Discrete and continuous random variables— Moments – Moment generating functions

UNIT-II: TWO - DIMENSIONAL RANDOM VARIABLES 6L

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression

UNIT-III: RANDOM PROCESSES 6L

Classification – Stationary process – Markov chain- Poisson process

UNIT-IV: VECTOR SPACES 6L

Vector spaces – Subspaces – Linear combinations– Linear independence and linear dependence – Bases and dimensions (definition only)

UNIT-V: LINEAR TRANSFORMATION 6L

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of linear transformations

TOTAL: 30L PERIODS

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1: Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.

CO2: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

CO3: Apply the concept of random processes in engineering disciplines.

CO4: Demonstrate accurate and efficient use of advanced algebraic techniques.

CO5: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.

TEXT BOOKS:

1. Ibe, O.C., “Fundamentals of Applied Probability and Random Processes”, Elsevier, 1st Indian Reprint, 2007.
2. Friedberg. A.H., Insel. A.J. and Spence. L., “Linear Algebra”, Prentice Hall of India, New Delhi, 4th Edition, 2004.
3. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., “Fundamentals of Queueing Theory”, Wiley Student 4th Edition, 2014

REFERENCE BOOKS:

1. Hsu, "Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
3. Kolman. B. Hill. D.R., “Introductory Linear Algebra”, Pearson Education, New Delhi, First Reprint, 2009.
4. Kumaresan. S., “Linear Algebra – A Geometric Approach”, Prentice – Hall of India, New Delhi, Reprint, 2010.
5. Strang. G., “Linear Algebra and its applications”, Thomson (Brooks/Cole), New Delhi, 2005..

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-
CO2	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-
CO4	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-
CO5	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-
Avg	3	3	3	2	1	-	-	-	-	-	1	1	1	-	-	-

No Correlation -

Low 1

Medium 2

High 3

OBJECTIVES:

- To learn the elements and planes in the human body.
- To identify all the organelles of an animal cell and their function.
- To analyze the cells, tissues, organs and organ systems in body.
- To explore the structure and functions of the types of systems of the human body.
- To acquire knowledge about anatomical features and physiology of human systems.

UNIT – I: INTRODUCTION 9

Level of Organization – Metabolism and Homeostasis – Plan of Body – Body Parts and Areas, Planes and Sections. Elements in the Human Body – Inorganic Compounds and Organic Compounds

UNIT – II: CELL AND TISSUE STRUCTURE, SENSE ORGANS 9

Structure of Cell –Structure and functions of sub organelles – Cell Membrane – Transport of across Cell Membrane - Action Potential – Cell to Cell Signaling– Cell Division. Types of Specialized tissues – Functions. Sense Organs: Eye, Ear.

UNIT – III: SKELETAL, MUSCULAR AND RESPIRATORY SYSTEMS 9

Skeletal System: Types of Bone and function – Physiology of Bone formation – Division of Skeleton – Types of joints and function – Types of cartilage and function. Muscular System: Parts of Muscle – Movements. Respiratory System: Parts of Respiratory Systems – Types of respiration - Mechanisms of Breathing – Regulation of Respiration.

UNIT – IV: CARDIOVASCULAR AND LYMPHATIC SYSTEMS 9

Cardiovascular System: Components of Blood and functions- Blood Groups and importance – Structure of Heart – Conducting System of Heart – Properties of Cardiac Muscle - Cardiac Cycle - Heart Beat – Types of Blood vessel – Regulation of Heart rate and Blood pressure. Lymphatic System: Parts and Functions of Lymphatic systems – Types of Lymphatic organs and vessels.

UNIT – V: DIGESTIVE AND URINARY SYSTEMS

9

Digestive System: Organs of Digestive system – Digestion and Absorption. Urinary System: Structure of Kidney and Nephron – Mechanisms of Urine formation – Regulation of Blood pressure by Urinary System – Urinary reflex.

TOTAL PERIODS: 45

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1:** Assess the overall levels of organization and importance of homeostasis in the human body.
- CO2:** Explain the organelles in cell, tissues, organs and organ system in human body.
- CO3:** Analyze the structure and physiological function of Skeletal, Muscular and Respiratory system.
- CO4:** Describe the structure and function of Cardiovascular and Lymphatic system.
- CO5:** Explore the structure and function of the Digestive and Urinary system.

TEXT BOOKS:

1. Prabhjot Kaur, "Anatomy and Physiology", Lotus Publishers. 2014.
2. Elaine N, Marieb, "Essential of Human Anatomy and Physiology", Twelfth Edition, Pearson Education, New Delhi, 2017.
3. Valerie C. Scanlon and Tina Sanders, "Essential of Human Anatomy and Physiology", Fifth Edition, F.A. Davis Company, Philadelphia 2007

REFERENCE BOOKS:

1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, "Fundamentals of Anatomy and Physiology", Pearson Publishers, 2014.
2. Gillian Pocock, Christopher D. Richards, "The Human Body – An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2013.
3. William F. Ganong, "Review of Medical Physiology", Twenty second Edition, Mc Graw Hill, New Delhi, 2010.
4. Eldra Pearl Solomon, "Introduction to Human Anatomy and Physiology", W.B.Saunders Company, 2015.

5. Guyton & Hall, "Medical Physiology", Thirteenth Edition, Elsevier Saunders, 2015.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	3	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO 2	3	-	-	2	-	-	-	2	-	-	-	2	2	2	-	-
CO 3	3	-	-	2	-	-	-	2	-	-	-	2	2	2	-	-
CO 4	3	-	-	2	-	-	-	2	-	-	-	2	2	2	-	-
CO 5	3	-	-	-	-	-	-	2	-	-	-	2	2	2	-	-
Avg.	3	-	-	2	-	-	-	2.2	-	-	-	2	2	2	-	-

OBJECTIVES:

- To Understand the concept behind feedback and continuum in various systems and subsystems and the need for mathematical modeling of various systems.
- To analyze the systems in time domains.
- To Gain knowledge about the systems in frequency domain.
- To Interpret the concept of stability of various systems.
- To apply mathematical modeling principles in understanding the various fundamental biological systems.

UNIT - I: INTRODUCTION 9

Open and Closed loop Systems, Mathematical Modeling of systems, Block diagram and signal flow graph representation of systems - reduction of block diagram and signal flow graph, Introduction to Physiological control systems- Illustration, Linear models of physiological systems, Difference between engineering and physiological control systems.

UNIT - II: TIME RESPONSE ANALYSIS 9

Step and impulse responses of first order and second order systems - time domain specifications of first and second order systems - steady state error constants.

UNIT - III: FREQUENCY RESPONSE ANALYSIS 9

Frequency domain specifications - Polar plots - Bode plots - Nyquist plot - Nyquist stability criterion, closed loop stability - Constant M and N circles - Nichol's chart.

UNIT - IV: STABILITY ANALYSIS 9

Definition of stability, Routh- Hurwitz criteria of stability, Root locus technique - construction of root locus and study of stability.

Simple models of muscle stretch reflex action - steady state analysis of muscle stretch reflex action, transient response analysis of neuromuscular reflex model action, frequency response of circulatory control model, Stability analysis of Pupillary light reflex.

TOTAL PERIODS: 45

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1:** Interpret the need for mathematical modeling, representation of systems and introduction to biological control systems.
- CO2:** Determine the time response of various systems.
- CO3:** Examine the frequency response characteristics of systems using charts.
- CO4:** Discuss the concept of system stability.
- CO5:** Appraise the concept of modeling basic physiological systems.

TEXT BOOKS:

1. I.J. Nagarath and M. Gopal, Control Systems Engineering, New Age International Publishers, 1st September 2018.
2. Michael C. Khoo, Physiological Control Systems, Analysis, Simulation and Estimation, IEEE Press, 2018.

REFERENCE BOOKS:

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.

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/108/101/108101037/>
2. <https://nptel.ac.in/content/storage2/courses/112104158/lecture14.pdf>
3. <https://nptel.ac.in/content/storage2/courses/112104158/lecture16.pdf>
4. <https://nptel.ac.in/content/storage2/courses/112104158/lecture17.pdf>

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	2	2	-	2	1	-	-	1	-	-	2	1	-	-
2	3	2	2	2	1	-	-	-	-	-	-	2	2	1	-	-
3	3	2	2	2	-	-	-	-	-	1	-	-	2	1	-	-
4	3	2	2	2	1	-	1	-	-	-	1	-	2	1	-	-
5	3	2	2	2	2	-	-	2	1	-	-	2	2	1	-	-
Avg	3	2	2	2	1.3	2	1		1	1	1	2	2	1	-	-

OBJECTIVES:

- To study the circuit configuration and introduce practical applications of linear integrated circuits.
- To understand the concept of application of ADC and DAC in real time systems and Phase Locked Loop with applications.
- To learn the design of digital fundamentals using logic gates.
- To design combinational digital circuits using logic gates.
- To familiarize the design procedures for synchronous and asynchronous sequential circuits.

UNIT I INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS**9**

Operational amplifier –ideal characteristics, Performance Parameters, Linear and Nonlinear Circuits and their analysis- voltage follower, Inverting amplifier, Non-inverting Amplifiers, Differentiator, Integrator, Voltage to Current converter, Instrumentation amplifier, Low pass, High pass filter and band pass filters, Comparator, Multivibrator and Schmitt trigger.

UNIT II DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS AND PLL**9**

Types of D/A converter -Weighted resistor, R-2R ladder DAC, D/A Accuracy and Resolution. A/D converter - Flash, Dual slope, Successive approximation, A/D Accuracy and Resolution. Voltage controlled oscillator, Voltage to Frequency converters. PLL-Closed loop analysis of PLL, Frequency multiplication/ division, FSK demodulator.

UNIT III THE BASIC GATES AND COMBINATIONAL LOGIC CIRCUITS**9**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes –Binary, BCD, 84-2-1, 2421, Excess 3, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and tabulation methods. Logic families- TTL, MOS, CMOS, BiCMOS – Comparison of Logic families.

UNIT IV COMBINATIONAL LOGIC CIRCUITS

9

Design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux.

UNIT V SEQUENTIAL LOGIC CIRCUITS

9

Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – state minimization, state assignment, circuit implementation. Counters, Ripple Counters, Ring Counters. Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out, Universal Shift Register.

TOTAL PERIODS: 45

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1:** Design new analog linear circuits and develop linear IC based systems.
- CO2:** Apply the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.
- CO3:** Use Boolean algebra and apply it to digital systems.
- CO4:** Design combinational digital circuits using logic gates.
- CO5:** Explore the analysis and design procedures for synchronous and asynchronous sequential circuits.

TEXT BOOK

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., New Delhi, 2018.
2. John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018.
3. David J Comer, "Digital Logic and State Machine Design", Oxford University Press, NewDelhi, 2017.

REFERENCES

1. Ramakant A, Gayakwad, "OP-AMP and Linear ICs", Prentice Hall of India, New Delhi, 2017.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill India, New Delhi, 2017.
3. Thomas L.Floyd , "Digital Fundamentals", Pearson Education, England, 2021.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	2	1	1	-	-	-	-	2	2	3	1	1	-
2	3	2	2	2	1	1	-	-	-	-	2	2	1	1	1	-
3	3	3	3	1	1	1	-	-	-	-	2	2	1	1	1	-
4	3	3	3	1	1	1	-	-	-	-	3	3	1	1	1	-
5	3	3	3	1	1	1	-	-	-	-	2	2	1	1	1	-
Avg	3	3	3	1	1	1	-	-	-	-	2.2	2.2	1.4	1	1	-

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To study about multiprocessor configurations and bus structure.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a PIC microcontroller based system for application specific solution.

UNIT-I: THE 8086 MICROPROCESSOR 9

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

UNIT-II: 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming –System bus structure, Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT-III: PERIPHERALS AND INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface -- Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications.

UNIT-IV: 8051 MICROCONTROLLER & INTERFACING 9

Architecture of 8051 – Special Function Registers (SFRs) - Instruction set - Addressing modes – Times - Serial Port – Interrupts - Assembly language programming. LCD & Keyboard Interfacing - Sensor Interfacing - External Memory Interfacing- Stepper Motor Interfacing.

UNIT-V: PIC MICROCONTROLLER & INTERFACING**9**

PIC Microcontroller - Features and Architecture, Classification of Instructions, PIC18 Programming in C, Timer, Serial Port and Interrupt, PIC18 Interfacing: ADC, DAC, and Sensor.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

On completion of the course, the student will be able to

- CO1:** Acquire the knowledge on architectural concepts of 8086 microprocessor
- CO2:** Understand bus interfacing systems and analyze the Coupled communication systems.
- CO3:** Explore and design the interface of I/O circuits.
- CO4:** Design the interfacing applications with microprocessor.
- CO5:** Formulate and implement 8051 microcontroller based systems.
- CO6:** Develop new systems based on PIC microcontroller.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007. (UNIT I- III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education, 2011. (UNIT IV)
3. Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems", Pearson Education, 2008. (UNIT V)

REFERENCES:

1. Douglas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH, 2012
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012
3. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.

4. Soumitra Kumar Mandal, "Microprocessor and Microcontroller Architecture, Programming and Interfacing using 8085, 8086, 8051", Kindle Edition, McGraw Hill Edu, 2013.
5. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt., Ltd., 2016.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	1	2	1	3	1	-	2	-	-	-	2	2	1	3	-
2	2	2	2	1	-	-	-	2	-	-	-	2	2	1	3	-
3	2	1	2	1	3	1	-	2	-	-	-	2	2	1	3	-
4	2	1	2	1	3	1	-	2	-	-	-	2	2	1	3	1
5	2	1	2	3	3	1	-	2	-	-	2	2	2	1	3	2
6	2	1	2	3	3	1	-	2	-	-	3	2	2	1	3	3
Avg	2	1.2	2	1.7	3	1	-	2	-	-	2.5	2	2	1	3	2

Objective:

- To know the basic structure of NCC and Role of NCC
- To improve the cadet's personality skill and leadership quality
- To make the interest of cadets to involve in social activities
- Preventing the potential damage and suffering
- to destruction of the enemy's ability to fight and will to fight

Unit I Introduction to NCC 6

Aims, Objectives & Organization of NCC, Incentives, Duties of NCC Cadet, NCC Camps and Types National Integration: Importance & Necessity, Factors Affecting National Integration, Unity in Diversity & Role of NCC in Nation Building, Threats to National Security.

Unit II Personality Development 6

Personal Transformation, Personal Productivity Skills - time management, organizational and planning skills, problem solving and decision-making abilities, basics of psychology, Leadership, Meditation

Unit III Social Service and Community Development 6

Basics, Rural Development Programmes, NGOs, Contribution of Youth, Protection of Children and Women Safety, Road / Rail Travel Safety, New Initiatives, Cyber and Mobile Security Awareness

Unit IV Disaster Managements and its Awareness 6

Importance of Hazards and Disaster, Types of disasters, Earthquakes and its types, flood types and its management, landside and its managements case studies of disasters in Sikkim, Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management.

Unit V War and Peace in Contemporary World 6

Conceptual framework of War and Peace, Concepts of theories and approaches, Modern /war fare: Conventional, nuclear, Guerilla and Irregular Warfare, Limited and Specialized Warfare with reference to mountain, desert and jungle warfare, terrorism

as a new mode of conflict, War as an Economic Problem, Defence and Development, Defence and Development, Defence and Development

TOTAL: 30 PERIODS

Note: NCC Credit Course Level – I is offered for NCC students only. The grades earned by the students will be recorded in the marksheet, however the same shall not be considered for the computation of CGPA.

Course outcome:

At the end of the course, the student should be able to:

- CO1:** Understand their roles and responsibilities
- CO2:** Demonstrate the knowledge of human values and morals
- CO3:** Actively participate in social service and development activities
- CO4:** Understand the importance of disaster management
- CO5:** Analyse the issues related to war and its effects.

Text Books

1. R. Gupta's NCC Handbook of NCC Cadets 'A', 'B' and 'C' certificate Examinations

Reference book:

1. V. B. RAO, Personality Development and Soft Skills, BS Publications
2. Harish K. Gupta, Disaster Management, Universities press

OBJECTIVES:

- To understand the basic concepts of medical instrumentation and bio sensors.
- To identify the physiological characteristics of Bio signals.
- To know about amplifiers and applications.
- To explore the basic measurements of physiological parameters.
- To acquire knowledge about the biochemical measurement techniques as applicable for diagnosis and treatment.

UNIT – I: BASIC CONCEPTS OF MEDICAL INSTRUMENTATION AND BIO SENSORS 9

Basic Concepts of Medical Instrumentation: Terminology of medicine and medical devices, generalized medical instrumentation system, alternative operational modes, medical measurement constraints-classification of biomedical instruments biostatistics-regulations of medical devices.

Bio Potential : Origin of bio potential and its propagation. Electrode–skin interface, half-cell potential. Types of electrodes and its application. Recording problems - measurement with two electrodes.

Biosensor: Need of sensors, working principle of biosensor, various types of biosensors and its applications, bio transducers, bio interface.

UNIT II BIOSIGNAL CHARACTERISTICS 9

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

UNIT III BIOAMPLIFIERS 9

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

UNIT – IV: MEASUREMENTS OF BLOOD PRESSURE, BLOOD VOLUME AND CARDIAC OUTPUT 9

Pressure: Direct and indirect measurements-harmonic analysis of blood pressure waveforms-heart sounds-phonocardiography.

Blood Volume: Electromagnetic flow meters-ultrasonic flowmeters-chamber plethysmography-photo plethysmography.

Cardiac Output Measurements: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

UNIT V BIOCHEMICAL MEASUREMENTS

9

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

PERIODS: 45

PRACTICALS:

1. Simple Op Amp Circuit Measurements.
2. Design and analysis of biological pre-amplifiers.
3. Blood pressure measurement.
4. Experiment of Photo-plethysmography.
5. Recording of ECG signal and analysis.
6. Recording of EMG-Signal.
7. Recording of various physiological parameters using patient monitoring system and telemetry units.
8. Measurement of respiration rate
9. Measurement of PH and Conductivity

PERIODS: 30

TOTAL PERIODS: 75

COURSE OUTCOMES:

On completion of the course, the student will be able to

- CO1:** Illustrate the origin of various biological signals medical terms and their Characteristics physical values,
- CO2:** Gain knowledge on characteristics of bio signals.
- CO3:** Explore amplifiers involved in monitoring and transmission of biosignals.
- CO4:** Analyze the measurement techniques for non-electrical bio-parameters
- CO5:** Examine the biochemical measurement techniques as applicable for Diagnosis and further treatment.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS 3 STUDENTS PER EXPERIMENT:

S.NO	NAME OF THE EQUIPMENT	REQUIRED
1	Op amp kit	1 No.
2	Photo-plethysmograph unit	1 No.
3	Multiparameter patient monitoring system	1 No.
4	Respiration measurement kit	1 No.
5	ECG recorder	1 No.
6	EMG recorder	1 No.
7	Blood flow measurement system using ultrasound transducer	1 No.
8	Function Generators	10 Nos
9	P ^H and conductivity Meter	1 No.
10	DSOs	1 No.
11	Regulated Power supplies	10 Nos
12	Bread boards	1 No.
13	IC 741	

TEXT BOOKS:

1. Paul H. King, Richard C. Fries, Arthur T. Johnson, "Design of Biomedical Devices and Systems", Third Edition, CRC Press, 2014.
2. Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, 2015.
3. John G. Webster, "Medical Instrumentation: Application and Design", Fourth Edition, John Wiley& sons, 2009.

REFERENCE BOOKS:

1. Steven Schreiner, Joseph D. Bronzino, Donald R. Peterson, "Medical Instruments and Devices: Principles and Practices", First Edition, CRC Press, 2017.
2. Andreoni, Giuseppe, Barbieri, Massimo, Colombo, Barbara-poliMI, "Developing Biomedical Devices-Design, Innovation and Protection", Springer Briefs, 2014.
3. Khandpur R.S, "Handbook of Biomedical Instrumentation", Fifth edition, Tata McGraw-Hill, New Delhi, 2014.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-
2	-	3	-	3	-	-	3	2	-	-	-	-	2	3	-	-
3	-	3	3	-	-	2	2	-	-	-	-	-	2	3	-	-
4	-	-	-	-	-	3	3	-	-	2	-	2	2	3	-	-
5	1	2	3	2	3	-	2	-	2	-	-	2	2	-	3	-
Avg	2	2.7	2.7	2.5	3	2.5	2.5	2	2	2	-	2	2	3	3	-

OBJECTIVES:

- To study the characteristics of inverting, non-inverting, and instrumentation amplifier.
- To learn the linear and non-linear applications of operational amplifiers.
- To identify the combinational circuits and design procedures.
- To understand the function of sequential circuits.
- To exhibit the student in simulating analog circuits.

LIST OF EXPERIMENTS:

1. Design of inverting and non-inverting amplifier.
2. Design of Integrator and Differentiator.
3. Design of Instrumentation amplifier.
4. Design of Active low pass, High pass filter and Band pass filter
5. Design of Astable and Monostable multivibrator using 555 timer.
6. Design of RC Phase shift and Wien bridge oscillators using op-amp.
7. Design of Schmitt Trigger using op-amp.
8. Study of logic gates, Half adder and Full adder.
9. Design and implementation of multiplexer and demultiplexer.
10. Design and implementation of encoder and decoder using logic gates.
11. Design and implementation of shift registers.
12. Design and implementation of mod-N counter.
13. Simulation and analysis of circuits using software (any open access).

TOTAL PERIODS: 45

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1: Learn and design amplifiers using op-amp.

CO2: Explore the filters and multivibrators.

CO3: Analyze the performance of combinational circuits.

CO4: Design and test the performance of sequential circuits.

CO5: Simulate and analyse amplifier circuits using software.

LIST OF LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS

1. Digital Trainer Kit - 15 Nos. (with 5 V, Variable and fixed frequency Clock, Bread Board, FourSeven Segment displays, LEDs for output display, Logic 1 and 0 Input switches).
2. Logic ICs – 50 Nos each (7400, 7402, 7404, 7408, 7410, 7420, 7432, 7447, 7448, 7474, 7476,7483, , 7485, 7486, 7490, 7495, 74151, 741).
3. NE555 – 50 Nos.
4. Components and Accessories: Resistors, Capacitors, Inductors, diodes, Zener Diodes,Bread Boards, Transformers.IC Power supply (5 V fixed) - 15 Nos.
5. Standalone desktop PCs with SPICE software – 15 Nos.

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	1	1	1	-	-	-	-	1	3	3	3	1	-	-
2	3	2	1	1	1	-	-	-	-	1	2	3	2	1	-	-
3	3	2	1	1	1	-	-	-	-	1	1	3	2	1	-	-
4	3	2	1	1	1	-	-	-	-	1	1	3	1	1	-	-
5	3	2	1	1	3	-	-	-	-	1	3	3	1	2	-	-
Avg	3	2	1	1	1.4	-	-	-	-	1	2	3	1.8	1.2	-	-

13. Interfacing key board and LCD.

14. Interfacing Temperature sensor

TOTAL PERIODS: 60

OUTCOMES:

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

CO1: Write ALP Programs for Arithmetic operations and Logical operations.

CO2: Express the programming logics for code conversion

CO3: Analyze the working principle of ADC and DAC.

CO4: Interface different I/O's with processor and Generate waveforms using 8086

CO5: Execute microcontroller programs in 8051.

CO6: Design a mini Project using PIC Microcontroller.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS 3
STUDENTS PER EXPERIMENT:**

S.NO	NAME OF THE EQUIPMENT	REQUIRED
1.	Intel Desktop Systems with MASM	10 No's
3.	8086 Microprocessor Trainer with Power Supply	10 No's
4.	8051 Micro Controller Trainer Kit with power supply	5 No's
5.	8255 Interface boards	3 No's
6.	8251 Interface boards	3 No's
7.	8259 Interface boards	3 No's
8.	8279 Keyboard / Display Interface boards	3 No's
9.	8254 timer/ counters, 8253 Timer	3 No's
10.	ADC and DAC cards	3 No's
11.	AC & DC motor with Controllers	2 No's
12.	Traffic Light Control Systems	3 No's
13.	Stepper Motor	3 No's
14.	CRO (Cathode Ray Oscilloscope - 20 MHz)	2 No's

COURSE OUTCOMES - PROGRAM OUTCOMES MATRIX

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	2	-	3	-	-	-	2	2	-	3	2	2	3	-
2	2	-	3	-	3	-	-	-	2	2	-	2	2	-	3	-
3	2	-	3	-	3	-	-	-	2	2	-	2	2	-	3	-
4	1	2	3	-	3	-	-	-	1	2	-	2	2	-	3	-
5	1	2	3	-	3	-	-	-	2	2	-	2	2	-	3	3
6	1	2	3	2	3	2	2	2	2	2	-	2	2	2	3	3
Avg	1.7	2	3	2	3	2	2	2	1.8	2	-	2.2	2	2	3	3