

SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

SRM Nagar, Kattankulathur - 603 203.

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



CURRICULA AND SYLLABI

**B.E.– ELECTRONICS AND INSTRUMENTATION
ENGINEERING**

REGULATION 2023

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VISION OF THE INSTITUTE

“Educate to excel in Social Transformation”

To accomplish and maintain international eminence and become a model institution for higher learning through dedicated development of minds, advancement of knowledge and professional application of skills to meet the global demands.

MISSION OF THE INSTITUTE

- To contribute to the development of human resources in the form of professional engineers and managers of international excellence and competence with high motivation and dynamism, who besides serving as ideal citizen of our country will contribute substantially to the economic development and advancement in their chosen areas of specialization.
- To build the institution with international repute in education in several areas at several levels with specific emphasis to promote higher education and research through strong institute industry interaction and consultancy.

VISION OF THE DEPARTMENT

Continue to provide outstanding graduate education in Electronics and Instrumentation Engineering driven by excellence in research, to develop new ideas and technologies for various Engineering systems and application.

MISSION OF THE DEPARTMENT

M1: To provide high quality technical education and training in the field of Electronics and Instrumentation Engineering through an enriched curriculum.

M2: To impart technical knowledge and hands on experience, leadership and Managerial skills to meet the current industrial and societal needs.

M3: To enhance the problem solving capabilities through design projects and Internships.

M4: To mould leaders and team players with required analytical skills through a blend of co-curricular, extracurricular and professional society activities.

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. PROFESSIONAL KNOWLEDGE:

Graduates will have the knowledge of mathematics, science, computing and engineering fundamentals, laboratory and project based experiences breadth and in- depth studies to formulate and solve engineering problems in Electronics , Instrumentation, Control and Automation Engineering and shall have proficiency in computer based engineering and use of modern computational tools.

II. PROFESSIONAL EMPLOYMENT:

Graduates will succeed in entry-level engineering positions with Electronics, Instrumentation, Automation and Computational or Manufacturing firms in regional, national, or international industries and with government agencies.

III. PROFESSIONAL STUDIES:

Graduates will succeed in the pursuit of advanced degrees in engineering or other fields and will have skills for, continued independent, life-long learning to become experts in their profession and to broaden their professional knowledge.

IV. PROFESSIONAL CITIZENSHIP:

Graduates will have the ability to organize and present information, to write and speak effective English, to work effectively on team-based engineering projects and will practice Ethics and have a sense of social responsibility.

V. PROFESSIONAL PRACTICE

Graduates will have the ability to develop their engineering design, problem- solving skills and aptitude for innovation as they work on multi-disciplinary teams, to develop the basic skills needed to perform and design experimental projects.

2. PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12:Life-long learning: Recognize the need for, and have the preparation 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 Bachelor of Engineering in Electronics and Instrumentation Engineering program the student will have following Program specific outcomes

PSO1: Ability to apply the acquired knowledge of basic skills, mathematical foundations, and principles of electronics and instrumentation, modeling and design of electronics and instrumentation based systems in solving engineering Problems.

PSO2: Ability to understand and analyze the interdisciplinary problems for developing innovative sustained solutions with environmental concerns.

PSO3: Ability to update knowledge continuously in the tools like MATLAB, Keil, Proteus, LabVIEW, PLC, SCADA, XILINIX and technologies like Industrial Instrumentation, Robotics, Automation Systems, VLSI, Embedded systems, Distributed control systems to meet the industry requirements.

PSO4: Ability to apply research based knowledge to design and conduct experiments, analyze, synthesize and interpret the data pertaining to Electronics and instrumentation Engineering problems and arrive at valid conclusions.

4. PEO – PO Mapping

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

MAPPING

SEMESTER	COURSE CODE	PROGRAMME OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
I	Professional English - I	2.2	1.6	0.4	0.6	0.4	-	0.4	-	-	2.8	0.2	0.4	-	-	-	-
	Matrices and Calculus	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
	Engineering Physics	2.8	1.4	1.4	1	1.25	1	1	-	-	-	-	1	-	-	-	-
	Engineering Chemistry	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.4	-	-
	Basic Civil and Mechanical Engineering	3	1.8	2	0.8	-	1.2	0.6	0.2	-	-	-	0.4	1.6	0.6	0.4	1.8
	தமிழர் மரபு/Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Engineering Practices Laboratory	0.6	1.2	1.4	1.2	1.4	0.2			0.2		0.2	0.4				
	Physics and Chemistry Laboratory	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-
	English Language Learning Laboratory	1	1	0.4	0.8	0.4	-	0.8	-	-	2.8	-	1	-	-	-	-
II	Professional English - II	1.2	1.2	1.8	1.2	0.4	-	0.4	-	-	2.8	0.2	0.4	-	-	-	-
	Statistics and Numerical Methods	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Physics for Electronics Engineering	3	1.66	1.5	1	2	1.5	3					1				
	Chemistry of Electronic Materials	2.6	2.4	2.2	1.8	1.4	0.2	0.2	-	-	-	-	2	0.6	-	-	-
	Problem Solving and Python	2	3	3	3	2	-	-	-	-	-	2	2	2		2	1

	Programming																
	தமிழரும் தொழில்நுட்பமும் /Tamil and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Problem Solving and Python Programming Laboratory	2	3	3	3	2	-	-	-	-	-	2	2	1	3	2	2
	Engineering Graphics and Design Laboratory	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
	Engineering Sciences Laboratory	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-
III	Transforms and Partial Differential Equations	3	3			1							1			-	-
	Electric Circuit Analysis	1	0.6	0.6	0.4	0.8	-	-	0.6	-	-	1.2	0.8	1	0.2	0.4	0.6
	Electron Devices and Circuits	2.6	2.6	2.2	2	-	-	-	1		1	-	-	1.2	-	-	2
	Electrical and Electronic Instruments	2.6	2.2	2.2	2.4	2.4	0.8	0.4	0.2	-	-	0.2	0.2	2.6	1.4	2	2
	Transducers Engineering	0.6	0.6	0.2	0.2	1	1.2	-	-	-	-	-	0.4	0.8	0.4	0.4	0.4
	Digital Logic Circuits	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.4		
	Measurements and Transducers Laboratory	0.6	-	0.4	-	1.4	0.8	-	-	-	-	-	-	1.2	0.2	0.4	0.2
	Electric Circuits Laboratory	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.4	-	-
	Electron Devices and Circuits Laboratory	3	2	2	-	-	2	-	2	2	1	-	-	-	-	-	1.4
IV	Applied Mathematics for Electrical and Instrumentation Engineering	3	1.6	1.4	0.6	-	-	-	-	-	-	-	1	-	-	-	-
	Electrical Machines	3	3	1	1.6	-	-	-	-	-	-	-	1	2.2	2	-	-

	Industrial Instrumentation-I	2.4	1.6	1.8	1.6	0.6	1	0.6	0.2	-	-	-	0.4	2.6	0.8	1.6	2
	Electronics for Analog Signal Processing	1.4	1.2	0.6	0.2	1.2	-	-	-	0.4	-	0.4	0.4	0.8	1.6	0.2	0.4
	Control Systems	2.6	2.6	1.4	2.2	-	-	-	2.8	-	2.8	-	1	1.4	-	-	1.8
	Microprocessors and Microcontrollers	2.2	2.2	1.8	1.8	2.2	-	0.4	-	1.2	-	1.6	1	1.2	0.4	-	1.6
	Electrical Machines and Control Systems Laboratory	3	3	2.4	1.6	2.2	1.2	-	-	-	-	-	1	2.2	2	1.8	1.2
	Linear and Digital Integrated Circuits Laboratory	0.6	0.8	1.6	1.2	0.6	-	-	0.2	0.6	0.8	-	0.2	1.2	0.4	1	0.6
	Microprocessors and Microcontrollers Laboratory	2	1.2	3	0.8	3	0.8	-		0.8	0.6	-	0.8	2	0.8	3	1.2

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

SRM VALLIAMMAI ENGINEERING COLLEGE
 (An Autonomous Institution Affiliated to Anna University, Chennai)
B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING
REGULATIONS – 2023
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS

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.	GE3133	Basic Civil and Mechanical Engineering	ESC	3	3	0	0	3
6.	GE3111	தமிழர் மரபு / Heritage of Tamils	HSMC	1	1	0	0	1
PRACTICALS								
7.	GE3134	Engineering Practices Laboratory	ESC	4	0	0	4	2
8.	GE3121	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
9.	EN3119	English Language Learning Laboratory	EEC	2	0	0	2	1
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.	PH3223	Physics for Electronics Engineering	BSC	3	3	0	0	3
4.	CH3223	Chemistry of Electronic Materials	BSC	3	3	0	0	3
5.	GE3231	Problem Solving and Python Programming	ESC	3	3	0	0	3
6.	GE3211	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	1	0	0	1
PRACTICALS								
7.	GE3221	Engineering Sciences Laboratory	BSC	4	0	0	4	2
8.	GE3232	Problem Solving and Python Programming Laboratory	ESC	4	0	0	4	2
9.	GE3233	Engineering Graphics and Design	ESC	5	1	0	4	3
10.	GE3251	NSS/YRC/NSO/ Club Activities#	PCD	0 [#]	0	0	0	0 [#]
TOTAL				30	17	1	12	24

[#]Common to all students.

SEMESTER III

S.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.	EE3363	Electric Circuit Analysis	PCC	3	3	0	0	3
3.	EI3361	Electron Devices and Circuits	PCC	3	3	0	0	3
4.	EI3362	Electrical and Electronic Instruments	PCC	3	3	0	0	3
5.	EI3363	Transducers Engineering	PCC	3	3	0	0	3
6.	EE3361	Digital Logic Circuits	PCC	3	3	0	0	3
PRACTICALS								
7.	EI3364	Measurements and Transducers Laboratory	PCC	3	0	0	3	1.5
8.	EE3365	Electric Circuits Laboratory	PCC	3	0	0	3	1.5
9.	EI3365	Electron Devices and Circuits Laboratory	PCC	3	0	0	3	1.5
TOTAL				27	18	0	9	22.5

SEMESTER IV

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	MA3423	Applied Mathematics for Electrical and Instrumentation Engineering	BSC	2	2	0	0	2
2.	EI3461	Electrical Machines	PCC	3	3	0	0	3
3.	EI3462	Industrial Instrumentation-I	PCC	3	3	0	0	3
4.	EI3463	Electronics for Analog Signal Processing	PCC	3	3	0	0	3
5.	EI3464	Control Systems	PCC	3	3	0	0	3
6.	EI3465	Microprocessors and Microcontrollers	PCC	3	3	0	0	3
7.	GE3451	NCC Credit Course Level -1*	PCD	3*	0	0	0	3*
PRACTICALS								
8.	EI3466	Electrical Machines and Control Systems Laboratory	PCC	4	0	0	4	2
9.	EI3467	Linear and Digital Integrated Circuits Laboratory	PCC	3	0	0	3	1.5
10.	EI3468	Microprocessors and Microcontrollers Laboratory	PCC	3	0	0	3	1.5
TOTAL				27	17	0	10	22

NCC Credit Course Level -1 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.

SEMESTER V

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	EI3561	Industrial Instrumentation -II	PCC	3	3	0	0	3
2.	EC3568	Discrete Time Systems and Signal Processing	PCC	3	3	0	0	3
3.	EI3562	Process Control	PCC	4	3	1	0	4
4.	CE35XX	Environmental Studies	ESC	2	2	0	0	2
5.	PEIXXX	Professional Elective -I	PEC	3	3	0	0	3
6.	PEIXXX	Professional Elective - II	PEC	3	3	0	0	3
7.	GE3551	NCC Credit Course Level - 2	PCD	3*	0	0	0	3*
THEORY CUM PRACTICALS								
8.	EI3563	Industrial Automation Systems	PCC	5	3	0	2	4
PRACTICALS								
9.	EI3564	Industrial Instrumentation Laboratory	PCC	3	0	0	3	1.5
10.	EI3565	Process Control Laboratory	PCC	3	0	0	3	1.5
TOTAL				29	20	1	8	25

SEMESTER VI

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	EC3665	Embedded Systems	PCC	3	3	0	0	3
2.	EC3666	IOT Concepts and Applications	PCC	3	3	0	0	3
3.	CS3665	Data Structures	PCC	3	3	0	0	3
4.	PEIXXX	Professional Elective - III	PEC	3	3	0	0	3
5.	PEIXXX	Professional Elective -IV	PEC	3	3	0	0	3
6.	BA36XX	Elective -Management	HSMC	2	2	0	0	2
7.	MEI1XX	Mandatory Course-I ^{&}	MC	3	3	0	0	0
PRACTICALS								
8.	CS3666	Data Structures Laboratory	PCC	3	0	0	3	1.5
9.	EN34XX	Professional Communication Laboratory	EEC	2	0	0	2	1
10.	EI3641	Mini Project	EEC	4	0	0	4	2
TOTAL				29	20	0	9	21.5

[&]Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

*Offered only for NCC Students. 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.

SEMESTER VII

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	EI3761	Applied Machine Learning	PCC	3	3	0	0	3
2.	EI3762	Industrial Data Networks	PCC	3	3	0	0	3
3.	PEIXXX	Professional Elective –V	PEC	3	3	0	0	3
4.	PEIXXX	Professional Elective –VI	PEC	3	3	0	0	3
5.	BA37XX	Human Values and Ethics	HSMC	2	2	0	0	2
6.	OXXXX	Open Elective	OEC	3	3	0	0	3
7.	MEI2XX	Mandatory Course-II [*]	MC	3	3	0	0	0
PRACTICALS								
8.	EI3763	Instrumentation System Design Laboratory	PCC	3	0	0	3	1.5
9.	EI3741	Internship (2 Weeks)	EEC	0	0	0	0	1
10.	EI3764	System Identification, Modeling and Simulation Laboratory	PCC	3	0	0	3	1.5
TOTAL				26	20	0	6	21

^{*}Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC-II)

SEMESTER VIII

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
PRACTICALS								
1.	EI3841	Project Work	EEC	20	0	0	20	10
TOTAL				20	0	0	20	10

TOTAL NO. OF CREDITS: 168

ELECTIVE – MANAGEMENT COURSES

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	BA36XX	Principles of Management	HSMC	2	2	0	0	2
2.	BA36XX	Total Quality Management	HSMC	2	2	0	0	2
3.	BA36XX	Human Resource Management	HSMC	2	2	0	0	2
4.	BA36XX	Entrepreneurship Development	HSMC	2	2	0	0	2

MANDATORY COURSES I

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	MBA1XX	Introduction to Women and Gender Studies	MC	3	3	0	0	0
2.	MEN1XX	Elements of Literature	MC	3	3	0	0	0
3.	MBA1XX	Patent drafting for beginners	MC	3	3	0	0	0
4.	MBA1XX	Psychology for professionals	MC	3	3	0	0	0

MANDATORY COURSES II

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	MGE2XX	Well Being with Traditional Practices (Yoga, Positive Thinking)	MC	3	3	0	0	0
2.	MGE2XX	History of Science and Technology in India	MC	3	3	0	0	0
3.	MCS2XX	Awareness of Cyber Security and Cyber Laws	MC	3	3	0	0	0
4.	MME2XX	Industrial Safety	MC	3	3	0	0	0

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Professional Elective	Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI
	IOT and Automation	Advanced Control	Applied Instrumentation	Health Care Instrumentation	Semi conductor / Communication	Computing Techniques
1.	PLC and SCADA	Software Design Tools for Sensing and Control	Analytical Instrumentation	Biomedical Instrumentation	Power Electronics and Drives	Soft Computing Techniques for Process Control
2.	Robotics and Automation	Advanced Process Control	Power Plant Instrumentation	Digital Image Processing	MEMS and Nano Technology	Computer Control of Processes
3.	Industry 4.0 for Process Industries	Process Modelling and Simulation	Instrumentation and Control in Petro Chemical Industries	Bio Signal Processing	VLSI Design	Artificial Intelligence and Data Science
4.	Sensor for IOT Application	System Identification	Automotive Instrumentation and Control	Medical Imaging Systems	Wireless Sensor Networks	Cloud and Edge computing
5.	IOT for Industry Automation	Non Linear Control	Safety Instrumented System	Medical Robotics	Automotive Electronics	Deep and Reinforcement Learning
6.	Security in IOT	Optimal Control	Fiber Optics and Laser Instrumentation	Physiological Control Systems	Solar PV Fundamentals and Applications	Virtual Reality & Augmented Reality

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V, VI and VII. These courses are listed in groups called verticals that represent a particular area of specialisation. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI or VII. The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2023.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I: IOT and AUTOMATION

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI101	PLC and SCADA	PEC	3	3	0	0	3
2.	PEI102	Robotics and Automation	PEC	3	3	0	0	3
3.	PEI103	Industry 4.0 for Process Industries	PEC	3	3	0	0	3
4.	PEI104	Sensor for IOT Application	PEC	3	3	0	0	3
5.	PEI105	IOT for Industry Automation	PEC	3	3	0	0	3
6.	PEC607	Security in IOT	PEC	3	3	0	0	3

VERTICAL II: ADVANCED CONTROL

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI201	Software Design Tools for Sensing and Control	PEC	3	3	0	0	3
2.	PEI202	Advanced Process Control	PEC	3	3	0	0	3
3.	PEI203	Process Modelling and Simulation	PEC	3	3	0	0	3
4.	PEI204	System Identification	PEC	3	3	0	0	3
5.	PEI205	Non Linear Control	PEC	3	3	0	0	3
6.	PEI206	Optimal Control	PEC	3	3	0	0	3

VERTICAL III: APPLIED INSTRUMENTATION

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI301	Analytical Instrumentation	PEC	3	3	0	0	3
2.	PEI302	Power Plant Instrumentation	PEC	3	3	0	0	3
3.	PEI303	Instrumentation and Control in Petro Chemical Industries	PEC	3	3	0	0	3
4.	PEI304	Automotive Instrumentation and Control	PEC	3	3	0	0	3
5.	PEI305	Safety Instrumented System	PEC	3	3	0	0	3
6.	PEI306	Fiber Optics and Laser Instrumentation	PEC	3	3	0	0	3

VERTICAL IV: HEALTH CARE INSTRUMENTATION

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI401	Biomedical Instrumentation	PEC	3	3	0	0	3
2.	PEC202	Digital Image Processing	PEC	3	3	0	0	3
3.	PEC401	Bio Signal Processing	PEC	3	3	0	0	3
4.	PEC404	Medical Imaging Systems	PEC	3	3	0	0	3
5.	PEI402	Medical Robotics	PEC	3	3	0	0	3
6.	PEI403	Physiological Control Systems	PEC	3	3	0	0	3

VERTICAL V: SEMI CONDUCTOR /COMMUNICATION

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI501	Power Electronics and Drives	PEC	3	3	0	0	3
2.	PEI502	MEMS and Nano Technology	PEC	3	3	0	0	3
3.	PEC107	VLSI Design	PEC	3	3	0	0	3
4.	PEC507	Wireless Sensor Networks	PEC	3	3	0	0	3
5.	PEI503	Automotive Electronics	PEC	3	3	0	0	3
6.	PEI504	Solar PV Fundamentals and Applications	PEC	3	3	0	0	3

VERTICAL VI: COMPUTING TECHNIQUES

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	PEI601	Soft Computing Techniques for Process Control	PEC	3	3	0	0	3
2.	PCS602	Machine Learning Techniques	PEC	3	3	0	0	3
3.	PCS601	Artificial Intelligence and Data Science	PEC	3	3	0	0	3
4.	PIT601	Cloud and Edge computing	PEC	3	3	0	0	3
5.	PIT602	Deep and Reinforcement Learning	PEC	3	3	0	0	3
6.	PIT404	Virtual Reality & Augmented Reality	PEC	3	3	0	0	3

**OPEN ELECTIVE
(VII SEMESTER)**

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories. Course offering department students cannot choose the courses offered by the department).

S.No	Course Code	Course Title	Course offering Department	Contact Periods	L	T	P	C
1.	OAG1XX	Environment and Agricultural Engineering	AGRI	3	3	0	0	3
2.	OAG1XX	Organic Farming for Sustainable Agricultural Production	AGRI	3	3	0	0	3
3.	OAD1XX	Open Source Software Tools	AI & DS	3	3	0	0	3
4.	OAD1XX	Web Essentials	AI & DS	3	3	0	0	3
5.	OCE1XX	Air and Noise Pollution Control Engineering	CIVIL	3	3	0	0	3
6.	OCE1XX	Green Building Design	CIVIL	3	3	0	0	3
7.	OCE1XX	Environmental Impact Assessment	CIVIL	3	3	0	0	3
8.	OCS1XX	IOT and its Applications	CSE	3	3	0	0	3
9.	OCS1XX	Machine Learning with R	CSE	3	3	0	0	3
10.	OCS1XX	Tamil Computing	CSE	3	3	0	0	3
11.	OCY1XX	Cyber Forensic and Investigation	CYBER	3	3	0	0	3
12.	OCY1XX	Social Media Security	CYBER	3	3	0	0	3
13.	OEC1XX	4G/5G Communication Networks	ECE	3	3	0	0	3
14.	OEC1XX	Industrial IOT and Industry 4.0	ECE	3	3	0	0	3
15.	OEC1XX	Arduino Programming and its Applications	ECE	3	3	0	0	3
16.	OEE1XX	Electric vehicles and power management	EEE	3	3	0	0	3
17.	OEE1XX	Energy Conservation and Management	EEE	3	3	0	0	3
18.	OEE1XX	Renewable Energy Sources	EEE	3	3	0	0	3
19.	OEI101	Robotics and	EIE	3	3	0	0	3

		Automation						
20.	OEI102	Sensors for Engineering Applications	EIE	3	3	0	0	3
21.	OIT1XX	Foundation of Data Science	IT	3	3	0	0	3
22.	OIT1XX	Augmented Reality & Virtual Reality	IT	3	3	0	0	3
23.	OIT1XX	3D Printing & its Applications	IT	3	3	0	0	3
24.	OME1XX	Refrigeration and Air Conditioning	MECH	3	3	0	0	3
25.	OME1XX	Advanced Manufacturing Processes	MECH	3	3	0	0	3
26.	OME1XX	Material Testing and Characterization	MECH	3	3	0	0	3
27.	OME1XX	Hazardous Waste Management	MECH	3	3	0	0	3
28.	OME1XX	Automotive Engineering	MECH	3	3	0	0	3
29.	OMD1XX	Introduction to Food Processing	MDE	3	3	0	0	3
30.	OMD1XX	Introduction to Biomedical Instrumentation	MDE	3	3	0	0	3
31.	OPH1XX	Advanced Functional Materials	Physics	3	3	0	0	3
32.	OCH1XX	Nanomaterials and Applications	Chemistry	3	3	0	0	3

SUMMARY

S.No	SUBJECT AREA	CREDIT AS PER SEMESTER								CREDITS TOTAL	PERCENTAGE
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	4	4	-	-	-	2	2	-	12	7.14
2.	BSC	12	12	3	2	-	-	-	-	29	17.26
3.	ESC	5	8	-	-	2	-	-	-	15	8.93
4.	PCC	-	-	19.5	20	17	10.5	9	-	76	45.24
5.	PEC	-	-	-	-	6	6	6	-	18	10.71
6.	OEC	-	-	-	-	-	-	3	-	3	1.79
7.	EEC	1	-	-	-	-	3	1	10	15	8.93
	TOTAL	22	24	22.5	22	25	21.5	21	10	168	100
	Non credit /mandatory	✓	-	-	-	-	✓	✓	-	-	-

Enrollment for B.E. / B. Tech. (Honours) / Minor degree (Optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E./B.Tech. (Honours) Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also. Complete details are available in Regulations 2023.

VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other degree programmes)

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V
Fintech and Block Chain	Entrepreneurship	Public Administration	Business Data Analytics	Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Constitution of India	Datamining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurship	Indian Administrative System	Operation and Supply Chain Analytics	Integrated Energy Planning for Sustainable Development
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis

VERTICALS FOR MINOR DEGREE

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL I: FINTECH AND BLOCK CHAIN

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.		Financial Management	PEC	3	3	0	0	3
2.		Fundamentals of Investment	PEC	3	3	0	0	3
3.		Banking, Financial Services and Insurance	PEC	3	3	0	0	3
4.		Introduction to Block chain and its Applications	PEC	3	3	0	0	3
5.		Fintech Personal Finance and Payments	PEC	3	3	0	0	3
6.		Introduction to Fintech	PEC	3	3	0	0	3

VERTICAL II: ENTREPRENEURSHIP

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.		Foundations of Entrepreneurship	PEC	3	3	0	0	3
2.		Team Building and Leadership Management for Business	PEC	3	3	0	0	3
3.		Creativity and Innovation in Entrepreneurship	PEC	3	3	0	0	3
4.		Principles of Marketing Management for Business	PEC	3	3	0	0	3
5.		Human Resource Management for Entrepreneurship	PEC	3	3	0	0	3
6.		Financing New Business Ventures	PEC	3	3	0	0	3

VERTICAL III: PUBLIC ADMINISTRATION

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.		Principles of Public Administration	PEC	3	3	0	0	3
2.		Constitution of India	PEC	3	3	0	0	3
3.		Public Personnel Administration	PEC	3	3	0	0	3
4.		Administrative Theories	PEC	3	3	0	0	3
5.		Indian Administrative System	PEC	3	3	0	0	3
6.		Public Policy Administration	PEC	3	3	0	0	3

VERTICAL IV : BUSINESS DATA ANALYTICS

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.		Statistics for Management	PEC	3	3	0	0	3
2.		Data mining for Business Intelligence	PEC	3	3	0	0	3
3.		Human Resource Analytics	PEC	3	3	0	0	3
4.		Marketing and Social Media Web Analytics	PEC	3	3	0	0	3
5.		Operation and Supply Chain Analytics	PEC	3	3	0	0	3
6.		Financial Analytics	PEC	3	3	0	0	3

VERTICAL V : ENVIRONMENT AND SUSTAINABILITY

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.		Sustainable infrastructure Development	PEC	3	3	0	0	3
2.		Sustainable Agriculture and Environmental Management	PEC	3	3	0	0	3
3.		Sustainable Bio Materials	PEC	3	3	0	0	3
4.		Materials for Energy Sustainability	PEC	3	3	0	0	3
5.		Integrated Energy Planning for Sustainable Development	PEC	3	3	0	0	3
6.		Environmental Quality Monitoring and Analysis	PEC	3	3	0	0	3

SEMESTER I

EN3111	PROFESSIONAL ENGLISH – I	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To upgrade the English language skills of students by introducing communication techniques, speaking and grammar learning activities which are relevant to authentic contexts.
2. To improve the basic reading and writing skills of the learners.
3. To enhance the communicative competence of the first-year engineering students.
4. To enable learners to use language effectively in academic/work contexts.
5. 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 (Normal and Block).

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

At the end of the course, learners will be able

1. To strengthen the basics of grammar.
2. To narrate informal and informal situations.
3. To describe a process/product and express opinion.
4. To interpret and analyse the content/information given.
5. 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.

REFERENCE BOOKS

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.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	2	2	2	-	-	-	-	3	-	-	-	-	-	-
2	2	2	-	-	-	-	-	-	-	3	1	1	-	-	-	-
3	2	-	2	2	-	-	-	-	-	3	-	1	-	-	-	-
4	3	3	-	2	-	-	2	-	-	3	-	-	-	-	-	-
5	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Avg.	2.2	1.6	0.4	0.6	0.4	-	0.4	-	-	2.8	0.2	0.4	-	-	-	-

COURSE OBJECTIVES

1. To understand and apply matrix techniques for engineering applications.
2. To familiarize the student with basic calculus and calculus traditions.
3. To solve the problems in single and multivariable calculus and plays an important role in science, economics, engineering.
4. Vector calculus can be widely used for modeling the various laws of physics.
5. 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

COURSE OUTCOMES

1. To apply the idea of reducing complex problems into simple form using matrix technique.
2. Basic application of calculus in engineering problems and to tackle for different geometries.
3. This course equips the students to have basic knowledge and understanding the Partial derivatives and maxima and minima by Lagrange's method.
4. Basic application of Double and Triple integrals used in Engineering real life problems
5. To study 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.

MAPPING OF COs WITH POs AND PSOs

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

COURSE OBJECTIVES

1. To enhance the fundamental knowledge in crystalline materials and its applications.
2. To explore the knowledge in the production of ultrasonic waves and application in the engineering field.
3. To familiarize the basics of laser and their technical advances in scientific, industrial and health care areas.
4. To understand the principle of fibre optical fibre and its applications.
5. To explore basic concepts 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

COURSE OUTCOMES

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

1. To understand the crystalline material, crystal defects and and growth techniques.
2. To understand the basics, generation and application of ultrasonics.
3. To acquire knowledge on the concepts of lasers and their applications in industry and medical field.
4. To conversant on principle behind the fibres and their applications in communication and devices made out of optical fibre.
5. 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.Krishnasagar, "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

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	s	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	-	-	-	-

CH3124	ENGINEERING CHEMISTRY	L	T	P	C
	(First Semester-Common to all branches)				
		3	0	0	3

COURSE OBJECTIVES

1. To make the students familiar with boiler feed water requirements, related problems and domestic water treatment techniques.
2. To introduce the basic concepts and applications of chemical thermodynamics.
3. To acquaint the student with the principles of chemical kinetics and its applications towards engineering.
4. To make the student conversant with the basics of surface chemistry and catalysis.
5. 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: 45 PERIODS

COURSE OUTCOMES

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

1. To infer the quality of water from quality parameter data and propose suitable treatment.
2. To apply the knowledge of chemical thermodynamics for material design and aspects.
3. To recommend the proper chemical kinetics for engineering processes and applications.
4. To recognize the surface morphology and its engineering applications.
5. To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

TEXT BOOKS

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 Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2019.

REFERENCE BOOKS

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.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	2	-	1	3	-	-	-	-	2	-	-	-	-
2	3	1	2	1	-	-	-	-	-	-	-	-	-	1	-	-
3	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	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	-	0.4	-	-

GE3135	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To impart basic knowledge on Civil and Mechanical Engineering.
2. To familiarize the materials and measurements used in Civil Engineering.
3. To provide the exposure on the fundamental elements of civil engineering structures and construction method.
4. To enable the students to distinguish the components and working principle of power plant units, boilers, IC engines and Electric vehicle.
5. To understand the concepts and working principle of pumps and refrigeration and air conditioning system.

A – OVER VIEW

UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 9

Overview of Civil Engineering: Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering.

Overview of Mechanical Engineering: Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying: Objects – classification – principles – measurements of distances – angles - determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials.

UNIT III BUILDING COMPONENTS AND STRUCTURES 9

Foundations: Types of foundations – Requirement of good foundations.

Civil Engineering Structures: Brick masonry – stone masonry – beams – columns – lintels – roofing– flooring – plastering – floor area, carpet area and floor space index - Rain water harvesting - introduction to high way and railway.

C – MECHANICAL ENGINEERING

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 9

Introduction to internal combustion engine – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines-Introduction to Electric vehicle. Classification of Power Plants-Working principle of steam, Gas, Diesel, Hydro – electric and Nuclear Power plants-working principle of Cochran, La-mont, Benson Boilers.

UNIT V PUMPS , REFRIGERATION AND AIR CONDITIONING 9

Reciprocating Pumps -single acting and double acting and Centrifugal Pumps. Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1. Knowledge of basics in various sub-disciplines of civil and mechanical Engineering.
2. Use the basics of surveying for calculation of area and volume in basic construction works
3. Fundamental elements of civil engineering structures and construction methods.
4. Understand the energy sources, working principle of power plants and working principle of IC Engines and Electric vehicle.
5. Understand the working principle of pumps and function of refrigeration and air conditioning system.

TEXT BOOKS

1. Shanmugam G and Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 2018.
2. Basant Agrawal and C.M.Agrawal, “Basic Mechanical Engineering”, Wiley Publications Pvt Ltd., New Delhi, 2018.
3. Venugopal K. and Prabhu Raja V., “ Basic Civil and Mechanical Engineering”,

Anuradha publications Pvt Ltd.,Chennai,2014.

4. Iqbal Hussain, “Electric and Hybrid Vehicles: Design Fundamentals, Second Edition” CRC Press, Taylor & Francis Group, Second Edition, 2011.
5. Satheesh Gopi, “Basic Civil Engineering”, Pearson publications, 2009.

REFERENCE BOOKS

1. Rajput R.K., “Thermal Engineering”, Laxmi Publications (P) Ltd, 10 th Edition, 2018.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2015.
3. Kothandaraman C.P., Domkundwar S., Dhanpat Rai,“Thermal Engineering”, Publishing Co.(P) Ltd., 6 th Edition, 2015.
4. MehrdadEhsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric and Fuel cell Vehicles” CRC Press, Taylor & Francis Group, Second Edition (2010)

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	2	-	-	3	2	1	-	-	-	1	1	-	1	2
2	3	3	2	1	-	1	-	-	-	-	-	-	2	1	-	2
3	3	1	2	1	-	1	1	-	-	-	-	-	2	1	-	2
4	3	2	2	1	-	1	-	-	-	-	-	1	2	1	1	2
5	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	1
Avg.	3	1.8	2	0.8	-	1.2	0.6	0.2	-	-	-	0.4	1.6	0.6	0.4	1.8

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.

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியா மற்றும் வெளிநாட்டின் பிற பகுதிகளின் தமிழ்ப் பண்பாட்டின் தாக்கம்- சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

TOTAL: 15 PERIODS

TEXT CUM REFERENCE BOOKS

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

GE3111	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

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

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

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -Massive Terracotta sculptures, Village deities.

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: 15 PERIODS

TEXT CUM REFERENCES

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

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

GROUP A (CIVIL & MECHANICAL)**LIST OF EXPERIMENTS : CIVIL****a) Buildings**

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

b) Plumbing Works:

- 1 Study of pipeline joints, its location and functions : valves, taps, couplings, unions, reducers, elbows in house hold fittings.
- 2 Study of pipe connections requirements for pumps and turbines.
- 3 Preparation of plumbing line sketches for water supply and sewage works.
- 4 Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- 5 Demonstration of plumbing requirements of high-rise buildings.

Carpentry works:

- 1 Study of the joints in roofs, doors, windows and furniture.
- 2 Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

LIST OF EXPERIMENTS : MECHANICAL

a) Welding:

- 1 Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
- 2 Gas welding practice - Study

b) Basic Machining:

- 1 Facing
- 2 Simple Turning
- 3 Step Turning

c) Sheet Metal Work:

- 1 Forming & Bending
- 2 Model making–Trays

d) Demonstration on:

- 1 Smithy operations, upsetting, swaging, setting down and bending.
- 2 Foundry operations like mould preparation for gear and step cone pulley.
- 3 Assembly of centrifugal pump.
- 4 Assembly of air conditioner.

GROUP B (ELECTRICAL & ELECTRONICS)

LIST OF EXPERIMENTS : ELECTRICAL

1. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.
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.

LIST OF EXPERIMENTS : ELECTRONICS

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
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.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

1. To Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. To Fabricate carpentry components and pipe connections including plumbing works and use welding equipment's to join the structures.
3. To Carry out the basic machining operations, make the models using sheet Metal works. Illustrate on centrifugal pump, air conditioner, operations of smithy, foundry and fittings.
4. To Carry out basic home electrical works and measure the electrical quantities.
5. To Elaborate on the electronics components, gates and soldering practices.

REFERENCE BOOKS

1. Laboratory Manual prepared by Course Coordinator

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
---------	--------------------------	--

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. | Meggar | 2 |

ELECTRONICS

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

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3					1						1				
2		1	2		3						1					
3				3	2							1				
4		2	3	1	2											
5		3	2	2					1							
Avg.	0.6	1.2	1.4	1.2	1.4	0.2			0.2		0.2	0.4				

GE3127	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
	(Common to all branches of B.E. / B.Tech Programmes)				
		0	0	4	2

PHYSICS LABORATORY: (Any five experiments to be conducted)

COURSE OBJECTIVES:

1. To familiarize problem solving skills related to physics principles and interpretation of experimental data.
2. To elucidate the basics of quantum, optics, properties of material and crystal structure.

LIST OF 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

COURSE OUTCOMES

1. To understand the functioning of various physics laboratory equipment.
2. To apply principles of elasticity, optics and quantum properties for engineering applications.

REFERENCE BOOKS

1. Wilson J.D. and Hernandez 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.

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

COURSE OBJECTIVES

1. To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, chloride, and chlorine.
2. To familiarise the students with electro analytical techniques such as conductometry and flame photometry to determine of impurities in aqueous solution.
3. To find the various characteristics of domestic water.
4. To understand the Pseudo first-order kinetics reaction.
5. 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/ TiO_2 / ZnO / CuO).
- 11 Pseudo first-order kinetics- ester hydrolysis.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

1. To infer the quality of water samples for alkalinity, hardness, DO, TDS, chloride, and chlorine.
2. To apply the knowledge on the estimation of metal ions, acidity and its precipitation nature towards their process.
3. To recognize the threshold limit for various characteristics of domestic water.
4. To identify the simple method of synthesis of nanoparticles.
5. To understand the pseudo first-order kinetics reaction from ester hydrolysis.

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).

MAPPING OF COs WITH POs AND PSOs (PHYSICS LAB)

COs	PO												PSO			
	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	-	-	-	-	-	-	-	-	-	-	-

MAPPING OF COs WITH POs AND PSOs (CHEMISTRY LAB)

COs	PO												PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-
2	2	1	1	1	1	-	-	-	-	-	-	-	-	2	-	-	-
3	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
4	2	1	1	1	2	-	-	-	-	-	-	1	-	-	-	-	-
5	2	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	2	1	0.8	1	1.2	-	0.2	-	-	-	-	0.2	-	0.4	-	-	-

EN3119	ENGLISH LANGUAGE LEARNING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

The course aims to

1. Enhance the employability and career skills of students.
2. Orient the students towards grooming as a professional.
3. Make them industry ready.
4. Develop their confidence and help them attend interviews successfully.
5. 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 ANALYSIS 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 OUTCOMES

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

1. Pronounce the words correctly.
2. Understand the non verbal clues.
3. Make an effective presentation.
4. Adequate soft skills required for the workplace.
5. Participate confidently in Group Discussions.

REFERENCE BOOKS

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.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-
2	1	1	-	-	-	-	1	-	-	2	-	1	-	-	-	-
3	2	2	1	2	2	-	-	-	-	3	-	1	-	-	-	-
4	2	1	1	-	-	-	3	-	-	3	-	1	-	-	-	-
5	-	1	-	1	-	-	-	-	-	3	-	1	-	-	-	-
Avg.	1	1	0.4	0.8	0.4	-	0.8	-	-	2.8	-	1	-	-	-	-

SEMESTER II

EN3211	PROFESSIONAL ENGLISH – II	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

The course prepares the second semester Engineering students

1. To develop strategies and techniques to enhance their reading skills.
2. To engage them in meaningful activities in order to improve their listening, speaking, reading and writing skills.
3. To improve their ability to write effective job application, resumes and draft impressive reports.
4. To develop analytical thinking skills for problem solving in communicative contexts.
5. 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 OUTCOMES

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

1. To compare and contrast ideas and information from technical texts.
2. To incorporate basic grammar structures to express appreciation, suggestion and complaint in writing.
3. To draft effective resumes using appropriate vocabulary and to avoid common errors.
4. To analyse problems so as to arrive at appropriate solutions and to communicate relevantly.
5. 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 Jevani, 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.

REFERENCE BOOKS

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.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	-	1	2	1	-	-	-	-	-	3	-	1	-	-	-	-
2	2	2	1	2	2	-	-	-	-	3	1	1	-	-	-	-
3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
4	2	3	2	3	-	-	2	-	-	3	-	-	-	-	-	-
5	2	-	1		-	-	-	-	-	2	-	-	-	-	-	-
Avg.	1.2	1.2	1.8	1.2	0.4	-	0.4	-	-	2.8	0.2	0.4	-	-	-	-

MA3222	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

1. This course aims at providing the necessary basic concepts of statistical and Numerical Methods for solving numerically different problems of engineering and Technology.
2. To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
3. To introduce the basic concepts of solving algebraic and transcendental equations.
4. To introduce the numerical techniques of interpolation in various intervals and differentiation and integration in engineering and technology disciplines.
5. 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 Eigen value of a matrix by Power method.

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

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 PERIODS

COURSE OUTCOMES

1. Apply the concept of testing of hypothesis for small and large samples in real life problems.
2. Apply the basic concepts of classifications design of experiments in the field of agriculture.
3. Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
4. Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
5. 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, New Delhi, 2006.

MAPPING OF COs WITH POs AND PSOs

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

PH3223	PHYSICS FOR ELECTRONICS ENGINEERING	L	T	P	C
	For Second Semester - B.E / B.Tech (Common to EEE, ECE and EIE)				
		3	0	0	3

COURSE OBJECTIVES

1. To understand the concept of free electron theories and to get knowledge on conducting and superconducting materials.
2. To impart the knowledge about basics of doping and types of semiconductors.
3. To enable the idea of magnetism and dielectric properties.
4. To explore the basics of interaction of photon with materials.
5. To enhance the fundamental knowledge of molecular electronics and nanodevices.

UNIT I CONDUCTING AND SUPERCONDUCTING MATERIALS 9

Classical free electron theory-Postulates - Expression for electrical conductivity and Thermal conductivity-Wiedemann-Franzlaw-Success and failures – Quantum free electron theory (qualitative) - Fermi Distribution function - Density of energy states - carrier concentration – Superconductors – Properties - Applications : Magnetic levitation, Cryotron and SQUID.

UNIT II SEMICONDUCTOR AND TRANSPORT PHYSICS 9

Properties - Direct and indirect semiconductors - Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Extrinsic semiconductors - Carrier concentration in N -type & P- type semiconductors - Carrier transport - Drift and Diffusion transport - Hall Effect-Theory and Experiment- PN junction diode - Forward and reverse bias characteristics.

UNIT III MEMORY STORAGE MATERIALS AND DIELECTRIC MATERIALS 9

Magnetism in materials - Diamagnetic material, Paramagnetic material and Ferromagnetic material - Ferromagnetic domain theory - Hysteresis Curve - Hard and soft magnetic material - Bubble memory – Dielectric material : Electronic

polarization, Ionic polarization, Orientational polarization and Space - charge polarization - dielectric loss – dielectric breakdown- high – k dielectrics.

UNIT IV OPTO ELECTRONIC DEVICES 9

Classification of optical materials Optical processes in semiconductors: optical absorption and emission - carrier injection and recombination - photo diode - solar cell - photodetectors- Light Emitting Diode - Organic LED - Optical switching – Plasmonics.

UNIT V MOLECULAR ELECTRONICS 9

Introduction to Nanotechnology - Size dependence of Fermi energy - quantum confinement – Excitons – quantum structures - Quantum wire, Quantum Well, Quantum Dot laser – quantum interference effects – Tunneling : Resonant Tunnelling Diode (RTD) - Resonant Tunnelling Transistor (RTT) – Coulomb blockade effects - Single electron phenomena and Single electron Transistor-Nano Robotics.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

1. To gain knowledge in energy band structures and superconducting materials.
2. To acquire knowledge on basics of semiconductor physics and its applications in various devices.
3. To gain knowledge about the properties and applications of magnetic and dielectric materials.
4. To have the necessary understanding on the functioning of optical materials for optoelectronic devices.
5. To understand the basics of quantum structures and their applications in nano electronics.

TEXT BOOKS

1. Kasap, S. O., "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. M. Arumugam, "Semiconductor Physics and optoelectronics", Anuradha agencies, 2003.
3. Wahab, M.A., "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.
4. Kittel, C., "Introduction to Solid State Physics", Wiley, 2005.
5. V. Rajendran., "Engineering Physics" Tata Mc Graw -Hills.
6. B.K.Pandey., S.Chaturvedi., "Engineering Physics", Cengage Learning, 2012.

REFERENCE BOOKS

1. B. N. Sankar., S. O. Pillai., "Engineering Physics" New age international publishers, 2007.
2. Donald .A.Neamen., "Semiconductor Physics and devices" Tata Mc Graw-Hill, New Delhi. 2007.
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	-	-	1	1	-	-	-	-	-	1				
2	3	2	2	-	2	-	-	-	-	-	-	1				
3	3	2	1	1	-	2	-	-	-	-	-	1				
4	3	-	1	-	3	2	3	-	-	-	-	1				
5	3	-	2	1	2	1	-	-	-	-	-	1				
Avg.	3	1.66	1.5	1	2	1.5	3					1				

CH3223	CHEMISTRY OF ELECTRONIC MATERIALS	L	T	P	C
	Second Semester-B.E./B.Tech. (Common to ECE, EEE and EIE)				
		3	0	0	3

COURSE OBJECTIVES

1. To make the students accustomed to carbon-based materials, their synthetic properties, and their application in the field of electrical and electronics.
2. To comprehend the synthetic properties and applications of polymers in engineering applications.
3. To acquaint the student with the principles of electrochemical reactions, and corrosion.
4. To understand the working principle and applications of analytical instruments in chemical analysis.
5. To make the student conversant with the basics of energy sources and storage devices, their properties, and applications.

UNIT I CHEMISTRY OF CARBON 9

Catenation property of carbon-carbon based compounds-structure and bonding - hydrocarbons: fuels, carbon-based organic materials, activated carbon, and allotrope of carbon: properties-applications of diamond, graphite, graphene, fullerenes, and carbon-nanotubes types – preparation – properties-applications (electrical and electronic field) - future perspective in energy conversion and storage.

UNIT II ENGINEERING POLYMERS 9

Polymers: Classification - types of polymerization - plastic and its types – applications-Engineering polymers: ABS, PVC, Nylon-6, Nylon-6,6, Teflon, Kevlar and PEEK - preparation, properties and uses-fiber reinforced polymers- conducting polymers: types, and applications - applications of polymers in medicine and surgery.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Electrode - electrode reaction - redox reaction - origin of electrode potential, oxidation potential - reduction potential - measurement and applications,

electrochemical series and its significance - electrochemical cell - Nernst equation (derivation). Corrosion - causes - factors - types - chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electroplating of Au - electroless plating of Ni - paints - constituents and function.

UNIT IV ENERGY SOURCES AND STORAGE DEVICES 9

Introduction - nuclear energy - light water nuclear power plant - breeder reactor, solar energy conversion - solar cells: principle, working and applications, types of batteries - primary battery (alkaline battery), secondary battery (lead acid battery, NICAD battery, lithium-ion battery), fuel cells (H₂-O₂ fuel cell). Super capacitors: storage principle, applications. Electric vehicles-working principles.

UNIT V INSTRUMENTAL METHODS AND ANALYSIS 9

Introduction, absorption of radiation, types of spectra, UV-Visible and IR Spectrophotometer: Instrumentation and applications, cyclic voltammetry for redox system. Thermal methods of analysis TGA, DTA, DSC. Sensors: oxygen, pulse oximeter, biometrics, and glucose sensor.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

1. To explain the carbon-based materials properties and their engineering applications.
2. To gain knowledge on various types of engineering polymers.
3. To understand the process of electrochemistry and its application in corrosion control.
4. To appraise the working principles and applications of analytical instruments.
5. To ability to understand energy sources and storage devices.

TEXT BOOKS

1. Shikha Agarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.

2. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2019.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCE BOOKS

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
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. R. V. Gadag and A. Nithyananda Shetty, "Engineering Chemistry", 3rd Edition, Wiley & I.K. International (P), LTD, New Delhi, 2019.

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	3	2	2	-	-	-	-	-	-	3	-	-	-	-
2	2	2	1	2	1	1	-	-	-	-	-	2	-	-	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-	-
4	3	3	3	2	2	-	-	-	-	-	-	1	2	-	-	-
5	3	3	3	2	2	-	1	-	-	-	-	3	-	-	-	-
Avg.	2.6	2.4	2.2	1.8	1.4	0.2	0.2	-	-	-	-	2	0.6	-	-	-

GE3231	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

-] 1. To know the basics of Python programming
-] 2. To read and write simple Python programs.
-] 3. To develop Python programs with conditionals and loops.
-] 4. To define Python functions and call them.
-] 5. To use Python data structures and its implementation – lists, tuples, dictionaries.
-] 6. 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

COURSE OUTCOMES

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

1. Develop simple computational problems using control flow statements.
2. Decompose a Python program into functions, Modules and Packages.
3. Represent compound data using Python lists, tuples, Strings, Set and dictionaries.
5. Read and write data from/to files and Exception handling in Python Programs.
5. Understand the concepts of Object Oriented Programming.
6. 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.

REFERENCE BOOKS

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/>

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	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
6	2	2	-	-	2	-	-	-	-	-	1	-	1			
Avg.	2	3	3	3	2	-	-	-	-	-	2	2	2		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

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.

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. கணினித்தமிழ் – 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 Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3211	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

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

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

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Perio, 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. கணினித்தமிழ் – 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 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 Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OBJECTIVES

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Read and write data from/to files in Python.
6. 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.

TOTAL: 60 PERIODS

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

MAPPING OF COs WITH POs AND PSOs

COs	PO												PSO			
	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	3	3	3	2	-	-	-	-	-	2	2	1	3	2	2

GE3237	ENGINEERING GRAPHICS AND DESIGN	L	T	P	C
	LABORATORY				
	(Common to all branches of B.E. / B.Tech. Programmes)	1	0	4	3

COURSE OBJECTIVES

The main learning objective of this course is to impart knowledge

1. To draw the conics curves and special curves.
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

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:

1. To construct the conics curves and special curves.
2. To construct the orthographic projection of lines and plane surfaces.
3. To construct the projections and solids and Isometric projection of simple solids.
4. To construct projections of section of solids and development of surfaces.
5. 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. Jeyapooan, “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

MAPPING OF COs WITH POs AND PSOs

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

GE3228	ENGINEERING SCIENCES LABORATORY	L	T	P	C
	(Common to all branches of B.E. / B.Tech Programmes)				
		0	0	2	1

PHYSICS LABORATORY: (Any five experiments to be conducted)

COURSE OBJECTIVES

1. To gain practical knowledge and to correlate with the theoretical studies.
2. To achieve perfectness in experimental skills and the study of practical applications.
3. To bring more confidence and ability to develop and fabricate engineering and technical equipment.

LIST OF EXPERIMENTS : PHYSICS LABORATORY (Any 5 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

COURSE OUTCOMES

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

1. To understand the functioning of various physics laboratory equipment.
2. To use graphical models to analyze the laboratory data and to solve problems individually and collaboratively.

TEXTBOOKS:

- 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.

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

1. To find the quality of water samples for copper and chromium present in water.
2. To recognize the amount of various ions present in the water sample through volumetric and instrumentation techniques.
3. To identify the molecular weight of the polymer using an Ostwald viscometer.
4. To recognize an environmental hazardous and threshold limit for industrial effluents.
5. 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).

MAPPING OF COs WITH POs AND PSOs (PHYSICS)

CO	PO												PSO			
	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	-	-	-	-	-	-	-	-	-	-	-

MAPPING OF COs WITH POs AND PSOs (CHEMISTRY)

CO	PO												PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-
2	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-	-	-
3	2	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-
4	2	2	1	1	1	2	2	2	-	-	-	-	-	-	-	-	-
5	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	2	1.4	1	1	1.2	0.4	0.6	0.4	-	-	-	-	-	0.4	-	-	-

GE3251	NATIONAL SERVICE SCHEME (NSS)	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

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

UNIT I	Introduction and Basic Concepts of NSS	8
	<ol style="list-style-type: none"> a. History – Aim – Objectives of NSS b. Emblem – Motto – Badge - Song c. Organizational structure - Roles and Responsibilities of NSS d. Regular activities d. Any approved indoor / outdoor programs by the Principal 	
UNIT II	Youth Leadership, Social Harmony and National Integration	8
	<ol style="list-style-type: none"> 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 	
UNIT III	Health, Hygiene and Sanitation and Youth Health	8
	<ol style="list-style-type: none"> 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

UNIT 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

TOTAL: 32 PERIODS

COURSE OUTCOMES

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.

REFERENCE BOOKS

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/>

GE3251	YOUTH RED CROSS (YRC)	L	T	P	C
	Social Service based activities				
		0	0	0	0

COURSE OBJECTIVES

1. To enhance the societal awareness
2. To upgrade the Personality

ACTIVITY I HEALTH PROMOTION	2
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Activities that promotes health

ACTIVITY II SOCIETAL SERVICE	2
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Social Service activities

ACTIVITY III FRIENDSHIP BUILDING	1
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Friendship building activities between communities

TOTAL: 5 PERIODS

COURSE OUTCOMES

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

REFERENCE BOOKS

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

GE3251	National Sports Organization (NSO)	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

1. To create awareness about basic fitness and mental strength
2. To promote the development of physical fitness
3. To develop the sporting activities of the youth
4. To create the social responsibilities and social interaction through participation

ACTIVITY I INTRODUCTION 1

Introduction of NSO & Physical Fitness and games Skills

ACTIVITY II PHYSICAL FITNESS ACTIVITIES 2

Importance of Basic Physical Fitness - BMI Calculation - Identification of deformities

ACTIVITY III SPORTS PRACTICE 2

Games and fitness activities Physical Fitness Activities

TOTAL: 5 PERIODS

COURSE OUTCOMES

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

REFERENCE BOOKS

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

பாடத்திட்டத்தின் நோக்கங்கள்

1. மாணவர்களை சிறந்த மேடைப்பேச்சாளர்களாக உருவாக்குவது.
2. தாய்மொழியின் மேன்மையை பாதுகாப்பது.

பயிற்சித் திட்டம்

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

<https://eegarai.darkbb.com/t63483-topic>

<https://poriyari.in/>

GE3251	Eclectic Lingua – Skill based activities	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

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

ACTIVITY I Extempore 2

Giving expression to thoughts

ACTIVITY II Building Vocabulary 2

Using relevant set of words for different contexts

ACTIVITY III Pronunciation 1

Speaking accurately and fluently

TOTAL: 5 PERIODS

COURSE OUTCOMES

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.

REFERENCE BOOKS

1. <https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=pronunciation>
2. <https://www.quillsandquotes.ca/post/12-fun-games-to-get-students-public-speaking>

GE3251	Catalysis – Skill-based activities	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

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

ACTIVITY I Quiz/debate **2**
the latest advancement in Chemistry towards engineering

ACTIVITY II Essay competition/Chart preparation **2**
Environmental sustainability

ACTIVITY III Nature Study **1**
field visit to eco-parks etc.

TOTAL: 5 PERIODS

COURSE OUTCOMES

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 BOOKS

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/>

GE3251	RESONANCE – SKILL BASED ACTIVITIES	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

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

ACTIVITY I	QUIZ	1
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Basics and general principle

ACTIVITY II	PAPER PRESENTATION	2
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Current trends

ACTIVITY III	PROJECTS	1
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Fun with Physics

TOTAL: 5 PERIODS

COURSE OUTCOMES

1. Recollect the general principles of Physics.
2. To explore the topics in the current trends in Physics.
3. Develop practical expertise in various areas of Physics.

REFERENCE BOOKS

1. Principles of Physics, 10Ed, Isv 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>.

GE3251	EULER.COM – Skill based activities	L	T	P	C
		0	0	0	0

COURSE OBJECTIVES

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

ACTIVITY I OLYMPIAD 1

The students will be provided with 25 questions in Engineering Mathematics. This should be completed in one hour.

ACTIVITY II MATHEMATICAL MODELLING 2

The students are expected to present physical models (Working as well as static models) based on the application of Engineering Mathematics

ACTIVITY III PAPER PRESENTATION 1

Students will be provided 5-7 minutes of time to present their findings in application of Mathematics.

TOTAL: 5 PERIODS

COURSE OUTCOMES

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.

REFERENCE BOOKS

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

SEMESTER III

MA3321	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
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		3	0	0	3
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COURSE OBJECTIVES

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

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	9
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Solutions Lagrange's linear equation — linear partial differential equations of second and higher order with constant coefficients of homogeneous type.

UNIT-II	FOURIER SERIES	9
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Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Harmonic analysis.

UNIT III	LAPLACE TRANSFORMS	9
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Existence conditions – Transforms of elementary functions – Basic properties – Inverse transforms – Convolution theorem – Transform of periodic functions.

UNIT IV	FOURIER TRANSFORMS	9
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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

9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Understand the fundamental concept of the concepts of Partial differential Equations.
2. Understand the basic concepts of mathematical principles on Fourier & Z-transforms.
3. Laplace transform and inverse transform of simple functions, properties, are studied.
4. Apply the concept of Understand the concept Fourier series and apply the concept in solving PDE.
5. 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.
5. P.Sivaramakrishna Das, C.Vijayakumari, Transforms and Partial Differential Equations, Pearson India Education Services Pvt. Ltd, 2019.

MAPPING OF COs WITH POs AND PSOs

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

COURSE OBJECTIVES

1. To introduce electric circuits and its analysis
2. To impart knowledge on solving circuit equations using network theorems
3. To educate the transient response of circuits.
4. To introduce the phenomenon of resonance in coupled circuits.
5. 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

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

TEXT BOOKS

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9thedition, 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", McGraw Hill , 2015.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1	1	-	-	-	-	-	-	-	-	3	-	1	-	2	-
2	1	-	1	2	-	-	-	-	-	-	-	3	1	-	-	-
3	1	-	1	-	2	-	-	3	-	-	-	-	1	-	2	3
4	1	1	1	-		-	-	-	-	-	3	1	1	1	-	-
5	1	1	-	-	2	-	-	-	-	-	-	-	1	-	-	3
Avg.	1	0.6	0.6	0.4	0.8	-	-	0.6	-	-	1.2	0.8	1	0.2	0.4	0.6

COURSE OBJECTIVES

- 1 To understand the structure, operation and applications of electronic devices.
- 2 To familiarize Characteristics & Small signal Model of BJT.
- 3 To explore the Characteristics & Small signal Model of Field Effect Transistor and Operation of Thyristor.
- 4 To learn the function of Differential amplifier and power
- 5 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

- 1 Explain the operation and characteristics of Semiconductor Diodes.
- 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.
- 3 Formulate the expression for voltage gain, input resistance and output resistance of FET amplifier under CS, CG and CD and operation of Thyristor.
- 4 Explain the operation of differential amplifier, single tuned amplifier and power amplifiers.
- 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/, 2010.
- 4 S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", McGraw Hill Education (India) Private Limited, 4th Edition, 2017.

REFERENCE 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 Hall Private Limited, 11th edition, 2017.
- 5 Jacob Millman, Christos C Halkias, Satyabrata Jit, ‘Electronic Devices and circuits’, McGraw Hill education, 4th edition, 2015.

MAPPING OF COs WITH POs AND PSOs

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

EI3362	ELECTRICAL AND ELECTRONIC INSTRUMENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To introduce the meters used to measure current & voltage.
2. To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
3. To have an adequate knowledge in the measurement techniques for resistance, inductance and capacitor.
4. To provide knowledge on various types of electronic and digital meters.
5. To provide knowledge on various types of cathode ray oscilloscopes, their applications and different types of signal analyzers.

UNIT I ELECTRICAL MEASUREMENTS 9

General features and Classification of electro mechanical instruments. Principles of Moving coil, moving iron, dynamometer type, rectifier type, thermal instruments. Extension of instrument range: shunt and multipliers, Current transformers and Potential transformers.

UNIT II MEASUREMENT OF POWER 9

Electrodynamic wattmeter's, Low Power Factor (LPF) wattmeter, errors, calibration of wattmeter. Single and three phase power measurement, Hall effect wattmeter, thermal type wattmeter.

UNIT III MEASUREMENT OF RESISTANCE, INDUCTANCE AND CAPACITANCE 9

Low, high and precise resistance measurement, Megger, Ohmmeters, Classical AC bridges: Inductance and capacitance measurements. Detectors in bridge measurement, Wagner earth, transformer ratio bridges.

UNIT IV ELECTRONIC AND DIGITAL MEASUREMENTS 9

Electronic voltmeter, current measurement with electronic instruments, Digital voltmeter, Analog and digital multi-meters, Digital frequency meters. Digital LCR meter, Q-Meter, Digital wattmeter and energy meters. Wave analyzers, Logic analyser, spectrum analyser – Signal and function generators

UNIT V DISPLAY AND RECORDING INSTRUMENTS

9

DSO, MSO, Function generators, Signal generators, Waveform analyzers, Spectrum analyzers, Distortion analyzers, LED, LCD and Organic LED displays.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Ability to understand the construction and principle of instruments used for electrical measurement.
2. Ability to measure power using different types of wattmeter.
3. Ability to understand the measurement of resistance, inductance and capacitance.
4. Ability to understand various types of signal Analyzers and their applications.
5. Ability to understand various types of cathode ray oscilloscopes and their applications.

TEXTBOOKS

4. E.W. Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler & Co, 2001.
5. H.S. Kalsi, Electronic Instrumentation, McGraw-Hill Education, New Delhi, 2010.
6. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2019.

REFERENCE BOOKS

1. S.K.Singh, 'Industrial Instrumentation and control', Tata McGraw Hill, 2nd edn., 2002.
2. J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K.Kataria & Sons, Delhi, 2003.
3. Martin U. Reissland, 'Electrical Measurement – Fundamental Concepts and Applications', New Age International (P) Ltd., 2001.
4. R.B. Northrop, Introduction to Instrumentation and Measurements, Taylor & Francis, New Delhi, 2008
5. M.M.S. Anand, "Electronics Instruments and Instrumentation Technology",

Prentice Hall India, NewDelhi, 2009.

6. J.J.Carr, "Elements of Electronic Instrumentation and Measurement", Pearson Education India, New Delhi, 2011.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	1	1	2	2	-	-	-	-	1	-	2	1	1	1
2	3	3	2	3	2	-	-	-	-	-	-	-	3	1	1	3
3	3	1	2	3	2	-	-	-	-	-	-	-	2	1	2	3
4	2	2	3	2	2	-	-	-	-	-	-	-	3	1	3	1
5	3	3	3	3	3	2	2	1	-	-	-	1	3	3	3	2
Avg.	2.6	2.2	2.2	2.4	2.4	0.8	0.4	0.2	-	-	0.2	0.2	2.6	1.4	2	2

COURSE OBJECTIVES

1. Get to know the methods of measurement, classification of transducers and to analyze error.
2. To understand the behavior of transducers under static and dynamic conditions and hence to model the transducer.
3. Get exposed to different types of resistive transducers and their application areas.
4. To acquire knowledge on capacitive and inductive transducers.
5. To gain knowledge on variety of transducers and get introduced to MEMS and Smart transducers.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

Units and standards, Functional elements of measurement system – Static calibration – Classification of errors, Limiting error and probable error– Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics: accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effect, range and span. Dynamic characteristics: Mathematical model of transducer - zero, first and second order instruments - impulse, step, ramp and frequency response of the above instruments.

UNIT III RESISTIVE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, thermistor, photo resistor (LDR), hot-wire anemometer, piezo-resistive sensor and humidity sensor

4. E.A. John P. Bentley, Principles of Measurement Systems, IV Edition, Pearson Education,2005
5. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999
6. Neubert H.K.P. Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003

List of Open-Source Software/ Learning website:

1. <https://nptel.ac.in/courses/108108147>
2. <https://nptel.ac.in/courses/108105064>
3. <https://electronics-tutorials.ws/io/io->

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
3	-	-	1	-	2	3	-	-	-	-	-	1	-	-	-	1
4	-	-	-	-	2	2	-	-	-	-	-	-	-	-	2	
5	-	-	-	1	1	1	-	-	-	-	-	1	1	-	-	1
Avg.	0.6	0.6	0.2	0.2	1	1.2	-	-	-	-	-	0.4	0.8	0.4	0.4	0.4

COURSE OBJECTIVES

1. To introduce the fundamentals of combinational and sequential digital circuits.
2. To study various number systems and to simplify the mathematical expressions using Boolean functions word problems.
3. To study implementation of combinational circuits using Gates` and MSI Devices.
4. To study the design of various synchronous and asynchronous circuits.
5. To introduce digital simulation techniques for development of application oriented logic Circuit.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9

Number system, error detection, corrections & codes conversions, Boolean algebra: DeMorgan's theorem, switching functions and minimization using K-maps & Quine McCluskey method - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters -asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits –Up-Down Counters, Ripple counter, state diagram; state reduction; state assignmentwith examples.

**UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND 9
PROGRAMMABILITY LOGIC DEVICES**

Transition stability, flow stability-race conditions, hazards &errors in digital circuits;

analysis of asynchronous sequential logic circuits introduction to Programmability
Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL

9

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Explain various number systems and characteristics of digital logic families.
2. Apply K-maps and Quine McCluskey methods to simplify the given Boolean Expressions and to explain the implementation of various combinational logic circuits.
3. Design of various synchronous logic circuits using Flip Flops
4. Explain asynchronous sequential circuits and programmable logic devices.
5. Use VHDL for simulating and testing RTL, combinatorial and sequential circuits.

TEXT BOOKS

1. Morris Mano.M, 'Digital Logic and Computer Design', Prentice Hall of India, 3rdEdition, 2005.
2. Donald D.Givone, 'Digital Principles and Design', Tata McGraw Hill,1st Edition, 2003.
3. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018.

REFERENCE BOOKS

1. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017
2. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications',Tata McGraw Hill, 7th Edition, 2010.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	1	3							1	3		1	
2	3	3	3	1	3							1	3		1	
3	3	3	3	1	3							1	3		1	
4	3	3	3	1	3							1	3		1	
5	3	3	3	1	3							1	3		1	
Avg.	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.4	-	-

EI3364	MEASUREMENTS AND TRANSducers	L	T	P	C
	LABORATORY				
		0	0	4	2

COURSE OBJECTIVES

1. To make the students aware of basic concepts of measurement and operation of different types of transducers.
2. To make the students conscious about static and dynamic characteristics of different types of transducers
3. To make the students to analyze step response of thermistor, RTD and thermocouple.
4. To make the student to measure resistance, inductance and capacitance using bridge circuits.
5. To make the students to calibrate the electrical instruments.

LIST OF EXPERIMENTS

- 1 Determination of characteristics of a potentiometric transducer and LDR.
- 2 Determination of characteristics of Strain gauge and Load cell.
- 3 Determination of characteristics of LVDT and Hall Effect transducer.
- 4 Determination of static and dynamic characteristics of thermocouple.
- 5 Determination of static and dynamic characteristics of thermistor.
- 6 Determination of static and dynamic characteristics of RTD.
- 7 Measurement of Angular displacement using resistive and Capacitive transducer.
- 8 Measurement of temperature using filled system thermometer.
- 9 Measurement of resistance using Wheatstone bridge and Kelvin's double bridge.
- 10 Measurement of inductance using Anderson bridge and capacitance measurement using Schering bridge.
- 11 Calibration of Ammeter and Voltmeter.
- 12 Calibration of wattmeter and Single-phase Energy meter.

TOTAL : 60 PERIODS

COURSE OUTCOMES

1. Understand and apply circuit theorems and concepts in engineering applications.
2. Simulate electric circuits.
3. Understand the concept of frequency response of the systems.
4. Understand the concept of 3 phase balanced circuit.
5. Understand the concept of 3 phase un-balanced circuit.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

1	Experimental setup for the Measurement of Linear displacement using Potentiometer.	01
2	Experimental setup for Strain gauge and Load cell characterization.	01
3	Experimental setup for LVDT characteristics.	01
4	Experimental setup for Hall Effect characteristics.	01
5	Experimental setup for the Measurement of Angular displacement.	01
6	Experimental setup for Thermistor characteristics.	01
7	Experimental setup for Thermocouple characteristics.	01
8	Experimental setup for RTD characteristics.	01
10	AC –Ammeters.	02
11	AC –Voltsmeters.	02
12	Single Phase Wattmeter.	02
13	Single Energy meter.	01
14	Sufficient number of power supply, Galvanometer, Bread board, Multimeter, resistors, Decade Capacitance box, Decade resistance box, Decade Inductance box, CRO	As Required

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	2	-	2	-	-	-	-	-	-	-	3	-	-	-
2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-
3	-	-	-	-	1	2	-	-	-	-	-	-	-	-	2	-
4	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-
5	-	-	-	-	1	2	-	-	-	-	-	-	2	-	-	1
Avg.	0.6	-	0.4	-	1.4	0.8	-	-	-	-	-	-	1.2	0.2	0.4	0.2

COURSE OBJECTIVES:

To impart knowledge on the following topics

1. To simulate various electric circuits using Pspice / Matlab / e-Sim / Scilab / LTspice
2. To gain practical experience on electric circuits and verification of theorems.
3. To gain practical experience on frequency response of RC and RLC circuit.
4. To gain practical experience on two port networks.
5. To simulate and gain practical experience on 3 phase balanced circuit.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.
12. Determination of Z and Y parameters of a Two - Port networks.
13. Simulation and experimental verification of Millman's theorem.

TOTAL: 60 PERIODS

COURSE OUTCOMES

1. Ability to Understand and apply circuit theorems and concepts in engineering applications.
2. Ability to Simulate electric circuits.
3. Ability to understand concept of frequency response of the systems.
4. Ability to understand concept of 3 phase balanced circuit.
5. Ability to concept of 3 phase un-balanced circuit.

REFERENCES

1. Laboratory Manual

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SI. No.	Description of Equipment	Required numbers (for batch of 30 students)
1.	Regulated Power Supply – 0 – 15 V D.C	10
2.	Function Generator (1 MHz)	10
3.	Single Phase Energy Meter	01
4.	Oscilloscope (20 MHz)	10
5.	Digital Storage Oscilloscope (20 MHz)	01
6.	PC	10
7.	Circuit Simulation Software (e-Sim/ Scilab/ Pspice / MATLAB / other Equivalent software Package)	Min.10 users
8.	Printer	01
9.	AC/DC - Voltmeters	10
10.	Ammeters	10
11.	Multi-meters	10
12.	Single Phase Wattmeter	03
13.	Decade Resistance Box, Decade Inductance Box	6.nos each
14.	Decade Capacitance Box	06
15.	Circuit Connection Boards	10
16.	Resistors, Inductors, Capacitors of various capacities (Quarter Watt to10 Watt)	As Required

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1						2		3				1			
2		1			1						2			2	2	
3	1			1			3	2			2			2		3
4		1										3			2	
5			1		1			2	3					3		
Avg.	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	-	0.4	-	-

EI3365

**ELECTRON DEVICES AND CIRCUITS
LABORATORY**

L T P C

0 0 3 1.5

COURSE OBJECTIVES

1. To understand the behavior of semiconductor devices and rectifiers experimentally.
2. To implement the characteristics of BJT under different configurations.
3. To get familiarized on JFET, SCR and UJT.
4. To design the amplifiers.
5. 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: 45 PERIODS

COURSE OUTCOMES

- 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.
- 2 Analyze the characteristics of BJT under CE and CB configuration.
- 3 Obtain the UJT, SCR and JFET parameters from the characteristics.
- 4 Calculate the gain of differential amplifier using FET.

- 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 (for batch of 30 students)
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

MAPPING OF COs WITH POs AND PSOs

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	2	-	-	2	-	2	2	1	-	-	-	-	-	1.4

SEMESTER IV

MA3423	APPLIED MATHEMATICS FOR ELECTRICAL AND INSTRUMENTATION ENGINEERING	L	T	P	C
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2	0	0	2
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COURSE OBJECTIVES

1. To develop the students with ordinary differential equations.
2. To develop the use of ordinary differential equations that is needed by engineers for practical application.
3. To develop an understanding of the standard techniques of complex variable theory in particular analytic function.
4. To develop an understanding of the standard techniques of complex variable theory in conformal mapping.
5. To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.

UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	6
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Higher order linear differential equations with constant coefficients – Method of variation of parameters.

UNIT II	APPLICATION OF ORDINARY DIFFERENTIAL EQUATIONS	6
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Solution of ODE related to electric circuits, motion of a particle in a resisting medium and simple harmonic motion.

UNIT III	ANALYTIC FUNCTIONS	6
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Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian coordinates - Properties – Harmonic conjugates – Construction of analytic function.

UNIT IV	CONFORMAL MAPPING	6
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Conformal mapping – Mapping by functions $w = z+c$, $w = cz$ and $w = 1/z$ – Bilinear transformation.

UNIT V COMPLEX INTEGRATION**6**

Cauchy's integral theorem – Cauchy's integral formula – Singularities – Residues – Cauchy's Residue theorem – Applications of circular contour (with poles NOT on real axis).

TOTAL: 30 PERIODS**COURSE OUTCOMES**

1. Understand how to solve the given ordinary differential equations.
2. Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
3. To develop an understanding of the standard techniques of complex variable theory in particular analytic function.
4. To familiarize the students with conformal mapping .
5. To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.

TEXTBOOKS

1. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
2. Narayanan.S, ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S. Viswanathan Publishers Pvt. Ltd.1998.

REFERENCE BOOKS

1. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, NewDelhi, 2008.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
4. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
2	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
3	3	1	2	1	-	-	-	-	-	-	-	1	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
5	3	1	1	1	-	-	-	-	-	-	-	1	-	-	-	-
Avg.	3	1.6	1.4	0.6	-	-	-	-	-	-	-	1	-	-	-	-

COURSE OBJECTIVES

1. To impart basic knowledge on different AC& DC Machines.
2. To introduce the concept of special machines to motivate the students to solve complex problems related to machines.
3. To impart knowledge on testing and controlling of different machines.
4. Make the students familiar with the testing and controlling of different machines.
5. To introduce other special machines

UNIT I D.C. MACHINES 9

D.C. Machines: – Principle of operation and construction of motor and generator – EMF and torque equation – Various excitation schemes – Characteristics of Motor and Generator – Starting, Speed control and braking of D.C. Motor.

UNIT II TRANSFORMERS 9

Principle, Construction and Types of Transformer - EMF equation – Equivalent Circuit-Phasor diagrams - Regulation and efficiency of a transformer-Introduction to three phase transformer Connection, Autotransformer.

UNIT III SYNCHRONOUS MACHINES 9

Principle of Operation, types - EMF Equation and Phasor diagrams - Synchronous motor- Starting Methods, Torque equation- V Curves, inverted V curves.

UNIT IV THREE PHASE INDUCTION MOTORS 9

Construction – Production of rotating magnetic field- Principle of operation, Torque-slip characteristics - Starting methods and Speed control of induction motors.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Types of single-phase induction motors –Double field revolving theory- Capacitor start motors – Shaded pole motor – Repulsion type motor – Universal motor –

Hysteresis motor - Switched reluctance motor – Brushless D.C motor-Stepper motor-Permanent magnet synchronous motor.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Ability to acquire knowledge to solve problems associated with DC and AC Machines.
2. Ability to test and control different machines based on the familiarity of basic concepts and working principle.
3. Ability to choose appropriate machines for a given application while carrying out projects.
4. Ability to apply the knowledge gained to choose appropriate machines for specific application useful for the society.
5. Ability to know about the latest developments related to machines and to learn their concepts even after the completion of the course.

TEXTBOOKS

1. Fitzgerald A.E, Kingsley C., UmansS. and Umans S.D., “Electric Machinery”, McGraw- Hill, 2017.
2. Theraja, B.L., and Theraja, A.K. “A Textbook of Electrical Technology”, Vol.II, S.C Chand and Co., New Delhi, 2007.

REFERENCE BOOKS

1. Abhijit Chakrabarti and SudiptaDebnath, “Electrical Machines”, McGraw- Hill Education, 2015.
2. Deshpande M. V., “Electrical Machines” PHI Learning Pvt. Ltd., New Delhi, 2011
3. B.S.Guru and H.R.Hiziroglu, “Electric Machinery and Transformer’, Oxford university Press 2007.
4. Del Toro V., “Electrical Engineering Fundamentals”, Prentice Hall of India, New Delhi, 1995.
5. Nagrath I. J and Kothari D. P. ‘Electric Machines’, Fourth Edition, McGraw Hill Education, 2010.
6. C.A.Gross, “Electric Machines”, CRC Press 2010.

7. NPTEL Video Lecture series on “Electrical Machines I” and “Electrical Machines II” by Dr. Krishna Vasudevan, IIT Madras.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	-	-	-	-	-	-	-	-	-	1	2	1	-	-
2	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-	-
3	3	3	1	2	-	-	-	-	-	-	-	1	2	2	-	-
4	3	3	1	2	-	-	-	-	-	-	-	1	2	2	-	-
5	3	3	1	2	-	-	-	-	-	-	-	1	2	2	-	-
Avg.	3	3	1	1.6	-	-	-	-	-	-	-	1	2.2	2	-	-

COURSE OBJECTIVES

1. To educate the measurement techniques of force, torque and speed
2. To understand the measurement techniques of acceleration, vibration and density
3. To introduce the measurement of viscosity, humidity and moisture.
4. To impart the knowledge of temperature measurement techniques.
5. To learn the pressure measurement techniques.

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED 9

Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells - Different methods of torque measurement: Strain gauge, Relative angular twist. Speed measurement: Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators - Stroboscope.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

Accelerometers: LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments - Seismic instruments as accelerometer – Vibration sensor - Calibration of vibration pickups - Units of density and specific gravity – Baume scale and API scale – Densitometers: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer

UNIT III MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 9

Viscosity: Saybolt viscometer - Rotameter type and Torque type viscometers – Consistency Meters – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell – Commercial type dew meter. Moisture: Different methods of moisture measurements – Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, Application of moisture measurement - Moisture measurement in solids.

UNIT IV TEMPERATURE MEASUREMENT

9

Definitions and standards – Primary and secondary fixed points – Different types of filled in system thermometers – Sources of errors in filled in systems and their compensation – Bimetallic thermometers – IC sensors – Thermocouples: Laws – Fabrication - Signal conditioning, Cold junction compensation - Commercial circuits, Response of thermocouple, Special techniques for measuring high temperature using thermocouple – Radiation fundamentals - Radiation methods of temperature measurement – Total radiation pyrometers – Optical pyrometers – Two color radiation pyrometers – Fiber optic sensor for temperature measurement – Thermograph, Temperature switches and thermostats – Temperature sensor selection, Installation and Calibration.

UNIT V PRESSURE MEASUREMENT

9

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules - Electrical methods: Elastic elements with LVDT and strain gauges - Capacitive type pressure gauge - Piezo resistive pressure sensor-Resonator pressure sensor - Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, ionization gauges, Cold cathode type and hot cathode type – Pressure gauge selection, installation and calibration using dead weight tester – Pressure Transmitter: Conventional and Smart transmitter, Level measurement using DPT.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Ability to reproduce the construction of instruments used for measurement of force, torque, speed, acceleration, vibration, density, viscosity, humidity, moisture, temperature and pressure.
2. Ability to understand the working of instruments used for measurement of force, torque, speed, acceleration, vibration, density, viscosity, humidity, moisture, temperature and pressure.
3. Ability to select instruments according to the application.
4. Ability to perform calibration of instruments and gain knowledge about different calibration techniques.

5. Ability to design signal conditioning circuits and compensation schemes for measuring instruments.

TEXTBOOKS

1. Doebelin, E.O. and Manik, D.N., "Measurement systems Application and Design", 7th McGraw-Hill Education Pvt. Ltd, 2019.
2. Jones, B.E., edited by Noltingk, B.E., "Instrument Technology", 4th Edition, Butterworth-Heinemann, International Edition, 2016.
3. A.K. Sawhney, PuneetSawhney, "A Course in Mechanical Measurements and Instrumentation & Control", Dhanpat Rai & Co. (P) Limited, 2017.

REFERENCE BOOKS

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.
2. Patranabis, D., "Principles of Industrial Instrumentation", 3rd Edition, McGraw-Hill Education, 2017.
3. Eckman D.P., "Industrial Instrumentation", Wiley Eastern Limited, 1990.
4. Singh,S.K., "Industrial Instrumentation and Control", Tata Mc-Graw-Hill Education Pvt. Ltd., New Delhi, 2009.
5. AlokBarua, "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Kharagpur.
6. Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.
7. A.K. Sawhney, "A Course in Electronic Measurements and Instrumentation", Dhanpat Rai & Co. (P) Limited, 2015.

MAPPING OF COs WITH POs AND PSOs

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	1	3	1
2	3	1	2	3	-	-	-	-	-	-	-	-	3	3	1	1
3	-	-	-	2	1	1	1	1	-	-	-	2	1	-	2	3
4	3	3	3	3	2	2	2	-	-	-	-	-	3	-	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	2
Avg.	2.4	1.6	1.8	1.6	0.6	1	0.6	0.2	-	-	-	0.4	2.6	0.8	1.6	2

EI3463	ELECTRONICS FOR ANALOG SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To introduce characteristics of operational amplifiers.
2. To impart knowledge on applications of operational amplifiers.
3. To study about comparators and waveform generators.
4. To educate on signal converter circuits.
5. To introduce various special ICs.

UNIT I OPERATIONAL AMPLIFIER CHARACTERISTICS 9

Introduction to Fabrication of integrated circuits, Functional block diagram and operation of Op-amp, Ideal Characteristics of Op-amp, DC Characteristics: Input bias current, Input offset current, Input offset voltage and Thermal drift, AC Characteristics: Frequency response, stability, frequency compensation, slew rate and methods of improving slew rate.

UNIT II APPLICATIONS OF OPAMP 9

Basic operation of Inverting and Non Inverting amplifiers, Voltage follower, Adder, Subtractor, Integrator, Differentiator, Instrumentation amplifier and its applications for transducer Bridge, Differential amplifier, Voltage to current and Current to voltage converters, clippers, clampers, peak detector, Precision rectifier, Sample and hold circuits.

UNIT III COMPARATORS AND WAVEFORM GENERATORS 9

Analog multiplier & Divider, first and second order active filters, Basic operation and applications of Comparator, Schmitt trigger, waveform generators, ICL 8038 function generator IC, Monostable, Astable and Bistable Multivibrators, Log and Antilog amplifier.

UNIT IV SIGNAL CONVERTERS 9

Need for D-A&A – D converter, D-A converter: Weighted resistor, R-2R ladder, and inverted R-2R types. A – D converter: Flash, Counter, Servo tracking, Successive

approximation, Dual slope types. DAC and ADC performance characteristics, examples of ADC, DAC IC's.

UNIT V SPECIAL ICs

9

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, IC voltage regulators – LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variable voltage regulators, switching regulator- SMPS.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Acquire the knowledge in IC fabrication procedure and characteristics of operational amplifier
2. Analyze operational amplifier circuits and communicate the results effectively
3. Design circuits using operational amplifier and simulate them using software tools
4. Work effectively in a team and implement circuits using operational amplifier.
5. Recognize and acquire knowledge on the converters based on applications

TEXTBOOKS

1. Ramkant A Gayakwad, "Op-Amps and Linear Integrated Circuits" Prentice Hall of India, Fourth Edition, 2009
2. Robert F Coughlin, Frederick F Driscoll, "Operational amplifiers and Integrated Circuits" fourth edition Pearson India, 2009

REFERENCE BOOKS

1. William D Stanely, "Operational Amplifiers with Linear Integrated Circuits" Pearson Education, Fourth Edition, 2009.
2. Albert Malvino, David Bates, "Electronic Principles" Tata McGraw Hill, Seventh Edition, 2008
3. Roy D Choudhary&Shail B Jain, "Linear Integrated circuits", New age international publishers, 5 th edition, 2018

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	1	1	-	-	-	-	-	-	-	3	2	-	-
2	-	-	-	-	3	-	-	-	1	-	1	1	-	2	1	-
3	-	-	-	-	2	-	-	-	1	-	1	1	-	2	1	-
4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
5	2	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-
Avg.	1.4	1.2	0.6	0.2	1.2	-	-	-	0.4	-	0.4	0.4	0.8	1.6	0.2	0.4

UNIT V STATE VARIABLE ANALYSIS

9

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1. To represent and develop systems in different forms using the knowledge gained.
2. To analyses the system in time and frequency domain.
3. To discuss the effect of PID controller in closed loop systems.
4. To analyses the stability of physical systems and construct compensator for the linear systems.
5. Ability to design State variable representation of physical systems.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2021.
2. Benjamin C. Kuo, " Automatic Control systems", Wiley,2014.
3. NagoorKaniA,"Control Systems Engineering", CBS Publishers and distributors, 2017.

REFERENCES:

1. M.Gopal, "Control System: Principle and design", McGraw Hill Education,2012.
2. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
3. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
4. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2017.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	3	-	-	-	3	-	3	-	1	1	-	-	2
2	3	3	3	2	-	-	-	3	-	3	-	1	2	-	-	3
3	2	1	2	1	-	-	-	2	-	2	-	1	1	-	-	1
4	3	3	3	2	-	-	-	3	-	3	-	1	2	-	-	2
5	3	3	3	3	-	-	-	3	-	3	-	1	1	-	-	1
Avg.	2.6	2.6	1.4	2.2	-	-	-	2.8	-	2.8	-	1	1.4	-	-	1.8

EI3465 MICROPROCEESORS AND MICROCONTROLLERS	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES

To impart knowledge on the following Topics

1. Architecture of μ P8085 & μ C8051
2. Architecture of μ P8086
3. Addressing modes & instruction set of 8085 & 8051.
4. Need & use of Interrupt structure 8085 & 8051.
5. Simple applications development with programming 8085 & 8051

UNIT I 8085 and 8086PROCESSOR 9

HardwareArchitecture,pin-outs–FunctionalBuildingBlocksofProcessor–
Memoryorganization – I/O ports and data transfer concepts– Timing Diagram –
Interrupts – 8086Processor(Architecture only).

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data
transfer, datamanipulation& control instructions – Programming: Loop structure
with counting & Indexing –Lookuptability -Subroutine instructions-stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pin-outs–Functional Building Blocks of Processor–
Memory organization – I/O ports and data transfer concepts – Timing Diagram–
Interrupts-Data Transfer, Manipulation, Control Algorithms & I/O instructions,
Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259,
8254, 8279, - A/D and D/A converters & Interfacing with 8085& 8051.

UNIT V MICROCONTROLLER PROGRAMMING & APPLICATIONS

9

Simple programming exercises – keyboard and display interface–Control of servomotor & stepper motor control–Application to automation systems. PIC and ARM processors.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Ability to acquire knowledge in Addressing modes & instructions set of 8085 & 8051.
2. Ability to need & use of Interrupt structure 8085 & 8051.
3. Ability to understand the importance of Interfacing.
4. Ability to explain the architecture of Microprocessor and Microcontroller and its applications.
5. Ability to write the assembly language program.

TEXTBOOKS

1. Sunil Mathur & Jeebananda Panda, “Microprocessor and Microcontrollers”, PHI Learning Pvt.Ltd, 2016.
2. R.S.Gaonkar, “Microprocessor Architecture Programming and Application, with 8085 ”, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely, “The 8051 Micro Controller and Embedded Systems”, 2/e Pearson Education, 5th Indian reprint, 2012.

REFERENCE BOOKS

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, PrenticeHallofIndia, 2nd Edition NewDelhi, 2014.
2. B.RAM, “Computer Fundamentals Architecture and Organization” New AgeInternationalPrivateLimited, Fifthedition,2017.
3. Sumitra Kumar Mandal, “Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051” , McGrawHill Edu, 2013.
4. Ajay V. Deshmukh, “Microcontroller Theory & Applications”, McGraw Hill

Edu,2016.

5. Douglas V.Hall,“Microprocessor and Interfacing”, McGrawHillEdu, 2016.

6. Myke Predko, “Programming and customizing the PIC microcontroller”, McGraw-Hill Education, 2008.

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	2	2	-	-	-	2	-	-	-	3	-	-	-
2	3	2	2	1	1	-	2	-	1	-	2	-	-	2	-	-
3	3	2	1	1	3	-	-	-	3	-	2	2	-	-	-	3
4	1	2	2	3	3	-	-	-	-	-	3	1	3	-	-	2
5	1	2	1	2	3	-	-	-	-	-	1	2	-	-	-	3
Avg.	2.2	2.2	1.8	1.8	2.2	-	0.4	-	1.2	-	1.6	1	1.2	0.4	-	1.6

GE3451	NCC Credit Course Level – I	L	T	P	C
	(Common to Army, Navy & Air)				
		3	0	0	3

COURSE OBJECTIVES

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

UNIT I Introduction to NCC 9

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 9

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 9

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 9

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

9

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: 45 PERIODS

COURSE OUTCOMES

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

1. Understand their roles and responsibilities
2. Demonstrate the knowledge of human values and morals
3. Actively participate in social service and development activities
4. Understand the importance of disaster management
5. Analyse the issues related to war and its effects.

TEXTBOOKS

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

REFERENCE BOOKS

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

EI3466	ELECTRICAL MACHINES AND CONTROL	L	T	P	C
	SYSTEMS LABORATORY				
		0	0	3	1.5

COURSE OBJECTIVES

1. To expose the students to the operation of D.C. machines.
2. To expose the students to the operation of transformers.
3. To expose the students to the operation of generators and induction motors.
4. To impart knowledge about modeling of the system and the design of controllers.
5. To understand the performance of the system.

LIST OF EXPERIMENTS

1. Determination of Open circuit and Load characteristics of a self-excited D.C. shunt generator.
2. Load test on DC shunt motor.
3. Load test on DC series motor.
4. Load test on single phase induction motor.
5. Load test on single phase transformer.
6. Speed control of DC shunt motor.
7. Determination of Transfer function of DC motor.
8. Study of characteristics of Synchros.
9. Determination of time and frequency responses of a Second order system.
10. Stability analysis of LTI system.
11. Design, Analysis and implementation of lag, lead and lag-lead compensators.
12. Effect of P, PD, PI, PID controller on a second order system (open loop stable and open loop unstable system).

TOTAL : 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student should have the:

1. To understand and analyze DC Machine.
2. To understand and analyze AC Machine.
3. To identify the model of the system using various techniques.
4. To design and implementation of control techniques for various control

application.

- To obtain the performance of the system.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

- DC Shunt Motor with Loading Arrangement – 3 nos
- Single Phase Transformer – 4 nos
- DC Series Motor with Loading Arrangement – 1 No.
- Single Phase Induction Motor with Loading Arrangement – 1 No.
- DC Shunt Motor Coupled With DC Shunt Generator – 1 No.
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Single Phase Resistive Loading Bank – 2 nos
- SPST switch – 2 nos
- DC Motor Transfer Function Module-2nos
- Synchro Transmitter and Receive module – 2nos

MAPPING OF COs WITH POs AND PSOs

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

EI3467	LINEAR AND DIGITAL INTEGRATED CIRCUITS	L	T	P	C
	LABORATORY				
		0	0	3	1.5

COURSE OBJECTIVES

1. To learn design, testing and characterizing of various combinational logic circuits.
2. To learn design, testing and characterizing of applications like Mux, Demux, Encoder and Decoder circuits.
3. To learn design, testing and characterizing of Synchronous and Asynchronous digital circuits.
4. To learn design, testing and characterizing of circuit behavior with analog ICs.
5. To study about working of 566 IC and LM 317 IC

LIST OF EXPERIMENTS

- 1 Design and implementation of adder, subtractor. (2 bit, 3 bit)
- 2 Design and implementation of Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
- 3 Design and implementation of Parity generator and parity checking
- 4 Design and implementation of Encoders and Decoders
- 5 Design and implementation of Mux and Demux (4:1)
- 6 Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO
- 7 Design and implementation of 3-bit modulo counters. (Synchronous /Asynchronous)
- 8 Application of Op-Amp: inverting and non-inverting amplifier, Adder, Subtractor.
- 9 Design and implementation of comparator, Integrator and Differentiator using opamp.
- 10 Astable, Monostable operation of Timer IC NE/SE 555 timer.
- 11 Voltage to frequency characteristics of NE/ SE 566 IC.
- 12 Variable Voltage Regulator using IC LM317.

COURSEOUTCOMES

1. Ability to understand and implement combinational circuits Functions.
2. Ability to understand the importance of encoders, decoders, multiplexers and demultiplexers
3. Ability to Design and implement sequential circuits
4. Ability to acquire knowledge on Application of Op-Amp
5. Ability to Design and implement voltage regulators.
6. Ability to acquire knowledge on Application of timer and PLL

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

SL.No	Name of the equipments / Components	Quantity Required
1	Dual ,(0-30V) variability Power Supply	10
2	CRO	9
3	Digital Multimeter	10
4	Function Generator	8
5	IC Tester (Analog)	2
6	Bread board	10
7	Computer (PSPICE installed)	1

Consumabilitys (sufficient quantity)

- 1 IC 741/ IC NE555/566/565
- 2 Digital IC types
- 3 LED
- 4 LM317
- 5 LM723
- 6 ICSG3524 / SG3525
- 7 Transistor – 2N3391
- 8 Diodes, IN4001,BY126
- 9 Zener diodes
- 10 Potentiometer
- 11 Step-down transformer 230V/12-0-12V

- 12 Capacitor
- 13 Resistors 1/4 Watt Assorted
- 14 Single Strand Wire

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1	2	3	3	3	-	-	-	1	1	-	1	3	2	2	2
2	-	1	3	3	-	-	-	-	1	1	-	-	3	-	1	-
3	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	1
4	1	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-
5	1	-	-	-	-	-	-	1	-	1	-	-	-	-	2	-
6	-	1	3	3	-	-	-	-	1	-	-	-	-	-	-	-
Avg.	0.6	0.8	1.6	1.2	0.6	-	-	0.2	0.6	0.8	-	0.2	1.2	0.4	1	0.6

EI3468	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES

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

1. To provide training on programming of microprocessors
2. To provide training on programming of microcontrollers
3. To provide training on interfacing peripherals with microprocessors.
4. To provide training on interfacing peripherals with microcontrollers
5. To provide training on interfacing I/O devices with arduino/raspberry pi development boards.

LIST OF EXPERIMENTS: 8 Bit Microprocessor (Hardware/ simulation software)

- 1 Simple arithmetic operations: addition/ subtraction/ multiplication/ division.
- 2 Programming with control instructions:
 - a. Ascending/Descending order, Maximum/Minimum of numbers.
 - b. Programs using Rotate instructions.
 - c. Hex/ASCII/BCD code conversions.
- 3 Interface Experiments: with 8085
- 4 Traffic light controller.
- 5 I/O Port/ Serial communication
- 6 Read a key, interface display

8-Bit Microcontroller (Hardware/ simulation software)

- 7 Demonstration of basic instructions with 8051
Micro controller execution, including:
 - (i) Conditional jumps & looping
 - (ii) Calling subroutines.

- 8 Programming I/O Port and timer of 8051
- (i) Study on interface with A/D & D/A
- (ii) Study on interface with DC & AC motors
- 9 Application hardware development using embedded processors.
- 10 Interfacing of LEDs and sensor with arduino/raspberry pi modules.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1. Understand programming logics for code conversion and arithmetic operations.
2. Perform interfacing of A/D and D/A converters and also speed control of DC and AC motor
3. Understand
4. Perform LED and sensor interfacing with development board
5. Understand and apply computing platform and software for engineering problems.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity required
1	8085 Microprocessor Trainer with Power Supply	15
2	8051 MicroController Trainer Kit with power Supply	15
3	8255 Interface boards	5
4	8251 Interface boards	5
5	8259 Interface boards	5
6	8279 Keyboard/ Display Interface boards	5
7	8254 timer/counters	5
8	ADC and DAC cards	5
9	AC & DC motor with Controllers	5
10	Traffic Light Control Systems	5

11	Arduino/Rasberry pi development board	2
12	Sensor(Temperature/Humidity)	2

MAPPING OF COs WITH POs AND PSOs

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	3		3				2				2	-	3	2
2	2	2	3	2	3				2			2	2	-	3	2
3	2	-	3		3	2							2	2	3	3
4	2	1	3		3								2	2	3	2
5	2	1	3	2	3	2				3		2	2	2	3	3
Avg.	2	1.2	3	0.8	3	0.8	-		0.8	0.6	-	0.8	2	0.8	3	1.2