



**SRI MANAKULA VINAYAGAR**  
**ENGINEERING COLLEGE**  
(An Autonomous Institution)

Puducherry

**B.TECH.**  
**INSTRUMENTATION AND CONTROL ENGINEERING**

**ACADEMIC REGULATIONS 2023**  
**(R-2023)**

**CURRICULUM AND SYLLABI**  
**VOLUME 2**



Dr. L. M. Varalakshmi

**B.Tech. Instrumentation and Control Engineering**

## COLLEGE VISION AND MISSION

### Vision

To be globally recognized for excellence in quality education, innovation, and research for the transformation of lives to serve the society.

### Mission

**M1: Quality Education:** To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

**M2: Research and Innovation:** To foster value- based research and innovation in collaboration with industries and Institutions globally for creating intellectuals with new avenues.

**M3: Employability and Entrepreneurship:** To inculcate the employability and entrepreneurial skills through value and skill based training.

**M4: Ethical Values:** To Instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

## DEPARTMENT VISION AND MISSION

### Vision

To provide quality education, training and research in the area of Instrumentation and Control Engineering to meet the industrial and societal needs with ethical values.

### Mission

**M1: Quality education:** To impart technical knowledge, leadership and managerial skills to meet the current industrial and societal needs.

**M2: Research and Innovation:** To foster innovation, research and development for the benefit of global community.

**M3: Employability and Entrepreneurship:** To enhance the employability skills and inculcate entrepreneurial attitude.

**M4: Ethical Values:** To provide extension services to rural society and instill ethical values among the students.



Dr. L. M. Varalakshmi

**PROGRAMME 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, 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.



**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)****PEO 1: Core Competency:**

Solve real-life engineering problems, design and development of innovative and cost-effective products exhibiting a solid foundation in Instrumentation and Control Engineering fundamentals to cater needs of society.

**PEO 2: State of the art technology:**

To impart state of the art technology to the students in the field of Instrumentation and Control Engineering to meet the industrial needs.

**PEO 3: Multi-disciplinary skills:**

To develop Multi-disciplinary skills and acquire leadership qualities along with professional and ethical values.

**PEO 4: Innovation and entrepreneurship:**

To promote innovation and entrepreneurship in designing and developing instrumentation systems to address social and technical challenges.

**PROGRAM SPECIFIC OUTCOMES (PSOs)****PSO1: Basic Knowledge in ICE:**

Apply the knowledge of Instrumentation and Control Engineering to relate the fundamental concepts of Instrumentation (measurement, control, operation, monitoring and maintenance) to varied measurement systems and models.

**PSO2: Advanced Tools for industrial automation:**

Apply the knowledge of hardware and software tools for industrial automation systems

**PSO3: Design and development of Instrumentation systems:**

Ability to design and develop instrumentation systems to solve real time applications.



**STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME**

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	15
2	Basic Science Courses (BS)	20
3	Engineering Science Courses (ES)	29
4	Professional Core Courses (PC)	66
5	Professional Elective Courses (PE)	18
6	Open Elective Courses (OE)	9
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	-
9	Mandatory Courses (MC*)	-
<b>Total</b>		<b>170</b>

**SCHEME OF CREDIT DISTRIBUTION – SUMMARY**

Sl. No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science Courses	3	5	1	1	2	-	-	3	15
2	Basic Science Courses (BS)	7	4	5	4	-	-	-	-	20
3	Engineering Science Courses (ES)	8	5	4	7	4	-	-	-	28
4	Professional Core Courses (PC)	4	8	13	8	8	15	11	-	67
5	Professional Elective Courses (PE)	-	-	-	3	3	3	3	6	18
6	Open Elective Courses (OE)	-	-	-	-	3	3	3	-	09
7	Project Work (PA)	-	-	-	-	1	1	2	8	12
8	Internship (PA)	-	-	-	-	-	-	1	-	01
9	Ability Enhancement courses (AEC*) Courses (AEC*)	-	-	-	-	-	-	-	-	-
10	Mandatory Courses (MC*)	-	-	-	-	-	-	-	-	-
<b>Total</b>		<b>22</b>	<b>22</b>	<b>23</b>	<b>23</b>	<b>21</b>	<b>22</b>	<b>20</b>	<b>17</b>	<b>170</b>

\* AEC and MC are not included for CGPA calculation

**HONOURS DEGREE PROGRAMME:**

The student is permitted to opt for earning an honours degree in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an honours degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA\* (\*for lateral entry) of not less than 8.0. The prescribed courses offered for Honours degree are given in **Annexure V**.



Dr. L. M. Varalakshmi

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23MATC01	Engineering Mathematics - I	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23ESTC01	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
4	U23CSTC02	Problem Solving Approach	ES	3	0	0	3	25	75	100
5	U23ICT101	Fundamentals of Electrical Machines	PC	3	0	0	3	25	75	100
<b>Theory cum Practical</b>										
6	U23ENBC01	Communicative English - I	HS	2	0	2	3	50	50	100
<b>Practical</b>										
7	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
8	U23ICP101	Problem Solving Approach Laboratory	ES	0	0	2	1	50	50	100
9	U23ICP102	Fundamentals of Electrical Machines Laboratory	PC	0	0	2	1	50	50	100
<b>Ability Enhancement Course</b>										
10	U23ICC1XX	Certification Course I**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
11	U23ICM101	Induction Programme	MC	2 Weeks			-	-	-	-
							22	425	575	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23MATC02	Engineering Mathematics - II	BS	3	1	0	4	25	75	100
2	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
3	U23BMTC01	Electron Devices and Circuits	PC	3	0	0	3	25	75	100
4	U23ICT202	Transducer Engineering	PC	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values - II	HS	2	0	0	2	25	75	100
<b>Theory cum Practical</b>										
6	U23ENBC02	Communicative English - II	HS	2	0	2	3	50	50	100
<b>Practical</b>										
7	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
8	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
9	U23BMPC01	Electron Devices and Circuits Laboratory	PC	0	0	2	1	50	50	100
10	U23ICP203	Transducer Engineering Laboratory	PC	0	0	2	1	50	50	100
<b>Ability Enhancement Course</b>										
11	U23ICC2XX	Certification Course II**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
12	U23ICM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							22	575	625	1200

**\*\* Certification Courses are to be selected from the list given in Annexure III**



Dr. L. M. Varalakshmi

**B.Tech. Instrumentation and Control Engineering**

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
3	U23ICTC01	Linear Integrated Circuits	PC	3	0	0	3	25	75	100
4	U23ICTC02	Digital Logic Circuits	PC	2	1	0	3	25	75	100
5	U23ICT303	Electrical and Electronic Instrumentation	PC	3	0	0	3	25	75	100
<b>Theory cum Practical</b>										
6	U23ICB301	Circuit Theory	PC	2	0	2	3	50	50	100
<b>Practical</b>										
7	U23ENPC01	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
10	U23ICPC01	Linear and Digital Integrated Circuits Laboratory	PC	0	0	2	1	50	50	100
<b>Ability Enhancement Course</b>										
11	U23ICC3XX	Certification Course III**	AEC	0	0	4	-	100	-	100
12	U23ICS301	Skill Enhancement Course I*	AEC	0	0	2	-	100	-	100
<b>Mandatory Course</b>										
13	U23ICM303	Climate Change	MC	2	0	0	-	100	-	100
							23	675	625	1300

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23MATC04	Numerical Methods and Optimization	BS	3	1	0	4	25	75	100
2	U23CSTC03	Data Structures	ES	3	0	0	3	25	75	100
3	U23ICT404	Linear Control Systems	PC	2	1	0	3	25	75	100
4	U23ICT405	Microcontroller Based System Design	PC	3	0	0	3	25	75	100
5	U23ICE4XX	Professional Elective I <sup>#</sup>	PE	3	0	0	3	25	75	100
<b>Theory cum Practical</b>										
6	U23ICB402	Solid and Fluid Mechanics	ES	2	0	2	3	50	50	100
<b>Practical</b>										
7	U23ENPC02	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U23CSPC02	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U23ICP404	Microcontroller Based System Design Laboratory	PC	0	0	2	1	50	50	100
10	U23ICP405	Simulation Laboratory	PC	0	0	2	1	50	50	100
<b>Ability Enhancement Course</b>										
11	U23ICC4XX	Certification Course IV**	AEC	0	0	4	-	100	-	100
12	U23ICS402	Skill Enhancement Course II*	AEC	0	0	2	-	100	-	100
<b>Mandatory Course</b>										
13	U23ICM404	Right to Information and Good Governance	MC	2	0	0	-	100	-	100
							23	675	625	1300

*\* Professional Electives are to be selected from the list given in Annexure I*

*\* Skill Enhancement Courses (1 and 2) are to be selected from the list given in Annexure IV*

**B.Tech. Instrumentation and Control Engineering**

SEMESTER – V										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23ITTC03	Programming in Java	ES	3	0	0	3	25	75	100
3	U23ICT506	Industrial Instrumentation	PC	3	0	0	3	25	75	100
4	U23ICT507	Embedded System Design	PC	3	0	0	3	25	75	100
5	U23ICE5XX	Professional Elective II #	PE	3	0	0	3	25	75	100
6	U23XXO5XX	Open Elective I §	OE	3	0	0	3	25	75	100
<b>Practical</b>										
7	U23ITPC03	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U23ICP506	Embedded System Design Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP507	Industrial Instrumentation Laboratory	PC	0	0	2	1	50	50	100
<b>Project Work</b>										
10	U23ICW501	Micro Project	PA	0	0	2	1	100	-	100
<b>Ability Enhancement Course</b>										
11	U23ICC5XX	Certification Course V**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
12	U23ICM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

SEMESTER – VI										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23ICT608	Analytical Instrumentation	PC	3	0	0	3	25	75	100
2	U23ICT609	Power Plant Instrumentation	PC	3	0	0	3	25	75	100
3	U23ICT610	Process Control	PC	3	0	0	3	25	75	100
4	U23ICE6XX	Professional Elective III #	PE	3	0	0	3	25	75	100
5	U23XXO6XX	Open Elective II §	OE	3	0	0	3	25	75	100
<b>Theory cum Practical</b>										
6	U23ICB603	Internet of Things for Automation	PC	2	0	2	3	50	50	100
<b>Practical</b>										
7	U23ICP608	Instrumentation System Design Laboratory	PC	0	0	2	1	50	50	100
8	U23ICP609	Process Control Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP610	Virtual Instrumentation Laboratory	PC	0	0	2	1	50	50	100
<b>Project Work</b>										
10	U23ICW602	Mini Project	PA	0	0	2	1	100	-	100
<b>Ability Enhancement Course</b>										
11	U23ICC6XX	Certification Course VI**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
12	U23ICM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	625	575	1200

§ Open Electives are to be selected from the list given in Annexure II



Dr. L. M. Varalakshmi



SEMESTER – VII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23ICT711	Computer Control of Processes	PC	3	0	0	3	25	75	100
2	U23ICT712	Instrumentation in Biomedical Applications	PC	3	0	0	3	25	75	100
3	U23ICT713	Process Automation	PC	3	0	0	3	25	75	100
4	U23ICE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective III \$	OE	3	0	0	3	25	75	100
<b>Practical</b>										
6	U23ICP711	Computer Control of Processes Laboratory	PC	0	0	2	1	50	50	100
7	U23ICP712	Process Automation Laboratory	PC	0	0	2	1	50	50	100
<b>Project Work</b>										
8	U23ICW703	Project Phase I	PA	0	0	4	2	50	50	100
9	U23ICW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23ICE8XX	Professional Elective V #	PE	3	0	0	3	25	75	100
3	U23ICE8XX	Professional Elective VI #	PE	3	0	0	3	25	75	100
<b>Project Work</b>										
4	U23ICW805	Project Phase II	PA	0	0	16	8	50	100	150
							17	125	325	450
<b>Total Credits</b>							<b>170</b>			



## Annexure – I

## PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	Course Code	Course Title
1	U23BMEC01	Communication Systems
2	U23ICE401	Fundamentals of Pneumatics and Hydraulics
3	U23ICE402	Hybrid Electric Vehicles
4	U23ICE403	Industrial Electronics
5	U23ICE404	Signal Processing for Instrumentation
Professional Elective – II (Offered in Semester V)		
Sl. No.	Course Code	Course Title
1	U23ICE505	Energy Harvesting Techniques
2	U23ICE506	Industrial Unit Operations
3	U23ICE507	Micro Electromechanical Systems
4	U23ICE508	Instrumentation Buses and Data Networks
5	U23ICE509	Wireless Instrumentation
Professional Elective – III (Offered in Semester VI)		
Sl. No.	Course Code	Course Title
1	U23ICEC01	Virtual Instrumentation
2	U23ICEC02	Soft Computing Techniques
3	U23ICE610	Calibration Systems
4	U23ICE611	Non-Linear control systems
5	U23ICE612	Fiber Optics and Laser Instrumentation
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	Course Code	Course Title
1	U23ICEC03	Intelligent Robotic Systems
2	U23ICE713	Advanced Process Control
3	U23ICE714	Automotive Instrumentation and Control
4	U23ICE715	Instrumentation symbols and Standards
5	U23ICE716	Field instruments for process control
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1	U23BMEC02	Wearable Technology
2	U23ICE817	Artificial Intelligence for Process Control
3	U23ICE818	Design of Process Control System Components
4	U23ICE819	Instrumentation in Agriculture and Food Processing Industries



5	U23ICE820	System Identification and Adaptive Control
<b>Professional Elective – VI (Offered in Semester VIII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
1	U23ICE821	Advanced Industrial Automation Systems
2	U23ICE822	Building Automation
3	U23ICE823	Instrumentation in Process Industries
4	U23ICE824	Piping and Instrumentation Diagram
5	U23ICE825	Safety in Process Industries



Dr. L. M. Varalakshmi

**Annexure - II**  
**OPEN ELECTIVE COURSES**

<b>Open Elective- I (Offered in Semester V/ VI)</b>				
<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Offering Department</b>	<b>Offered Department</b>
<b>Open Elective – I/ Open Elective – II</b> (Offered in Semester V for <b>CSE, IT, MECH, Mechatronics, AI&amp;DS</b> ) (Offered in Semester VI for <b>EEE, ECE, ICE, CIVIL, BME, CCE, FT</b> )				
1	U23ICOC01	Sensors and Transducers	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS
2	U23ICOC02	Basics of LabVIEW	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS, Mechatronics
<b>Open Elective- II (Offered in Semester VII)</b>				
1	U23ICOC03	Fuzzy Logic and Neural Networks	ICE	CSE, IT, MECH, CSBS, AI&DS, Mechatronics
2	U23ICOC04	Industrial Automation	ICE	ECE, CSE, IT, MECH, CCE, CSBS, AI&DS



Dr. L. M. Varalakshmi

## Annexure – III

## ABILITY ENHANCEMENT COURSES – CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23ICCX01	Adobe Photoshop	Adobe
2	U23ICCX02	Adobe Animate	Adobe
3	U23ICCX03	Adobe Dreamweaver	Adobe
4	U23ICCX04	Adobe After Effects	Adobe
5	U23ICCX05	Adobe Illustrator	Adobe
6	U23ICCX06	Adobe InDesign	Adobe
7	U23ICCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23ICCX08	Autodesk Inventor - ACU	Autodesk
9	U23ICCX09	Autodesk Revit - ACU	Autodesk
10	U23ICCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23ICCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23ICCX12	Autodesk Maya - ACU	Autodesk
13	U23ICCX13	Cloud Security Foundations	AWS
14	U23ICCX14	Cloud Computing Architecture	AWS
15	U23ICCX15	Cloud Foundation	AWS
16	U23ICCX16	Cloud Practitioner	AWS
17	U23ICCX17	Cloud Solution Architect	AWS
18	U23ICCX18	Data Engineering	AWS
19	U23ICCX19	Machine Learning Foundation	AWS
20	U23ICCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23ICCX21	Advance Programming Using C	CISCO
22	U23ICCX22	Advance Programming Using C ++	CISCO
23	U23ICCX23	C Programming	CISCO
24	U23ICCX24	C++ Programming	CISCO
25	U23ICCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23ICCX26	CCNP Enterprise: Core Networking	CISCO
27	U23ICCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23ICCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23ICCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23ICCX30	Fundamentals Of Internet of Things	CISCO
31	U23ICCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23ICCX32	Java Script Programming	CISCO
33	U23ICCX33	NGD Linux Essentials	CISCO
34	U23ICCX34	NGD Linux I	CISCO
35	U23ICCX35	NGD Linux II	CISCO
36	U23ICCX36	Advance Java Programming	Ethnotech
37	U23ICCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23ICCX38	Angular JS	Ethnotech
39	U23ICCX39	Catia	Ethnotech
40	U23ICCX40	Communication Skills for Business	Ethnotech
41	U23ICCX41	Coral Draw	Ethnotech
42	U23ICCX42	Data Science Using R	Ethnotech
43	U23ICCX43	Digital Marketing	Ethnotech
44	U23ICCX44	Embedded System Using C	Ethnotech



45	U23ICCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23ICCX46	English For IT	Ethnotech
47	U23ICCX47	Plaxis	Ethnotech
48	U23ICCX48	Sketch Up	Ethnotech
49	U23ICCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23ICCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23ICCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23ICCX52	IOT Using Python	Ethnotech
53	U23ICCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23ICCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23ICCX55	Software Testing	Ethnotech
56	U23ICCX56	MX-Road	Ethnotech
57	U23ICCX57	CLO 3D	Ethnotech
58	U23ICCX58	Solid works	Ethnotech
59	U23ICCX59	Staad Pro	Ethnotech
60	U23ICCX60	Total Station	Ethnotech
61	U23ICCX61	Hydraulic Automation	Festo
62	U23ICCX62	Industrial Automation	Festo
63	U23ICCX63	Pneumatics Automation	Festo
64	U23ICCX64	Agile Methodologies	IBM
65	U23ICCX65	Block Chain	IBM
66	U23ICCX66	Devops	IBM
67	U23ICCX67	Artificial Intelligence	ITS
68	U23ICCX68	Cloud Computing	ITS
69	U23ICCX69	Computational Thinking	ITS
70	U23ICCX70	Cyber Security	ITS
71	U23ICCX71	Data Analytics	ITS
72	U23ICCX72	Databases	ITS
73	U23ICCX73	Java Programming	ITS
74	U23ICCX74	Networking	ITS
75	U23ICCX75	Python Programming	ITS
76	U23ICCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23ICCX77	Network Security	ITS & Palo alto
78	U23ICCX78	MATLAB	MathWorks
79	U23ICCX79	Azure Fundamentals	Microsoft
80	U23ICCX80	Azure AI (AI-900)	Microsoft
81	U23ICCX81	Azure Data (DP -900)	Microsoft
82	U23ICCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23ICCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23ICCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23ICCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23ICCX86	Microsoft Excel	Microsoft
87	U23ICCX87	Microsoft Excel Expert	Microsoft
88	U23ICCX88	Securities Market Foundation	NISM
89	U23ICCX89	Derivatives Equity	NISM
90	U23ICCX90	Research Analyst	NISM
91	U23ICCX91	Portfolio Management Services	NISM
92	U23ICCX92	Cyber Security	Palo alto



93	U23ICCX93	Cloud Security	Palo alto
94	U23ICCX94	PMI – Ready	PMI
95	U23ICCX95	Tally – GST & TDS	Tally
96	U23ICCX96	Advance Tally	Tally
97	U23ICCX97	Associate Artist	Unity
98	U23ICCX98	Certified Unity Programming	Unity
99	U23ICCX99	VR Development	Unity



Dr. L. M. Varalakshmi

**Annexure – IV****ABILITY ENHANCEMENT COURSES – SKILL ENHANCEMENT COURSES (SEC)**

Sl. No	Course Code	Course Title
1.	U23ICS301	<b>Skill Enhancement Course 1 *</b>
		• Troubleshooting of Electronic Equipments
		• Calibration of Measuring Instruments
		• Application of Arduino
2.	U23ICS402	<b>Skill Enhancement Course 2 *</b>
		• Applications using Raspberry Pi
		• PLC Programming
		• AutoCAD for Instrumentation

**\* Any one Skill Enhancement course to be selected from SEC 1 and SEC 2.**



## Annexure – V

## HONOURS PROGRAMME - SENSORS TECHNOLOGY

COURSE DETAILS											
Sl. No.	Semester	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
<b>Theory</b>											
1	IV	U23ICH401	Design of Sensors and Transducers	PC	3	1	0	4	25	75	100
2	V	U23ICH502	Smart Sensors and Actuators	PC	3	1	0	4	25	75	100
3	VI	U23ICH603	Data acquisition and communication	PC	3	1	0	4	25	75	100
4	VII	U23ICH704	Instrumentation System Design	PC	3	1	0	4	25	75	100
5	VIII	U23ICH805	Industrial Internet of Things	PC	3	1	0	4	25	75	100
<b>Total</b>								<b>20</b>	<b>125</b>	<b>375</b>	<b>500</b>
<b>Equivalent NPTEL courses##</b>											
1	Sensors and Actuators							<b>3</b>	<b>12 Weeks Course</b>		
2	Optical Fiber Sensors							<b>3</b>			
3	Transducers for Instrumentation							<b>3</b>			
4	Introduction to Internet of Things							<b>3</b>			
5	Design for Internet of Things							<b>3</b>			

## The student shall be given an option to earn 3 credits through one equivalent 12 week NPTEL course instead of any one course listed for honours degree programme that should be completed before the commencement of eighth semester. The equivalent courses are subject to change based on its availability as per NPTEL course list.

## Academic Curriculum 2023 (R-2023)

Department	<b>Mathematics</b>			Programme: <b>B.Tech.</b>						
Semester	<b>I</b>			Course Category: <b>BS</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23MATC01</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Engineering Mathematics – I</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to ALL Branches Except CSBS)										
Prerequisite	Basic Mathematics									
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the concept of Eigen values and Eigen vectors, Diagonalization of a Matrix							<b>K3</b>	
	<b>CO2</b>	Solve higher order differential equations							<b>K3</b>	
	<b>CO3</b>	Understand the different types of partial differential equations							<b>K3</b>	
	<b>CO4</b>	Know about the Applications of double and triple integrals							<b>K3</b>	
	<b>CO5</b>	Gain the knowledge about Vector Calculus and its Applications							<b>K3</b>	
<b>UNIT – I</b>	<b>Matrices</b>						<b>Periods:12</b>			
Rank of a Matrix – Systems of Linear Equations – Characteristic equation – Cayley Hamilton Theorem – Eigen values and Eigen vectors of a real Matrix – Diagonalization of Matrices.										<b>CO1</b>
<b>UNIT – II</b>	<b>Differential Equations (Higher Order)</b>						<b>Periods:12</b>			
Linear Differential equations of higher order with constant coefficients – Euler's linear equation of higher order with variable coefficients – Method of Variation of parameters.										<b>CO2</b>
<b>UNIT – III</b>	<b>Functions Of Several Variables</b>						<b>Periods:12</b>			
Partial derivatives – Total derivatives – Maxima and Minima of two variables – Lagrange's Method of multipliers.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Multiple Integrals</b>						<b>Periods:12</b>			
Multiple Integrals – Change of order of integration (Cartesian form). Applications: Area as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).										<b>CO4</b>
<b>UNIT – V</b>	<b>Vector Calculus</b>						<b>Periods:12</b>			
Gradient – Divergence and Curl – Directional derivatives – Irrotational and Solenoidal vector fields – Properties (Statement only) – Gauss Divergence Theorem and Stoke's Theorem (without proofs).										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 60</b>		
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>1. M.K. Venkataraman, "Engineering Mathematics", The National Publishing Company, 2<sup>nd</sup> Edition, 2016.</li> <li>2. N. P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9<sup>th</sup> Edition, 2018.</li> <li>3. S.Narayanan and T.K. Manickavasagam Pillay, "Differential Equations and its Applications", Viswanathan. S, Printers &amp; Publishers Pvt Ltd, 2009.</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>1. G. Balaji, "Matrices and Calculus (Engineering Mathematics – I)" Balaji Publications, 9th Edition June 2023</li> <li>2. A. Singaravelu, "Engineering Mathematics – I", Meenakshi publications, 1998.</li> <li>3. Erwin Kreyszig, "Advanced Engineering Mathematics ", Wiley, 10<sup>th</sup> Edition, 2019.</li> <li>4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6<sup>th</sup> Edition, 2018.</li> <li>5. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3<sup>rd</sup> Edition, 2019.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li>1. <a href="http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra-slides-systems-of-equation-handout.pdf">http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra-slides-systems-of-equation-handout.pdf</a></li> <li>2. <a href="http://www.math.cum.edu/~wn0g/2ch6a.pdf">http://www.math.cum.edu/~wn0g/2ch6a.pdf</a></li> <li>3. <a href="https://nptel.ac.in/courses/122/104/122104017/">https://nptel.ac.in/courses/122/104/122104017/</a></li> <li>4. <a href="https://nptel.ac.in/courses/111/106/111106051/">https://nptel.ac.in/courses/111/106/111106051/</a></li> <li>5. <a href="https://nptel.ac.in/courses/111/108/111108081/">https://nptel.ac.in/courses/111/108/111108081/</a></li> </ol>										

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
5	2	2	1	-	-	-	1	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Physics / Chemistry</b>			Programme: <b>B.Tech.</b>						
Semester	<b>I / II</b>			Course Category: <b>BS</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23BSTC01</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Physical Science for Engineers</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to all Branches)										
Prerequisite	Physics of 12 <sup>th</sup> standard or equivalent / Chemistry of 12 <sup>th</sup> standard or equivalent.									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Understand the basic of properties of magnetic, dielectric and superconductors.								<b>K2</b>
	<b>CO2</b>	Identify the wave nature of the particles, physical significance of wave functions								<b>K3</b>
	<b>CO3</b>	Understand the basic principles of laser and fiber optics communication								<b>K2</b>
	<b>CO4</b>	Understand and familiar with the water treatment.								<b>K2</b>
	<b>CO5</b>	Understand the electrode potential for its feasibility in electrochemical reaction and uses of various batteries.								<b>K2</b>
	<b>CO6</b>	Understand the specific operating condition under which corrosion occurs and suggest a method to control corrosion.								<b>K2</b>
<b>SECTION A - PHYSICS</b>										
<b>UNIT-I</b>	<b>Magnetic, Dielectric and Superconducting Materials</b>						<b>Periods: 8</b>			
Introduction to magnetic materials, Ferromagnetism- Domain Theory-Types of energy-Hysteresis-Hard and Soft magnetic materials-ferrites-Dielectric materials -Types of polarization – Langevin-Debye equation -Frequency effects on polarization-Dielectric breakdown- Ferroelectric materials -Superconducting materials and their properties.										<b>CO1</b>
<b>UNIT-II</b>	<b>Quantum Mechanics</b>						<b>Periods: 7</b>			
Matter Waves - de Broglie Wavelength - Uncertainty Principle –Physical Significance of wave functions - Schrodinger wave Equation - Time Dependent - Time Independent - Application to Particle in a One Dimensional Box - Tunnel Diode.										<b>CO2</b>
<b>UNIT-III</b>	<b>Laser And Fiber Optics</b>						<b>Periods: 7</b>			
Lasers - Principles of Laser - Spontaneous and Stimulated Emissions - Einstein's Coefficients - Population Inversion and Laser Action –components of laser - Types of Lasers - NdYAG, CO <sub>2</sub> laser, GaAs Laser Fiber Optics - Principle and Propagation of light in optical fiber - Numerical aperture and acceptance angle - Types of optical fibers (material, refractive index, mode)										<b>CO3</b>
<b>SECTION B – CHEMISTRY</b>										
<b>UNIT-IV</b>	<b>Water And Its Treatment</b>						<b>Periods: 8</b>			
Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD. Desalination of brackish water: Reverse osmosis-disadvantages of using hard water in boiler - Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment–Ion exchange demineralization and zeolite process.										<b>CO4</b>
<b>UNIT-V</b>	<b>Electrochemical Cells and Storage Devices</b>						<b>Periods: 8</b>			
Galvanic cells, single electrode potential, standard electrode potential, electrochemical series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen, calomel and Ag/AgCl. Batteries and fuel cells: Types of batteries- alkaline battery-lead storage battery- nickel-cadmium battery- fuel cell H <sub>2</sub> -O <sub>2</sub> fuel cell-applications.										<b>CO5</b>
<b>UNIT-VI</b>	<b>Corrosion</b>						<b>Periods: 7</b>			
Corrosion –Introduction - factors – types – chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspects – electrochemical protection – sacrificial anode method and impressed current cathodic method. Uses of inhibitors, metallic coating – anodic coating, cathodic coating. Metal cladding, Electroplating of Copper and electroless plating of nickel.										<b>CO6</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>			<b>Total Periods: 45</b>	
<b>Text Books</b>										
1. V Rajendran, "Engineering Physics", TMH, New Delhi , 2 <sup>nd</sup> Edition ,2011. 2. S.S Dara – "A text book of Engineering Chemistry" -. S.Chand Publications, 15 <sup>th</sup> Edition, 2021 3. C.Jain, Monica Jain "Engineering Chemistry", Dhanpat Rai Pub. Co., New Delhi, 17 <sup>th</sup> Edition (2015).										
<b>Reference Books</b>										
1. R.Murugesan, "Modern Physics", S. Chand &Co, New Delhi 2006. 2. William D Callister Jr., "Material Science and Engineering", John Wiley and sons, 6 <sup>th</sup> Edition, 2009.										

Department of Instrumentation and Control Engineering



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

3. Jain & Jain "Engineering chemistry", DhanpatRai Publishing Company. 23<sup>rd</sup> Edition, 2022
4. Mars Fontana "Corrosion Engineering", July 2017
5. JinaRedlin, "Handbook of Electrochemistry", March 28, 2005

**Web References**

1. [https://www.sciencedaily.com/terms/materials\\_science.htm](https://www.sciencedaily.com/terms/materials_science.htm).
2. [https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials\\_science.html](https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials_science.html).
3. <https://study.com/academy/lesson/semiconductors-superconductors-definition-properties.html>
4. <https://mechanicalc.com/reference/engineering-materials>
5. [http://ndl.ethernet.edu.et/bitstream/123456789/89589/1/%5BPerez\\_N.%5D\\_Electrochemistry\\_and\\_corrosion%28BookZZ.org%29.pdf](http://ndl.ethernet.edu.et/bitstream/123456789/89589/1/%5BPerez_N.%5D_Electrochemistry_and_corrosion%28BookZZ.org%29.pdf)

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
2	3	2	3	2	-	-	-	-	-	-	-	-	-	-	-
3	3	2	3	2	-	-	-	-	-	-	-	-	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
6	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Civil / Mechanical</b>			Programme: <b>B.Tech.</b>						
Semester	<b>I / II</b>			Course Category: <b>ES</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ESTC01</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Basics of Civil and Mechanical Engineering</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
<b>(Common to ECE, EEE, ICE, MECH, CIVIL Branches)</b>										
Prerequisite	<b>Basic Science</b>									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Understand the types of buildings and materials.								<b>K2</b>
	<b>CO2</b>	Summarize on the various components of buildings and surveying concepts								<b>K2</b>
	<b>CO3</b>	Identify the various infrastructure facilities								<b>K2</b>
	<b>CO4</b>	To familiarize the working principles of IC engines and automobile systems								<b>K2</b>
	<b>CO5</b>	To understand about the power generation systems and its components								<b>K1</b>
	<b>CO6</b>	To acquire knowledge about the various machining process.								<b>K2</b>

**SECTION A - CIVIL ENGINEERING**

<b>UNIT - I</b>	<b>Buildings And Buildings Materials</b>	<b>Periods: 08</b>
Buildings – Definition – Classification according to NBC-plinth area, Floor area, carpet area, floor space index - Development of Smart cities - Green building, Benefits from green building. Building Materials - stone, brick, cement, cement mortar, concrete, steel, Timber - their properties and uses		<b>CO1</b>
<b>UNIT - II</b>	<b>Buildings Components and Surveying</b>	<b>Periods: 08</b>
Various Buildings Components and their functions. Foundation: function and types - Brick masonry, Stone Masonry and its types – Floors, Roofs and its types. Surveying: Objects – Classification – Principles – Measurements of Distances and areas – Leveling		<b>CO2</b>
<b>UNIT - III</b>	<b>Basic Infrastructure</b>	<b>Periods: 07</b>
Roads and Bridges – types, components advantage and disadvantages. Railways - Permanent way and its elements. Sources of Water - Quality of Water- Domestic sewage Treatment – Rain Water harvesting – Dams - site selection for dam construction, types of dams.		<b>CO3</b>

**SECTION B – MECHANICAL ENGINEERING**

<b>UNIT- IV</b>	<b>Internal And External Combustion Systems</b>	<b>Periods: 08</b>
IC engines – Classification – Working principles – Diesel and Petrol Engines: Two stroke and four stroke engines – merits and demerits. Steam generators (Boilers) – Classification – Constructional features (of only low-pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.		<b>CO4</b>
<b>UNIT- V</b>	<b>Power Generation Systems, Refrigeration and Air Conditioning System</b>	<b>Periods: 07</b>
Power plants: Thermal – Nuclear, Hydraulic, Solar, Wind, Geothermal, Wave, Tidal and Ocean Thermal Energy Conversion systems - Functions, Applications - Schemes and layouts (Description only) Refrigeration and Air Conditioning System: 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.		<b>CO5</b>
<b>UNIT- VI</b>	<b>Manufacturing Process</b>	<b>Periods: 07</b>
Lathe - types, Specifications, Operations of a centre lathe. Casting - Pattern making, Allowances, Green sand and dry sand moulding, casting defects. Welding - Arc and Gas welding process, brazing and soldering (process description only).		<b>CO6</b>
<b>Lecture Periods: 45</b>	<b>Tutorial Periods: -</b>	<b>Practical Periods: -</b>
		<b>Total Periods: 45</b>

**Text Books**

1. Dr. S. Jayakumar, "Basic Civil Engineering", Aagash Neka Publications, 2011
2. G Shanmugam, MS Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education, 1st Edition, 2018.
3. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.

**Reference Books**

## Academic Curriculum 2023 (R-2023)

1. M.P. Poonia, S.C. Sharma and T.R. Banga, Basic Mechanical Engineering, Khanna Publishing House 2018.
2. S.S.Bhavikatti, Basic Civil engineering, New Age International Ltd. 2018.
3. V. Rameshbabu, Basic Civil & Mechanical Engineering, VRB Publishers Private Limited, January 2017.
4. Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, Pearson Publication, 7th Edition, 2014.
5. Gopi Satheesh, Basic Civil engineering, Pearson Publications, 3rd Edition, 2015.

**Web References**

1. <https://nptel.ac.in/courses/112107291/>
2. <https://nptel.ac.in/courses/112103/112103262/>
3. <https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/lecture-notes/>
4. <https://nptel.ac.in/courses/105102088/>
5. <https://nptel.ac.in/courses/105104101/>

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
2	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
3	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
5	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



## Academic Curriculum 2023 (R-2023)

Department	<b>Computer Science and Engineering</b>			Programme: <b>B.Tech</b>						
Semester	<b>I</b>			Course Category: <b>ES</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23CSTC02</b>			Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Problem Solving Approach</b>			<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to CSE, ICE and CCE)										
Prerequisite	NIL									
Course Outcomes	<b>After completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Explain the basic concepts of computational thinking and problem solving.							<b>K2</b>	
	<b>CO2</b>	Explain basic concepts of algorithm and data organization.							<b>K2</b>	
	<b>CO3</b>	Illustrate algorithmic solution to problem solving.							<b>K3</b>	
	<b>CO4</b>	Explain the concepts of array, merging, sorting & searching.							<b>K2</b>	
<b>CO5</b>	Implement recursive algorithm to solve problems.							<b>K3</b>		
<b>UNIT-I</b>	<b>Computational Thinking and Logic-Solving Problems</b>						<b>Periods: 9</b>			
Computational Thinking – Information and Data – Converting Information into Data – Data Capacity – Data Types and Encoding – Logic-Solving Problems – Limits of Computation – Pseudocode and Flow Chart.										<b>CO1</b>
<b>UNIT-II</b>	<b>Algorithmic Thinking and Data Organization</b>						<b>Periods: 9</b>			
Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns – Pseudocode and Flow Chart.										<b>CO2</b>
<b>UNIT-III</b>	<b>Fundamental Algorithms and Factoring Methods</b>						<b>Periods: 9</b>			
Fundamental Algorithms: Exchanging – Counting – Summing – Factorial Computation – Fibonacci Sequence – Reversing the Digit-Base Conversion – Character to number conversion. Factorial Methods: Finding Square Root – Greatest Common Divisor – Prime Number – Prime Factor – Pseudocode and Flow Chart.										<b>CO3</b>
<b>UNIT-IV</b>	<b>Array, Merging, Sorting and Searching</b>						<b>Periods: 9</b>			
Array Techniques: Introduction – Array order reversal – Array Counting or Histogramming – Maximum and Minimum of a Set – Removal of Duplicate – Partitioning – Longest monotone. Sorting and searching: Sorting by Bubble, Selection, Insertion. Searching: Linear, Binary – Pseudocode and Flow Chart.										<b>CO4</b>
<b>UNIT-V</b>	<b>Text Processing, Pattern Searching and Recursive Algorithms</b>						<b>Periods: 9</b>			
Key word Searching – Text Line Adjustment – Linear Pattern Search – Sub Linear Pattern Search. Recursion: Towers of Hanoi – Sample Generation – Combination Generation – Permutation Generation – Pseudocode and Flow Chart.										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>										
1. David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman & Hall/CRC Textbooks in Computing, 2014.										
2. R.G.Dromey, "How to solve it by Computer", PHI, 2008.										
3. Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA, 2008.										
<b>Reference Books</b>										
1. Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education, 2018.										
2. Don McAdam, Roger Winn, "A Problem-solving Approach", Prentive Hall Canada; 2 <sup>nd</sup> Edition, 2017.										
3. V Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012.										
4. Sham Tickoo "A Problem-solving Approach", Delmar/Cengage Learning, 2009.										
5. Harold Abelson & Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997.										
<b>Web References</b>										
1. <a href="https://www.edx.org/learn/problem-solving">https://www.edx.org/learn/problem-solving</a>										
2. <a href="https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html">https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html</a>										
3. <a href="https://www.classcentral.com/course/problem-solving-skills-6687">https://www.classcentral.com/course/problem-solving-skills-6687</a>										

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	1	-	-	-	1	-	-	1	3	2	3
2	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
3	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
4	2	1	-	-	1		-	-	-	-	-	1	3	2	3
5	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B. Tech.</b>						
Semester	<b>I</b>			Course Category: <b>PC</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ICT101</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Fundamentals of Electrical Machines</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to all Branches)										
Prerequisite	Physics									
Course Outcomes	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Gain Knowledge about the basic concepts of magnetic circuits.								<b>K2</b>
	<b>CO2</b>	Describe the working of transformer, auto transformer and assess the regulation and efficiency of transformer.								<b>K2</b>
	<b>CO3</b>	Demonstrate the operation of DC machines and their performance characteristics.								<b>K3</b>
	<b>CO4</b>	Explain the working concept of single phase, three phase induction motor and analyze the operating behavior of induction motor								<b>K3</b>
	<b>CO5</b>	Understand the working concepts of special machines								<b>K3</b>
<b>UNIT-I</b>	<b>Magnetic Circuits (Qualitative Treatment Only)</b>						<b>Periods: 09</b>			
Definition of MMF, Flux and Reluctance - Leakage Factor - Reluctances in Series and Parallel (Series and Parallel Magnetic Circuits) - Electromagnetic Induction - Fleming's Rule - Lenz's Law - Faraday's laws - statically and dynamically induced EMF - Self and mutual inductance - Analogy of Electric and Magnetic Circuits.										<b>CO1</b>
<b>UNIT-II</b>	<b>Transformers (Qualitative Treatment Only)</b>						<b>Periods: 09</b>			
Construction and Principle of operation of Single Phase Transformer - EMF Equation - Phasor Diagram on No Load and Loaded Transformer -Equivalent Circuit - Regulation and Efficiency. Introduction to auto transformers.										<b>CO2</b>
<b>UNIT-III</b>	<b>D.C Machines (Qualitative Analysis Only)</b>						<b>Periods: 09</b>			
Construction, Principles of operation of DC Generators - Types –EMF Equation - Performance Characteristics of Series and Shunt Generators.										<b>CO3</b>
DC Motor - Torque Equation- Speed - Torque Characteristics of Series and Shunt Motors – Speed Control methods and Applications. Need for starter – types.										
<b>UNIT-IV</b>	<b>Induction Motors (Qualitative Treatment Only)</b>						<b>Periods: 09</b>			
Constructional Details of Three Phase Induction Motor - Slip Ring and Squirrel Cage Rotor- Principle of operation- Torque Equation - Torque / Slip Characteristics - Starters - Applications Introduction to Single Phase Induction Motors - Capacitor Start Capacitor Run Motor -Shaded Pole Motor.										<b>CO4</b>
<b>UNIT-V</b>	<b>Synchronous Machines And Special Machines (Qualitative Treatment Only)</b>						<b>Periods: 09</b>			
Principles of Alternator - Construction Details - Types Special Machines: Stepper motor- AC and DC Servomotor - Permanent Magnet Synchronous Motor - Brushless D.C Motor - Construction, Working and Applications.										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods:-</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>										
1. J.B. Gupta, "Theory and Performance of Electrical Machines", S.K. Kataria & Sons, 4th Edition, 2013.										
2. B.L. Theraja and A.K. Theraja, "A Text Book of Electrical Technology, Vol. II", S. Chand & Company Ltd., 2010.										
3. R.K. Rajput, "Electrical Engineering" Lakshmi Publications Pvt Limited, 4th Edition, 2018.										
<b>Reference Books</b>										
1. S.K. Bhattacharya, "Electrical Machines", Tata Mc Graw Hill Company Ltd, 4th Edition, 2014.										
2. D P Kothari and I.J Nagarath, "Electrical Machines", McGraw Hill Education(India) Private Limited, Fifth edition, 2019.										
3. Nagsarkar, T. K., Sukhija, M. S. Principles of Basic Electrical Engineering. Canada: Oxford University Press, 2018.										
4. Edward Hughes "Electrical and Electronic Technology", Pearson Education, 10th Edition, 2011.										
5. Abhijit Chakrabarti and Sudipta Debnath, "Electrical Machines", McGraw- Hill Education, 2015										
6. Janardanan, E. Special Electrical Machines. India: PHI Learning, 2014										
<b>Web References</b>										
1. <a href="https://www.electricaltechnology.org/">https://www.electricaltechnology.org/</a>										
2. <a href="https://nptel.ac.in/courses/108105053/">https://nptel.ac.in/courses/108105053/</a>										
3. <a href="https://www.youtube.com/watch?v=FAjM4C7dssM">https://www.youtube.com/watch?v=FAjM4C7dssM</a>										

\* TE – Theory Exam, LE – Lab Exam



## Academic Curriculum 2023 (R-2023)

## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	2	-	-	-	-	-	-	-	2	3	2	2
2	3	2	1	2	-	-	-	-	-	-	-	2	3	2	2
3	3	2	1	2	-	-	-	-	-	-	-	2	3	2	2
4	3	2	1	2	-	-	-	-	-	-	-	2	3	2	2
5	3	2	1	2	-	-	-	-	-	-	-	2	3	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>English</b>			Programme: <b>B.Tech.</b>						
Semester	<b>First</b>			Course Category : HS		End Semester Exam Type:TE				
Course Code	U23ENBC01			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Communicative English - I</b>			<b>2</b>	<b>-</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>
<b>(Common to ALL Branches except CSBS)</b>										
Prerequisite	Basics of English Language									
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the communication flow in organization and its objectives							<b>K2</b>	
	<b>CO2</b>	Write the technical contents with grammatically precise sentences							<b>K2</b>	
	<b>CO3</b>	Articulate with correct pronunciation and overcome vernacular impact in speaking							<b>K3</b>	
	<b>CO4</b>	Express opinions confidently in formal and informal communicative contexts							<b>K2</b>	
	<b>CO5</b>	Attend interview with assertiveness							<b>K3</b>	
<b>UNIT- I</b>	<b>Workstead Communication</b>						<b>Periods:10</b>			
Communication, Definition, Process, Channels, Barriers, Strategies for Effective Communication, Verbal and Nonverbal Communication - Listening, Types, Barriers, Enhancing Listening Skills - Bibliography: Book, Journal and Internet References										<b>CO1</b>
<b>UNIT- II</b>	<b>Common Errors In Writing And Comprehension Strategies</b>						<b>Periods:10</b>			
Subject Verb Agreement, Misplaced Modifiers, Squinting Modifiers, Dangling Modifier, Fused Sentence, Comma Splice, Sentence Fragment - Reading Comprehension: Technical passage, Strategies: Skimming, Scanning, Intensive and Extensive Reading, Prediction, and Contextual Meaning										<b>CO2</b>
<b>UNIT- III</b>	<b>Phonetics</b>						<b>Periods:10</b>			
Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non-silent Letters, Intonation, Spelling Rules and Words often misspelled, Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue										<b>CO3</b>
<b>UNIT- IV</b>	<b>Communication Practice-I</b>						<b>Periods:15</b>			
<b>List of Exercises</b>										<b>CO4</b>
<b>Listening:</b> Self Introduction videos										
<b>Speaking:</b> Self-Introduction, Extempore, and Role Play										
<b>Reading:</b> Non-Technical Comprehension Passage										
<b>Writing:</b> Common Errors in Writing										
<b>UNIT-V</b>	<b>Interpersonal Communication-I</b>						<b>Periods:15</b>			
<b>List of Exercises</b>										<b>CO5</b>
<b>Listening:</b> Speech Sounds, Interview Videos										
<b>Speaking:</b> Debate, Structured Group Discussion, and Conversation										
<b>Reading:</b> Commonly Confused Words										
<b>Writing:</b> Transcription										
<b>Lecture Periods:30</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods:30</b>		<b>Total Periods:60</b>		
<b>Text Books</b>										
1. Richa Mishra , RatnaRao, "A textbook of English Language Communication Skills", Macmillan Publishers India Private Ltd., Revised Edition 2021.										
2. Rizvi M. Ashraf, "Effective Technical Communication", New Delhi: Tata-McGraw-Hill Publishing Company Limited, 4th Edition, 2010.										
3. Balasubramanian T, "English Phonetics for Indian students workbook", 2nd Edition, Trinity Press, 2016.										
<b>Reference Books</b>										
1. N.P.Sudharshana, C. Savitha," English for Engineers", Cambridge University Press, 2018.										
2. Raman, Meenakshi, and Sharma, Sangeetha, "Technical Communication - Principles and Practice", 3rd Edition, Oxford University Press, 2017.										
3. Comfort, Jeremy,etal., "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge, Reprint 2011.										
4. Wren & Martin, "High School English Grammar and Composition", S Chandh &Co. Ltd, 2015.										
5. Boove, Courtland L, "Business Communication Today", Pearson Education, New Delhi,2002.										
<b>Web References</b>										
1. <a href="https://lemongrad.com/subject-verb-agreement-rules/">https://lemongrad.com/subject-verb-agreement-rules/</a>										
2. <a href="https://opentextbc.ca/advancedenglish/chapter/misplaced-and-dangling-modifiers/">https://opentextbc.ca/advancedenglish/chapter/misplaced-and-dangling-modifiers/</a>										
3. <a href="https://www.hitbullseye.com/Reading-Comprehension-Tricks.php">https://www.hitbullseye.com/Reading-Comprehension-Tricks.php</a>										

4. <https://www.softwaretestinghelp.com/how-to-crack-the-gd/>
5. <https://worldscholarshipvault.com/neutralize-mother-tongue-interference/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
5	1	-	-	-	-	-	-	-	1	3	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Methods**

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20( to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical					
Continuous Assessment Internal Evaluation			End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)			30 marks		
Listening (L)*	10		Listening (L)*	10	40
Speaking(S)	5		Speaking(S)	5	
Reading(R)*	10		Reading(R)*	10	
Writing(W)*	5		Writing(W)*	5	

- LRW components of Practical can be evaluated through Language Lab Software



## Academic Curriculum 2023 (R-2023)

Department	<b>Mechanical Engineering</b>	Programme: <b>B.Tech.</b>						
Semester	<b>I / II</b>	Course Category : <b>ES</b>				End Semester Exam Type: <b>LE</b>		
Course Code	<b>U23ESPC02</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Design Thinking and IDEA Lab</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>

(Common to ALL Branches)

Prerequisite	Basic Knowledge of Science							
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Demonstrate a comprehensive understanding of the tools and inventory associated with the IDEA Lab.						<b>K2</b>
	<b>CO2</b>	Develop proficiency in ideation techniques to generate creative and innovative solutions for various design challenges and problems						<b>K3</b>
	<b>CO3</b>	Acquire practical knowledge of mechanical and electronic fabrication processes, including hands-on experience with machinery, tools, and techniques used in the manufacturing and assembly of physical components.						<b>K3</b>
	<b>CO4</b>	Cultivate the skills necessary for developing innovative and desirable products, including the ability to integrate user needs, market trends, and technological advancements into the design process.						<b>K4</b>
	<b>CO5</b>	Apply iterative design methodologies to refine and improve solutions based on feedback, user testing, and evaluation of functional, aesthetic, and usability aspects						<b>K4</b>

**Design process:** Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs, Insight-leaving from the lives of others/standing on the shoes of others, Observation

**Design team-Team formation, Conceptualization:** Visual thinking, Drawing/sketching, New concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, Wooden model, Clay model, 3D printing; Experimenting/testing.

Sustainable product design, Ergonomics, Semantics, Entrepreneurship/business ideas, Product Data Specification, establishing target specifications, Setting the final specifications. Design projects for teams.

**List of Lab Activities and Experiments**

- Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
- Machining of 3D geometry on soft material such as softwood or modelling wax.
- 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
- 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
- 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
- Familiarity and use of welding equipment.
- Familiarity and use of normal and wood lathe.
- Embedded programming using Arduino and/or Raspberry Pi.
- Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
- Discussion and implementation of a mini project.
- Documentation of the mini project (Report and video).

**Lecture Periods: -**      **Tutorial Periods: -**      **Practical Periods: 30**      **Total Periods: 30**

**Text Books**

- Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd
- Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.

**Reference Books**

- Ulrich and Eppinger, Product Design and Development, McGraw Hill, 3rd Edition, 2004
- The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018.
- The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan, Weldon Owen; 2017.

Department of Instrumentation and Control Engineering



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

4. . Paul Horowitz and Winfield Hill "The Art of Electronics" Cambridge University Press. 3rd edition.
5. Paul Sherz and Simon Monk "Practical Electronics for Inventors". .. McGraw Hill. 4th edition
6. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education.
7. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill.
8. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer
9. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and Distributors, 5th Edition,2002.

**Web References**

1. [https://onlinecourses.nptel.ac.in/noc23\\_mg72](https://onlinecourses.nptel.ac.in/noc23_mg72)

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	2	-	-	2	-	3	2	-	-	-
2	3	3	3	2	2	2	-	-	2	-	3	2	-	-	-
3	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
4	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
5	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B. Tech.</b>						
Semester	<b>I</b>			Course Category: <b>ES</b>		*End Semester Exam Type: <b>LE</b>				
Course Code	<b>U23ICP101</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Problem Solving Approach Laboratory</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to all Branches)										
Prerequisite	Basics of Mathematics									
Course Outcomes	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	To understand and apply algorithmic thinking.								<b>K2</b>
	<b>CO2</b>	To demonstrate proficiency in flowcharting.								<b>K2</b>
	<b>CO3</b>	To implement a programming solution and apply mathematical concepts.								<b>K3</b>
	<b>CO4</b>	To develop problem-solving skills.								<b>K3</b>
	<b>CO5</b>	To enhance debugging and error handling.								<b>K3</b>
<b>List of Experiments</b>										
<ol style="list-style-type: none"> <li>Write an algorithm, Flowchart, pseudo code and program to find the sum of two numbers</li> <li>Write an algorithm, Flowchart, pseudo code and program to find the average of three numbers</li> <li>Write an algorithm, Flowchart, pseudo code and program to find an odd number between 1 to 50.</li> <li>Write an algorithm, Flowchart, pseudo code and program to find even numbers between 1 to 50.</li> <li>Write an algorithm, Flowchart, pseudo code and program to swap two numbers with and without a temporary variable.</li> <li>Write an algorithm, Flowchart, pseudo code and a program to convert temperature from Celsius to Fahrenheit and vice versa.</li> <li>Write an algorithm, Flowchart, pseudo code and program to find the Area and Perimeter of a Square and Circle.</li> <li>Write an algorithm, Flowchart, pseudo code and program to find Simple Interest and compound interest.</li> <li>Write an algorithm, Flowchart, pseudo code and program to find the roots of a quadratic equation.</li> <li>Write an algorithm, Flowchart, pseudo code and program to check if the given year is leap year or not</li> <li>Write an algorithm, Flowchart, pseudo code and program to check if the given number is Armstrong or not.</li> <li>Write an algorithm, Flowchart, pseudo code and program to generate the first n terms of the Fibonacci sequence.</li> </ol>										
<b>Lecture Periods:</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods: 45</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman &amp; Hall/CRC Textbooks in Computing, 2014.</li> <li>R.G. Dromey, "How to solve it by Computer", PHI, 2008.</li> <li>Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA, 2008.</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education, 2018.</li> <li>Don Mc Adam, Roger Winn, "A Problem-solving Approach", Prentive Hall Canada; 2<sup>nd</sup> Edition, 2017.</li> <li>V Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012.</li> <li>Sham Tickoo "A Problem-solving Approach", Delmar/Cengage Learning, 2009.</li> <li>Harold Abelson &amp; Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li>Geeks for Geeks (<a href="http://www.geeksforgeeks.org">www.geeksforgeeks.org</a>)</li> <li>Stack Overflow (<a href="http://stackoverflow.com">stackoverflow.com</a>)</li> <li>W3Schools (<a href="http://www.w3schools.com">www.w3schools.com</a>)</li> </ol>										

\* TE – Theory Exam, LE – Lab Exam





**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	3	-	-	-	-	-	-	2	-	2	1
2	3	3	3	2	3	-	-	-	-	-	-	2	-	2	1
3	3	3	3	2	3	-	-	-	-	-	-	2	-	2	1
4	3	3	3	2	3	-	-	-	-	-	-	2	-	2	1
5	3	3	3	2	3	-	-	-	-	-	-	2	-	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B. Tech.</b>						
Semester	<b>I</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICP102</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Fundamentals of Electrical Machines Laboratory</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to all Branches)									
Prerequisite									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Acquire knowledge on wiring electrical circuits such as domestic and Go-Down wiring.							<b>K2</b>
	<b>CO2</b>	Apply appropriate measurement techniques for the calculation of power and performance of machines.							<b>K2</b>
	<b>CO3</b>	Estimate the performance of DC and induction motor by conducting load and no-load tests.							<b>K3</b>
	<b>CO4</b>	Acquire hands on experience of conducting speed tests on DC machines and obtaining their characteristic curve using standard analytical as well as graphical methods							<b>K3</b>
	<b>CO5</b>	Acquire hands on experience of conducting various tests on alternators.							<b>K3</b>
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>Wiring circuits for <ol style="list-style-type: none"> <li>Go Down wiring</li> <li>Staircase</li> <li>Ceiling fan and fluorescent lamp wiring</li> </ol> </li> <li>Load test on single phase transformer</li> <li>Open circuit and short circuit test on single phase transformer</li> <li>Load characteristics of dc shunt motor</li> <li>Speed control of dc shunt motor.</li> <li>Load characteristics of dc series motor</li> <li>Open circuit characteristics of separately excited dc shunt generator</li> <li>Load test on single phase Induction motor</li> <li>Load test on single phase Alternator</li> <li>Study of DC and AC starters</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods: 45</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>J.B. Gupta, "Theory and Performance of Electrical Machines", S.K. Kataria &amp; Sons, 4th Edition, 2013.</li> <li>B.L. Theraja and A.K. Theraja, "A Text Book of Electrical Technology, Vol.II", S. Chand &amp; Company Ltd., 2010.</li> <li>R.K. Rajput, "Electrical Engineering" Lakshmi Publications Pvt Limited, 4th Edition, 2018.</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>Umesh Agarwal, "Laboratory Manual Basic Electrical Engineering, 2019", Notion Press, 1<sup>st</sup> Edition, 2019.</li> <li>P. Tiwari &amp; S. Sairola S.K. Kataria &amp; Sons, "Electrical Engineering Laboratory Practice ", Reprint 2010 Edition 2010.</li> <li>Kothari, D. P., Umre, B. S. Laboratory Manual for Electrical Machines. India: I.K. International Publishing House Pvt. Limited, 2016</li> <li>Chaturvedi, D. K. (2010). Electrical Machines Lab Manual with MATLAB Programs. India: Laxmi Publications Pvt Limited.</li> <li>Janardanan, E. Special Electrical Machines. India: PHI Learning, 2014.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/108/108/108108076/">https://nptel.ac.in/courses/108/108/108108076/</a></li> <li><a href="https://nptel.ac.in/courses/108/105/108105017/">https://nptel.ac.in/courses/108/105/108105017/</a></li> <li><a href="http://www.cittumkur.org/eee/em.pdf">http://www.cittumkur.org/eee/em.pdf</a></li> </ol>									

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	-		-			-			3	2	2
2	3	2	3	1	1		-			-			3	2	2
3	3	2	3	1	1		-			-			3	2	2
4	3	2	3	1	1		-			-			3	2	2
5	3	2	3	1	1		-			-			3	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Students shall choose an international certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>				
Semester	<b>I</b>		Course Category: <b>MC</b>		End Semester Exam Type: -		
Course Code	<b>U23ICM101</b>		Periods/Week		Credit	Maximum Marks	
	L	T	P	C	CAM	ESE	TM
Course Name	<b>Induction Programme</b>		<b>2 weeks</b>		Non-Credit	-	-
Prerequisite	-						
Course Outcomes	<b>On completion of the course, the students will be able to</b>						BT Mapping (Highest Level)
	<b>CO1</b>	Develop holistic attitude and harmony in the individual, family, and Society					<b>K2</b>
	<b>CO2</b>	Acquire grammar skills and capable to write and speak English confidently					<b>K2</b>
	<b>CO3</b>	Understand the basic concepts in Mathematics and Programming					<b>K2</b>
	<b>CO4</b>	Know about the art and culture, language and literature of this vast secular nation					<b>K2</b>
<b>CO5</b>	Identify the inherent talent and develop it professionally					<b>K3</b>	
<b>UNIT-I</b>	<b>Universal Human Values</b>			<b>Periods: 12</b>			
Welcome and Introductions - Getting to know each other, Aspirations and Concerns - Individual Academic and Career, Expectations of Family, Peers, Society, Nation, Fixing one's Goals, Self-Management - Self-confidence, Peer Pressure, Time Management, Anger, Stress Personality Development, Self-improvement, Health - Health issues, Healthy diet, Healthy lifestyle, Hostel life, Relationships - Home sickness, Gratitude towards Parents, Teachers and others Ragging and interaction, Competition and Cooperation, Peer Pressure, Society - Participation in Society, Natural Environment - Participation in Nature, Sum Up - Role of Education, Need for a Holistic Perspective, Self-evaluation and Closure - Sharing and feedback.							<b>CO1</b>
<b>UNIT-II</b>	<b>Proficiency in English</b>			<b>Periods: 12</b>			
Communication skills - Prognostic test on Grammar - Synonyms, Antonyms, Tenses, Sentence Completion, Idioms and Phrases, One- word Substitution, Homophones, Homonyms, Use of Prepositions, Subject-verb Agreement - Writing - Paragraph writing, Letter writing, Essay writing, Story Development.							<b>CO2</b>
<b>UNIT-III</b>	<b>Bridge Course in Mathematics and C Programming</b>			<b>Periods: 12</b>			
<b>Mathematics:</b> Fundamentals of differential and integral calculus: Theory and Practice, Limit of function - Fundamental results on limits - Continuity of a function - Concept of differentiation - Concept of derivative - Slope of a curve -Differentiation Techniques - Derivatives of elementary functions from first principle - Derivatives of inverse functions - Logarithmic differentiation - Method of substitution - Differentiation of parametric functions -Differentiation of implicit functions - Higher order derivatives. Integrals of functions containing linear functions -Method of integration (Decomposition method, method of substitution, integration by parts) - Definite integrals. Simple definite integrals - Properties of Definite integrals - Reduction formulae - Area and volume - Length of curve - surface area of a solid.							<b>CO3</b>
<b>C Programming:</b> Features of C and its basic Structure - Keywords - constants - variables - operators - Data types - Formatted input and output statements - Control and Looping statement - Arrays - Functions - Strings - writing simple C programs.							
<b>UNIT-IV</b>	<b>Literary Activities</b>			<b>Periods: 12</b>			
Team building activities - Quiz - Oral Exercises - Group discussion, Debate, Extempore, Role play,							<b>CO4</b>
<b>UNIT-V</b>	<b>Creative Arts</b>			<b>Periods: 12</b>			
Introduction to painting and renowned artworks -Documentary and Short films -Music -Vocal, Instrumental - Dance - Classical, Cinematic - Mimicry - Mime.							<b>CO5</b>
<b>Lecture Periods: 60</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Lecture Periods: 60</b>	
<b>Reference Books</b>							
1. R.R Gaur, R. Asthana, G.P. Bagaria," A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2 <sup>nd</sup> Revised Edition, 2019.							
2. Kumar Mohan R, "English Grammar for all (Functional and Applied Grammar)", Unicare Academy, 2022.							
3. Seely, John," Oxford A-Z of Grammar and Punctuation, Oxford Publication, 2013.							
4. B.V. Ramana," Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6 <sup>th</sup> Edition, 2018.							
5. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.							
6. E. Balagurusamy, "PROGRAMMING IN ANSI C", Mc Graw Hill, 8 <sup>th</sup> Edition, 2019.							
7. Dr.K.K.Pillay,"Social Life of Tamils", A joint publication of TNTB & ESC and RMRL							
8. R.Balakrishnan, "Journey of Civilization",Roja muthiah research publishers, 1 <sup>st</sup> Edition 2019							
9. - , , , , , : , 2002.							
10. - , , , , , : , 2002.							
11. - , , , , , : , 2002.							
<b>Web References</b>							



## Academic Curriculum 2023 (R-2023)

1. <http://www.newsociety.com/Books/S/Slow-isBeautiful>
2. <https://www.aplustopper.com/formal-letter/>
3. <https://www.javatpoint.com/c-programming-language-tutorial>
4. <http://www.math.cum.edu/~wn0g/2ch6a.pdf>
5. <https://education.nsw.gov.au/teaching-and-learning/curriculum/creative-arts>

## Evaluation methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Mathematics</b>			Programme : <b>B.Tech.</b>						
Semester	<b>II</b>			Course Category: <b>BS</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23MATC02</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Engineering Mathematics – II</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to ALL Branches Except CSBS, FT)										
Prerequisite	Basic Mathematics									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Convert a periodic function into series form.							<b>K2</b>	
	<b>CO2</b>	Compute Fourier transforms of various functions.							<b>K3</b>	
	<b>CO3</b>	Solve Differential Equations using Laplace transforms.							<b>K3</b>	
	<b>CO4</b>	Apply inverse Laplace transform of simple functions.							<b>K3</b>	
	<b>CO5</b>	Solve difference equations using Z – transforms.							<b>K3</b>	
<b>UNIT – I</b>	<b>Fourier Series</b>					<b>Periods:12</b>				
Dirichlet's conditions – General Fourier series – Odd and Even functions – Half-Range sine series and cosine series – Change of intervals – Parseval's Identity.										<b>CO1</b>
<b>UNIT – II</b>	<b>Fourier Transforms</b>					<b>Periods:12</b>				
Fourier Transforms and its inverse – Properties of Fourier Transform (without proof) – Fourier sine and cosine Transforms and their properties (excluding proof).										<b>CO2</b>
<b>UNIT – III</b>	<b>Laplace Transforms</b>					<b>Periods:12</b>				
Laplace transforms of elementary functions and Periodic functions – Basic properties (excluding proof) – Laplace transforms of derivatives and integrals – Initial and final value theorems.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Inverse Laplace Transforms</b>					<b>Periods:12</b>				
Definition of inverse Laplace Transforms – Convolution theorem (excluding proof) – Solutions of Linear Ordinary Differential Equations of second order with constant coefficients.										<b>CO4</b>
<b>UNIT – V</b>	<b>Z – Transforms</b>					<b>Periods:12</b>				
Z-transforms – Elementary Properties – Inverse Z-transforms (using partial fraction and Residues) – Solution of difference equations using Z - transform.										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>			<b>Total Periods: 60</b>	
<b>Text Books</b>										
1. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, New Delhi, 3 <sup>rd</sup> Edition, 2011.										
2. C. P. Gupta, Shree Ram Singh. M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2 <sup>nd</sup> Edition, 2016.										
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand, New Delhi, 22 <sup>nd</sup> Edition 2019.										
<b>Reference Books</b>										
1. N.P. Bali and Dr. Manish Goyal, "A TEXTBOOK OF ENGINEERING MATHEMATICS", UNIVERSITY SCIENCE PRESS, India, 8 <sup>th</sup> Edition, 2016.										
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearson India Education services Pvt. Ltd, India 1 <sup>st</sup> 2017.										
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10 <sup>th</sup> Edition, 2019.										
4. G. Balaji, "Engineering Mathematics - Transforms and Partial Differential Equations", G. Balaji Publishers, 18 <sup>th</sup> Edition, 2022.										
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2017.										
<b>Web References</b>										
1. <a href="https://nptel.ac.in/courses/111105121/">https://nptel.ac.in/courses/111105121/</a>										
2. <a href="https://nptel.ac.in/courses/111105035/">https://nptel.ac.in/courses/111105035/</a>										
3. <a href="https://nptel.ac.in/courses/11110711">https://nptel.ac.in/courses/11110711</a>										
4. <a href="https://swayam.gov.in/nd1_noc20_ma17/preview">https://swayam.gov.in/nd1_noc20_ma17/preview</a>										
5. <a href="https://nptel.ac.in/courses/111/103/111103021/">https://nptel.ac.in/courses/111/103/111103021/</a>										

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	1	-	-	-	-	-	1	1	-	-
2	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
5	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi



## Academic Curriculum 2023 (R-2023)

Department	<b>Computer Science and Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>II</b>			Course Category: <b>ES</b>	*End Semester Exam Type: <b>TE</b>					
Course Code	<b>U23CSTC01</b>			Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Programming in C</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to All Branches)										
Prerequisite	-									
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Comprehend the basics of Computers.							<b>K2</b>	
	<b>CO2</b>	Illustrate the concepts of control structures and looping.							<b>K2</b>	
	<b>CO3</b>	Implement programs using arrays and functions.							<b>K3</b>	
	<b>CO4</b>	Demonstrate programs using Structure and Pointers.							<b>K3</b>	
<b>CO5</b>	Build the programs using Union and File management Operations.							<b>K3</b>		
<b>UNIT-I</b>	<b>Introduction</b>						<b>Periods: 09</b>			
Generation and Classification of Computers - Block Diagram of a Computer –Categories of Software – Network Structure - Number System – Binary – Decimal – Conversion – Algorithm – Pseudo code – Flow Chart.										
<b>UNIT-II</b>	<b>C Programming Basics</b>						<b>Periods: 09</b>			
Introduction to 'C' Programming – Basic structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements.										
<b>UNIT-III</b>	<b>Arrays And Functions</b>						<b>Periods: 09</b>			
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations- Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion										
<b>UNIT-IV</b>	<b>Structure And Pointers</b>						<b>Periods: 09</b>			
Structure Introduction – Structure definition – Structure declaration – Structure within a structure –Self Referential Structure. Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays -Pointer to Function –Pointer and Structure- Simple programs.										
<b>UNIT-V</b>	<b>Unions And Files</b>						<b>Periods: 09</b>			
Union Introduction - Programs Using Structures and Unions – Introduction to File - File Operations - File Input and Output Functions - Random Access to Files - File System Functions - Command Line Arguments- Storage Classes - Pre-Processor Directives- Dynamic Memory Functions.										
<b>Lecture Periods: 45</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8thEdition,2019.</li> <li>YashvantKanetkar, "Let us C", BPB Publications, 16th Edition, 2017</li> <li>Herbert Schildt, "C: The Complete Reference", McGraw Hill, FourthEdition,2014</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>Vikas B. Agarwal Jyoti P. Mirani, "Computer Fundamentals , Nirali Prakashan Aug-2019,</li> <li>Ashok N Kamthane, "Computer Programming", Pearson education, 2<sup>nd</sup> Impression,2012.</li> <li>VikasVerma, "A Workbook on C ", Cengage Learning, 2<sup>nd</sup> Edition,2012.</li> <li>P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Sri Krishna Publications, 4<sup>th</sup> Edition, 2012.</li> <li>PradipDev, ManasGhoush, "Programming in C", Oxford University Press, 2<sup>nd</sup> Edition, 2011.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li><a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a></li> <li><a href="https://www.geeksforgeeks.org/c-language-set-1-introduction/">https://www.geeksforgeeks.org/c-language-set-1-introduction/</a></li> <li><a href="https://www.tutorialspoint.com/cprogramming">https://www.tutorialspoint.com/cprogramming</a></li> <li><a href="https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c">https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c</a></li> <li><a href="https://nptel.ac.in/courses/106/104/106104128/">https://nptel.ac.in/courses/106/104/106104128/</a></li> </ol>										

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Biomedical Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>II</b>			Course Category: <b>PC</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23BMTC01</b>			Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Electron Devices and Circuits</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to BME and ICE Branches)										
Prerequisite	<b>Physics</b>									
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Explains the operation of basic semiconductor diodes and its applications							<b>K2</b>	
	<b>CO2</b>	Classify the transistors configuration and analyze its characteristics							<b>K3</b>	
	<b>CO3</b>	Distinguish the special semiconductor devices and its applications							<b>K3</b>	
	<b>CO4</b>	Analyze the transistor using small signal model and understand the operation of different categories of amplifiers							<b>K4</b>	
	<b>CO5</b>	Investigate the operation of different types of feedback amplifiers and oscillators							<b>K3</b>	
<b>UNIT-I</b>	<b>Diodes and their Applications</b>						<b>Periods: 9</b>			
Formation of P-N junction diode- forward and reverse biased P-N junction, V-I characteristics, diffusion and transient capacitance, Zener diode and its reverse characteristics, Zener breakdown, Avalanche breakdown, Rectifiers-half wave rectifier, full wave rectifier with and without filters, Clippers, Clampers, Voltage Regulator – Zener diode as Voltage regulator.										<b>CO1</b>
<b>UNIT-II</b>	<b>Bipolar Junction Transistor and Field Effect Transistor</b>						<b>Periods:9</b>			
<b>Bipolar Junction Transistor:</b> Principle of operation –Current components, CE, CB, and CC Configurations, Input and output characteristics – Cut-off, active and saturation region, Transistor as a switch, Transistor as an amplifier. <b>Field Effect Transistor:</b> Classification - JFET and its characteristics – JFET parameters, MOSFET – principle of operation- Depletion and enhancement modes.										<b>CO2</b>
<b>UNIT-III</b>	<b>Special Semiconductor Devices</b>						<b>Periods: 9</b>			
Unijunction Transistor (UJT), Tunnel diode, Varactor diode, Schottky diode, Gunn diode, Light Emitting Diode (LED), Laser, PIN diode, Photo diode, Liquid Crystal Display (LCD), Silicon Control Rectifier (SCR), DIAC, TRIAC, Applications of SCR, DIAC, TRIAC.										<b>CO3</b>
<b>UNIT-IV</b>	<b>Amplifiers</b>						<b>Periods: 9</b>			
BJT small signal low frequency model using h parameter – Analysis of CE, CB and CC amplifiers, RC coupled amplifiers, Cascade amplifier, Power amplifiers –Class A, Class B, Class AB, Push Pull, Class C amplifiers.										<b>CO4</b>
<b>UNIT-V</b>	<b>Feedback Amplifiers and Oscillators</b>						<b>Periods: 9</b>			
Feedback amplifiers-Properties of negative feedback-voltage and current, Series and Shunt feedback, Positive feedback, Barkhausen Condition for oscillations, Classification of Oscillators, RC phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>			<b>Total Periods: 45</b>	
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>1. S.Salivahanan, N. Suresh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata Mcgraw-Hill, 2nd Edition, 2017</li> <li>2. Jacob Millman, Chritos C Halkias, " Electronic Devices and Circuits", McGraw Hill, 4<sup>th</sup> edition, 2015</li> <li>3. R S Sedha "A Textbook of Applied Electronics" S.Chand Publications, 2008</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits Theory, Pearson, 9th Edition, 2013.</li> <li>2. Thomas L. Floyd, "Electronic devices" Prentice Hall", 10<sup>th</sup> Edition, 2018</li> <li>3. Kumar and Jain, "Electronic devices and Circuits" PHI learning, 2016</li> <li>4. Bakshi, U. A., &amp; Godse, A. P., "Electronic Devices and Circuits", Technical Publications, 2008</li> <li>5. Anil Kumar Maini., Varsha Agrawal, "Electronic devices and circuits", Wiley, 2019</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/117/103/117103063/">https://nptel.ac.in/courses/117/103/117103063/</a></li> <li>2. <a href="https://nptel.ac.in/courses/108108122/">https://nptel.ac.in/courses/108108122/</a></li> <li>3. <a href="https://www.electronics-tutorials.ws/">https://www.electronics-tutorials.ws/</a></li> </ol>										

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	2	-	-	-	-	-	-	3	-	2
2	3	2	2	1	2	2	-	-	-	-	-	-	3	-	2
3	3	2	2	1	2	2	-	-	-	-	-	-	3	-	2
4	3	3	2	1	2	2	-	-	-	-	-	-	3	-	2
5	3	3	2	1	2	2	-	-	-	-	-	-	3	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>II</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICT202</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Transducer Engineering</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Basics of Electronics								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Comprehend the basic concepts of measurement systems and sensors							<b>K2</b>
	<b>CO2</b>	Analyze the resistive transducers and apply them for various applications							<b>K2</b>
	<b>CO3</b>	Gain knowledge on the types of inductive transducers and apply them for various applications							<b>K2</b>
	<b>CO4</b>	Classify and apply various types of capacitive transducers and analyze various types of sensors							<b>K2</b>
	<b>CO5</b>	Gain knowledge on Smart Sensors							<b>K3</b>
<b>UNIT-I</b>	<b>Measurements and Instrumentation of Transducers</b>					<b>Periods: 09</b>			
Functional blocks of a Measurement system. Fundamental and Derived units –Standards of Measurement. Classification of Errors: Error analysis, Statistical methods, Classification of transducers – Selection of transducers.									<b>CO1</b>
<b>UNIT-II</b>	<b>Variable Resistance Transducers</b>					<b>Periods: 09</b>			
<b>Resistive Transducers:</b> Resistance Potentiometer: Loading effect on Potentiometer. Resistance Strain gauges: Un bonded and Bonded type strain gauges. <b>Applications:</b> Temperature Measurement using RTD and Thermistor – Gas flow measurement using hot-wire Anemometer –measurement of moisture in solids and wood – level measurement using resistive tapes.									<b>CO2</b>
<b>UNIT-III</b>	<b>Variable Inductance Transducers</b>					<b>Periods: 09</b>			
<b>Inductive Transducers:</b> Simple inductance and Mutual inductance Transducers – Induction Potentiometers. Linear Variable Differential Transformers – Variable reluctance transducers – Eddy current transducers. <b>Applications:</b> Displacement measurement - Thickness Measurement – Position Measurement.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Variable Capacitance Transducers and Other Transducers</b>					<b>Periods: 09</b>			
<b>Capacitive Transducers:</b> Variable area type – Variable dielectric type – Variable distance type. Applications: Capacitive Thickness Transducers– Capacitive Moisture Transducers - Capacitive Level Transducer. <b>Other Transducers:</b> Piezoelectric Transducers - Magnetostrictive Transducers – Hall Effect Transducers – Photo electric Transducer									<b>CO4</b>
<b>UNIT-V</b>	<b>Smart Sensors</b>					<b>Periods: 09</b>			
Introduction to Smart Sensors and Semiconductor sensors: MEMS, Nano-sensors, SQUID Sensors- <b>Applications:</b> Environmental Monitoring sensors (Water Quality & Air Pollution) - Sensor for Motion and Position Measurement: GPS, SONAR, Thermal Sensors.									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>									
1. S.Vijayachitra, Transducers engineering, 2 <sup>nd</sup> Edition, Prentice Hall of India, 2016. 2. Patranabis, D., "Sensors and Transducers", 2 <sup>nd</sup> Edition, Prentice Hall India Pvt. Ltd, 2010. 3. Murthy D.V.S., "Transducer and Instrumentation", PHI, 2 <sup>nd</sup> Edition, 2012.									
<b>Reference Books</b>									
1. Jacob Fraden , "Handbook of modern sensors physics, designs and applications", 5 <sup>th</sup> edition, Springer, 2015. 2. PavelRipka, "Modern sensors handbook", ISTE Ltd, 1 <sup>st</sup> edition, 2007. 3. Renganathan S., "Transducer Engineering" -Allied Publishers Limited, 2003 4. Doebelin E.A., "Measurement Systems: Applications and Design", 5 <sup>th</sup> Edition, Tata McGraw Hill Publishing Company, New Delhi,									

## Academic Curriculum 2023 (R-2023)

2008.

5. Sawhney A.K., "Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai & Sons, 18<sup>th</sup> Edition., 2010.**Web References**

1. <https://lecturenotes.in/subject/30/sensors-and-transducers-st>
2. <https://lecturenotes.in/notes/2143-notes-for-sensors-and-transducers-st-by-anita-mohanty>
3. <https://www.electronicshub.org/sensors-and-transducers-introduction/>
4. <https://lecturenotes.in/notes/2143-notes-for-sensors-and-transducers-st-by-anita-mohanty>

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3
2	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3
3	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3
4	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3
5	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>II</b>		Course Category: <b>HS</b>			End Semester Exam Type: -			
Course Code	<b>U23HSTC01</b>		Periods/Week		Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Universal Human Values -II</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	UHV-I: Universal Human Values-Introduction								
<b>Course Outcome</b>	The course will enable the student to							BT Mapping (Highest Level)	
	<b>CO1</b>	Aware of themselves, and their family, society and nature.						<b>K2</b>	
	<b>CO2</b>	Be responsible in life, and in handling problems while keeping human relationships and human nature in mind.						<b>K2</b>	
	<b>CO3</b>	Apply creativity in their education and develop holistic model.						<b>K2</b>	
	<b>CO4</b>	Apply what they have learnt to their real life.						<b>K2</b>	
	<b>CO5</b>	Be proficient to provide sustainable solutions to the problems in society and nature.						<b>K2</b>	
<b>UNIT-I</b>	<b>Introduction to Value Education</b>				<b>Periods:09</b>				
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Understanding Value Education - Self-exploration as the Process for Value Education -Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations									<b>CO1</b>
<b>UNIT-II</b>	<b>Harmony in the Human Being</b>				<b>Periods:09</b>				
Understanding Human being as the Co-existence of the Self and the Body-Distinguishing between the Needs of the Self and the Body-The Body as an Instrument of the Self-Understanding Harmony in the Self-Harmony of the Self with the Body- Programme to ensure self-regulation and Health									<b>CO2</b>
<b>UNIT-III</b>	<b>Harmony in the Family and Society</b>				<b>Periods:09</b>				
Harmony in the Family – the Basic Unit of Human Interaction- ‘trust’ – the Foundational Value in Relationship- ‘Respect’ – as the Right Evaluation-Other Feelings, Justice in Human-to-Human Relationship-Understanding Harmony in the Society-Vision for the Universal Human Order.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Harmony in the Nature/Existence</b>				<b>Periods:09</b>				
Understanding Harmony in the Nature-Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature-Realizing Existence as Co-existence at All Levels-The Holistic Perception of Harmony in Existence									<b>CO4</b>
<b>UNIT-V</b>	<b>Implications of the Holistic Understanding – a Look at Professional Ethics</b>				<b>Periods:09</b>				
Natural Acceptance of Human Values-Definitiveness of (Ethical) Human Conduct:- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics-Holistic Technologies, Production Systems and Management Models-Typical Case Studies-Strategies for Transition towards Value-based Life and Profession									<b>CO5</b>
<b>Lecture Periods:45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods:45</b>	
<b>Text Books</b>									
A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019.									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999</li> <li>2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.</li> <li>3. The Story of Stuff (Book).</li> <li>4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi</li> <li>5. Small is Beautiful - E. F Schumacher</li> <li>6. Slow is Beautiful - Cecile Andrews</li> <li>7. Economy of Permanence - J C Kumarappa</li> <li>8. Bharat Mein Angreji Raj – Pandit Sunderlal</li> <li>9. Rediscovering India - by Dharampal</li> <li>10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi</li> <li>11. India Wins Freedom - Maulana Abdul Kalam Azad</li> <li>12. Vivekananda - Romain Rolland (English)</li> <li>13. Gandhi - Romain Rolland (English)</li> </ol>									

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi



## Academic Curriculum 2023 (R-2023)

Department	<b>English</b>			Programme: <b>B.Tech.</b>						
Semester	<b>Second</b>			Course Category : HS		End Semester Exam Type: <b>TE</b>				
Course Code	U23ENBC02			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Communicative English - II</b>			<b>2</b>	<b>-</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>
<b>(Common to ALL Branches except CSBS)</b>										
Prerequisite	Basics of English Language									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	CO1	Draft effective written communication in professional environment							<b>K2</b>	
	CO2	Apply the mechanics of creative writing with precision and clarity							<b>K3</b>	
	CO3	Acquire language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation							<b>K2</b>	
	CO4	Develop language fluency and gain self-confidence							<b>K3</b>	
	CO5	Express thoughts and ideas with clarity and focus							<b>K2</b>	
<b>UNIT-I</b>	<b>Business Correspondence</b>						<b>Periods:10</b>			
Business Writing: Circular, Agenda, Memoranda, Notice, Instruction, Minutes, Email Writing ,Report Writing- Official and Demi Official Letters : Applying for Educational / Car / Home Loans / Joining Report, Leave Letter, Industrial Visit, In plant Training, Letter to the Editor, Calling for a quotation, Placing Order, Letter of Complaints, Letter seeking Clarification, Resume', Job Application Letter, Bio-data, CV										<b>CO1</b>
<b>UNIT-II</b>	<b>Functional Writing Skills</b>						<b>Periods:10</b>			
Four Modes of Writing, Sentence Structure , Art of condensation: Summary Writing and Note Making, Use of phrase and clause in sentence, Principles of paragraph writing, Techniques of Essay Writing, Jumbled Sentence, Paraphrasing										<b>CO2</b>
<b>UNIT-III</b>	<b>Etiquettes</b>						<b>Periods:10</b>			
Etiquette: Meaning, Kinds: Corporate Etiquette, Meeting Etiquette, Telephone Etiquette, Email Etiquette, Social Media Etiquette, Dining Etiquette, Communication Etiquette										<b>CO3</b>
<b>UNIT-IV</b>	<b>Communication Practice-II</b>						<b>Periods:15</b>			
<b>List of Exercises</b>										<b>CO4</b>
<b>Listening:</b> Letter writing tips										
<b>Speaking:</b> Just a Minute, Impromptu Speech, Contemporary Issues										
<b>Reading:</b> Variety of examples for Modes of Writing										
<b>Writing:</b> Different types of letters										
<b>UNIT-V</b>	<b>Interpersonal Communication-II</b>						<b>Periods:15</b>			
<b>List of Exercises</b>										<b>CO5</b>
<b>Listening:</b> Videos on different types of Etiquettes										
<b>Speaking:</b> Team Presentation, Negotiation Skills										
<b>Reading:</b> Phrases and Clauses										
<b>Writing:</b> Free writing on any given topic, Paraphrasing Practice										
<b>LecturePeriods:30</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods:30</b>		<b>Total Periods:60</b>		
<b>Text Books</b>										
1. PC Das, "Letter Writing including Official and Business Letters", New Central Book Agency, 2020.										
2. Kumar, Sanjay, Pushpalatha," Communication Skills". Oxford University Press, 2018.										
3. Raman, Meenakshi&Sangeetha Sharma," Communication Skills", New Delhi: OUP,2018.										
<b>Reference Books</b>										
1. Sahukar, Nimeran , Bhalla, Prem,, "The book of Etiquettes and Manners".PustakMahal Publisher, New Delhi; 1st Edition 2009.										
2. Gerson Sharon J, Steven M. Gerson, "Technical Writing Process and Product", Pearson Education Pvt. Ltd. 3 <sup>rd</sup> Edition, 2009.										
3. Grussendorf, Marion, "English for Presentations". Oxford University Press, Oxford, 2007.										
4. Seely John, "The Oxford Guide to Writing and Speaking", Oxford University Press, 2006.										
5. R.C. Sharma, Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill &Co.Ltd., New Delhi, 2001.										
<b>Web References</b>										
1. <a href="https://www.indeed.com/career-advice/finding-a-job/how-to-write-an-application-letter">https://www.indeed.com/career-advice/finding-a-job/how-to-write-an-application-letter</a>										
2. <a href="https://owlcation.com/humanities/Four-Types-of-Writing">https://owlcation.com/humanities/Four-Types-of-Writing</a>										
3. <a href="https://targetstudy.com/languages/english/paragraph-writing.html">https://targetstudy.com/languages/english/paragraph-writing.html</a>										
4. <a href="https://www.businessnewsdaily.com/8262-email-etiquette-tips.html">https://www.businessnewsdaily.com/8262-email-etiquette-tips.html</a>										

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Methods**

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20( to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical					
Continuous Assessment Internal Evaluation			End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)			30 marks		
Listening (L)*	10		Listening (L)*	10	40
Speaking(S)	5		Speaking(S)	5	
Reading(R)*	10		Reading(R)*	10	
Writing(W)*	5		Writing(W)*	5	

- LRW components of Practical can be evaluated through Language Lab Software

Department	<b>Mechanical</b>		Programme : <b>B.Tech.</b>						
Semester	<b>II</b>		Course Category: <b>ES</b>			End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ESPC03</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Engineering Graphics Using AutoCAD</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to all Branches)									
Prerequisite	-								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Familiarize with the fundamentals and standards of engineering graphics.							<b>K3</b>
	<b>CO2</b>	Perform drawing of basic geometrical constructions and multiple views of objects.							<b>K2</b>
	<b>CO3</b>	Visualize the isometric and perspective sections of simple solids.							<b>K3</b>
	<b>CO4</b>	Connect side view associate on front view.							<b>K4</b>
	<b>CO5</b>	Correlate sectional views and lateral surface developments of various solids.							<b>K4</b>
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.</li> <li>Drawing a Title Block with necessary text and projection symbol.</li> <li>Drawing 2D sketch by applying modify tools like fillet, mirror, array, etc.,</li> <li>Drawing front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.</li> <li>Drawing front view, top view and side view of objects from the given pictorial views (eg. Simple stool, V-block, Mixie Base).</li> <li>Drawing a plan of residential building (Two bed rooms, kitchen, hall, etc.)</li> <li>Drawing sectional views of prism, pyramid, cylinder, cone, etc,</li> <li>Drawing lateral surface development of prism, pyramid, cylinder, cone, etc,</li> <li>Drawing isometric projection of simple objects.</li> <li>Creating 3D model of simple object and obtaining 2D multi-view drawings.</li> <li>Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.</li> </ol>									
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>James D. Bethune, Engineering Graphics with AutoCAD A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020.</li> <li>NS Parthasarathy and Vela Murali, Engineering Drawing, Oxford university press, 2015.</li> <li>M.B Shah, Engineering Graphics, ITL Education Solutions Limited, Pearson <b>Education</b> Publication, 2011.</li> <li>Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017.</li> <li>Jeyapooan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd., 7th Edition, New Delhi, 2016.</li> <li>C M Agrawal, Basant Agrawal, Engineering Graphics, McGraw Hill, 2012.</li> <li>Dhananjay A. Jolhe, Engineering Drawing: With An Introduction To CAD McGraw Hill, 2016.</li> <li>James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li><a href="http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php">http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php</a></li> <li><a href="http://www.nptelvideos.in/2012/12/computer-aided-design.html">http://www.nptelvideos.in/2012/12/computer-aided-design.html</a></li> <li><a href="https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/">https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/</a></li> <li><a href="https://autocadtutorials.com">https://autocadtutorials.com</a></li> <li><a href="https://dwgmodels.com">https://dwgmodels.com</a></li> </ol>									

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

**Correlation Level: 1 - Low, 2 - Medium, 3 – High**

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Dr. L. M. Varalakshmi

Department	<b>Computer Science and Engineering</b>			Programme: <b>B.Tech.</b>			
Semester	<b>II</b>			Course Category: <b>ES</b>		*End Semester Exam Type: <b>LE</b>	
Course Code	<b>U23CSPC01</b>			Periods/Week		Credit	Maximum Marks
Course Name	<b>Programming In C Laboratory</b>			L	T	P	C
				<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
							CAM
							ESE
							TM
							<b>50</b>
							<b>50</b>
							<b>100</b>
(Common to all Branches)							
Prerequisite	-						
Course Outcomes	<b>On completion of the course, the students will be able to</b>						BT Mapping (Highest Level)
	<b>CO1</b>	Implement logical formulations to solve simple problems leading to specific applications.					<b>K3</b>
	<b>CO2</b>	Execute C programs for simple applications making use of basic constructs, arrays and strings.					<b>K3</b>
	<b>CO3</b>	Experiment C programs involving functions, recursion, pointers, and structures.					<b>K3</b>
	<b>CO4</b>	Demonstrate applications using sequential and random access file processing.					<b>K3</b>
	<b>CO5</b>	Build solutions for online coding challenges.					<b>K3</b>
<b>List of Exercises</b>						<b>Periods:09</b>	
<ol style="list-style-type: none"> <li>Create a C program to find the Area of the triangle.</li> <li>Develop a C program to read a three digit number and produce output like 1 hundreds 7 tens 2 units For an input of 172.</li> <li>Write a C program to check whether a given character is vowel or not using Switch – Case statement.</li> <li>Print the numbers from 1 to 10 along with their squares using C program.</li> <li>Demonstrate do—While loop in C to find the sum of 'n' numbers.</li> <li>Find the factorial of a given number using Functions in C.</li> <li>Write a C program to check whether a given string is palindrome or not?</li> <li>Write a C program to check whether a value is prime or not?</li> <li>Develop a C program to swap two numbers using call by value and call by reference.</li> <li>Construct a C program to find the smallest and largest element in an array.</li> <li>Implement matrix multiplication using C program.</li> <li>Create a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp.</li> <li>Develop a C program to remove all characters in a string except alphabets.</li> <li>Create a C program to find the sum of an integer array using pointers.</li> <li>Write a C program to find the Maximum element in an integer array using pointers.</li> <li>Construct a C program to display Employee details using Structures</li> <li>Write a C program to display the contents of a file on the monitor screen.</li> <li>Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.</li> <li>Write a C program to create two files with a set of values. Merge the two file contents to form a single file</li> <li>Create a C program to pass the parameter using command line arguments.</li> </ol>							
<b>Lecture Periods:</b>		<b>Tutorial Periods:</b>		<b>Practical Periods:30</b>		<b>Total Periods:30</b>	
<b>Reference Books</b>							
<ol style="list-style-type: none"> <li>Zed A Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016.</li> <li>Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", Pearson Education, First edition, 2011.</li> <li>Maureen Sprinkle Hubbard, "Problem Solving and Programming Concepts", Pearson, 9<sup>th</sup> Edition, 2011.</li> <li>Yashwanth Kanethkar, "Let us C", BPB Publications, 13<sup>th</sup> Edition, 2008.</li> <li>B.W.Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2<sup>nd</sup> Edition, 2006.</li> </ol>							
<b>Web References</b>							
<ol style="list-style-type: none"> <li><a href="https://alison.com/course/introduction-to-c-programming">https://alison.com/course/introduction-to-c-programming</a></li> <li><a href="https://www.geeksforgeeks.org/c-programming-language/">https://www.geeksforgeeks.org/c-programming-language/</a></li> <li><a href="http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf">http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf</a></li> <li><a href="https://www.tenouk.com/clabworksheet/clabworksheet.html">https://www.tenouk.com/clabworksheet/clabworksheet.html</a></li> <li><a href="https://fresh2refresh.com/c-programming/">https://fresh2refresh.com/c-programming/</a></li> </ol>							

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Dr. L. M. Varalakshmi

Department	<b>Biomedical Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>II</b>			Course Category: <b>PC</b>		*End Semester Exam Type: <b>LE</b>				
Course Code	<b>U23BMPC01</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Electron Devices and Circuits Laboratory</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to BME and ICE Branches)										
Prerequisite	-									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Demonstrate the characteristic of PN Junction diode and Zener diode							<b>K3</b>	
	<b>CO2</b>	Construct and analyze the applications of diodes							<b>K4</b>	
	<b>CO3</b>	Analyze the characteristics of different types of transistors and special diodes.							<b>K4</b>	
	<b>CO4</b>	Design the LC oscillators and analyze the frequency response of CE amplifier.							<b>K4</b>	
	<b>CO5</b>	Simulate the power amplifiers and feedback amplifiers.							<b>K3</b>	
<b>List of Experiments:</b>										
<ol style="list-style-type: none"> <li>1. Characteristics of PN Junction Diode and Zener Diode.</li> <li>2. Analysis of Half wave and Full wave Rectifiers.</li> <li>3. Analysis of wave shaping circuits (Clippers and Clampers).</li> <li>4. Characteristics of LED and Photo diode.</li> <li>5. Characteristics of BJT in CB configuration</li> <li>6. Characteristics of BJT in CE configuration</li> <li>7. Characteristics of JFET</li> <li>8. Negative resistance characteristics of UJT</li> <li>9. Characteristics of Thyristors</li> <li>10. Study the frequency response of CE Amplifier.</li> <li>11. Design and Testing of LC Oscillators.</li> <li>12. Simulation of Power Amplifiers and Feedback Amplifiers.</li> </ol>										
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: 30</b>		<b>Total Periods:30</b>		
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>1. Srinivasa Murthy, "Electronic Devices and Circuits Laboratory Manual", 4<sup>th</sup> Edition, October 2015</li> <li>2. David A.Bell," Lab Manual For Electronic Devices &amp; Circuits", Fourth edition, PHI learning private limited, January 2004</li> <li>3. Robert Boylestad , Louis Nashelsky, Franz Monssen , " Lab Manual for Electronic Devices and Circuit Theory", Pearson, 11<sup>th</sup> Edition, August 2012.</li> <li>4. Maheswari. L.K and Anand.M.M.S, "Laboratory Manual for Introductory Electronic Experiments", New Age, 2010.</li> <li>5. Muhammad H. Rashid "Introduction to PSpice using OrCAD for circuits and electronics, Pearson, 3<sup>rd</sup> Edition , 2004.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li>1. <a href="http://www.allaboutcircuits.com">www.allaboutcircuits.com</a></li> <li>2. <a href="http://www.circuitstoday.com">www.circuitstoday.com</a></li> <li>3. <a href="http://www.tutorialspoint.com">www.tutorialspoint.com</a></li> </ol>										

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	1	-	-	2	-	-	1	3	1	2
2	3	2	2	2	2	2	-	-	2	-	-	1	3	1	2
3	3	2	2	3	2	1	-	-	2	-	-	1	3	1	2
4	3	2	2	3	2	2	-	-	2	-	-	2	3	2	2
5	3	2	2	3	2	2	-	-	2	-	-	1	3	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Dr. L. M. Varalakshmi



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>II</b>		Course Category Code: <b>PC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICP203</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Transducer Engineering Laboratory</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Prerequisite	Basics in Electronics								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Acquaint knowledge on strain gauge, potentiometer and load cell							<b>K2</b>
	<b>CO2</b>	Analyze and understand the static and dynamic characteristics of thermocouple, thermistor and RTD.							<b>K3</b>
	<b>CO3</b>	Demonstrate the performance characteristics of capacitive and inductive type of transducers.							<b>K3</b>
	<b>CO4</b>	Acquire knowledge on energy harvesting transducers.							<b>K3</b>
	<b>CO5</b>	Select suitable sensors and transducers for various applications.							<b>K3</b>
<b>List of Experiments:</b>									
<ol style="list-style-type: none"> <li>1. Characteristics of Strain gauge and load cell.</li> <li>2. Characteristics of potentiometer.</li> <li>3. Characteristics of temperature transducer using RTD, Thermistor and Thermocouple.</li> <li>4. Characteristics of Filled in system thermometer</li> <li>5. Characteristics of LVDT.</li> <li>6. Angular displacement Measurement using capacitive transducers.</li> <li>7. Speed measurement using photoelectric tachometer.</li> <li>8. Pressure measurement using piezoelectric transducers.</li> <li>9. Measurement of Voltage, Current and Power using Hall Effect Sensor.</li> <li>10. Characteristics of I/P Converters.</li> <li>11. Characteristics of Optical Transducers.</li> <li>12. Measurement of position and error detector using synchro transmitter and Receiver</li> </ol>									
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Handbook of Laboratory Measurements and Instrumentation IFSA Publishing (2011)</li> <li>2. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18<sup>th</sup>Edition, Dhanpat Rai &amp; Company Private Limited, 2017.</li> <li>3. Renganathan. S, "Transducer Engineering", 4<sup>th</sup>edition Allied Publishers, Chennai, 2003.</li> <li>4. Sensors and transducers by Patranabis, 2<sup>nd</sup> Edition, 2003.</li> <li>5. John G. Webster, Sensors and Signal Conditioning, Wiley Inter Science, 2<sup>nd</sup>Edition, 2008</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://lecturenotes.in/subject/30/sensors-and-transducers-st">https://lecturenotes.in/subject/30/sensors-and-transducers-st</a></li> <li>2. <a href="https://lecturenotes.in/notes/2143-notes-for-sensors-and-transducers-st-by-anita-mohanty">https://lecturenotes.in/notes/2143-notes-for-sensors-and-transducers-st-by-anita-mohanty</a></li> <li>3. <a href="https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod2.pdf">https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod2.pdf</a></li> </ol>									

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	1	-	-	2	2	-	2	-	2	1	3	3	3
2	3	-	1	-	-	2	2	-	2	-	2	1	3	3	3
3	3	-	1	-	-	2	2	-	2	-	2	1	3	3	3
4	3	-	1	-	-	2	2	-	2	-	2	1	3	3	3
5	3	-	1	-	-	2	2	-	2	-	2	1	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

**U23ICC2XX****CERTIFICATION COURSE - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Hrs</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>50</b>

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100



Dr. L. M. Varalakshmi

## Academic Curriculum 2023 (R-2023)

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>II</b>		Course Category: <b>MC</b>			End Semester Exam Type: -			
Course Code	<b>U23ICM202</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Sports Yoga and NSS</b>		0	0	2	Non-Credit	100	-	100
Prerequisite	-								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility and relaxation.							<b>K2</b>
	<b>CO2</b>	Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.							<b>K2</b>
	<b>CO3</b>	Develop understanding of psychological problems associated with age and lifestyle.							<b>K2</b>
	<b>CO4</b>	Recognize the importance of national service in community development.							<b>K2</b>
	<b>CO5</b>	Convert existing skills into socially relevant life skills.							<b>K2</b>
<b>UNIT-I</b>	<b>Introduction To Physical Education</b>					<b>Periods: 06</b>			
Definition, Aims and Objectives of Physical Education - Changing trends in Physical Education <b>Physical Fitness, Wellness and Lifestyle:</b> Importance of Physical Fitness and Wellness - Components of Physical fitness - Components of Health related fitness - Components of wellness - Preventing Health Threats through Lifestyle Change - Concept of Positive Lifestyle.									<b>CO1</b>
<b>UNIT-II</b>	<b>Yoga And Lifestyle</b>					<b>Periods: 06</b>			
Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration and related Asanas (Sukhasana, Tadasana, Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra. Asanas as preventive measures – Hypertension – Obesity - Back Pain-Diabetes - Asthema.									<b>CO2</b>
<b>UNIT-III</b>	<b>Training And Planning In Sports</b>					<b>Periods: 06</b>			
Training - Warming up and limbering down-Skill, Technique and Style - Objectives of Planning – Tournament - Knock-Out, League/Round Robin and Combination. <b>Psychology and Sports</b> - Important of Psychology in Physical Education and Sports - Differentiate Between Growth and Development - Adolescent problems and their Management - Emotion: Concept, Type and Controlling of emotions - Concepts and Types of Aggressions in Sports - Psychological benefits of exercise - Anxiety and Fear and its effects on Sports Performance - Motivation, its type and techniques - Understanding Stress and Coping strategies									<b>CO3</b>
<b>UNIT-IV</b>	<b>Introduction To National Service Scheme</b>					<b>Periods: 06</b>			
Orientation of NSS volunteers: History, motto, symbol, awards, structure and activities of NSS - Days of National and International Importance - Sensitizing about the thrust areas and awareness activities - Importance of tree plantation and voluntary blood donation - The role of SHGs and NGOs in community development – CSR - Life skills and youth development-extension activities in HEIs - various clubs and schemes like RRC, ELC, YRC, UBA, SBA, etc.,									<b>CO4</b>
<b>UNIT-V</b>	<b>Community Issues And The Use Of Technology</b>					<b>Periods: 06</b>			
Common Problems of rural India - Technology development and its suitability – Sustainability - Value addition to agricultural products - Service learning and youth volunteering – Shramdaan - Campus cleaning - Field visit to nearby communities - village survey - Initiatives to clean and green environment - preservation of water bodies in adopted villages.									<b>CO5</b>
<b>Lecture Periods: -</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: 30</b>			<b>Total Periods: 30</b>		
<b>Reference Books</b>									
1. Brar Ajmer Singh, Gill Jagtar Singh, Bains Jagdish, "Modern Textbook of Physical Education Health and Sports- I", Kalyani Publishers, 6 <sup>th</sup> Edition, 2014.									
2. B.K.S. Iyengar, "Light on Yoga: The Definitive Guide to Yoga Practice", Thorsons Publishers, Thorsons Classics edition, 2015.									
3. Joseph, Siby K, Mahodaya, "Bharat Essays on Conflict Resolution", Institute of Gandhian Studies Publishers, 2007.									
4. Barman Prateeti, Goswami, "Document on Peace Education", Triveni Akansha Publishing House, New Delhi, 2009.									
5. Prof R.B.S. Verma, "Field Work Practicum in Social Work-Emerging Concerns", Rapid Publisher, Lucknow, 2020.									
6. Sibereisen, K, Richard M, "Lerner Approaches to Positive Youth Development", Sage Publications, New Delhi, 2007.									
7. Hoshiar Singh, "Administration of Rural Development in India", Sterling Publisher, the University of Michigan, 2009.									
<b>Web References</b>									
1. <a href="http://www.thebetterindia.com/140/national-service-scheme-nss">http://www.thebetterindia.com/140/national-service-scheme-nss</a>									
2. <a href="http://en.wikipedia.org/wiki/national-service-scheme">http://en.wikipedia.org/wiki/national-service-scheme</a> 19= <a href="http://nss.nic.in/adminstruct">http://nss.nic.in/adminstruct</a>									

3. <http://nss.nic.in>
4. <http://socialworknss.org/about.html>
5. Young Journal on Youth published by SAGE: <http://you.sagepub.com>

#### Evaluation methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

B.Tech. Instrumentation and Control Engineering



Dr. L. M. Varalakshmi

Department	<b>Mathematics</b>			Programme: <b>B.Tech.</b>						
Semester	<b>III</b>			Course Category Code: <b>BS</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23MATC03</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Probability and Statistics</b>			<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to All Branches Except CSBS)										
Prerequisite	Basic Probability									
Course Outcomes	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	CO1	Apply the concept of probability.								<b>K3</b>
	CO2	Solve the problem on Random variables.								<b>K3</b>
	CO3	Evaluate the correlation and Regression.								<b>K3</b>
	CO4	Find Correlation between variables.								<b>K3</b>
	CO5	Analyze the problems in small samples.								<b>K3</b>
<b>UNIT – I</b>	<b>Theory of Probability</b>						<b>Periods:12</b>			
Random Experiments - Sample Space - Exhaustive events- Axioms of probability – Conditional probability – Total probability – Bayes theorem.										<b>CO1</b>
<b>UNIT – II</b>	<b>Random Variables</b>						<b>Periods:12</b>			
Moments–Moment generating functions and their properties. Binomial distribution – Poisson distribution – Exponential distribution – Normal distribution (Excluding Derivation of Mean, Variance and MGF)										<b>CO2</b>
<b>UNIT – III</b>	<b>Design of Experiments</b>						<b>Periods:12</b>			
Analysis of variance: One way and two-way classifications. Correlation – Rank correlation and Regression.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Large Samples</b>						<b>Periods:12</b>			
Large Samples: Single Propositions – Difference of Proportions – Single Mean – Difference of Mean – Difference of Standard Deviations										<b>CO4</b>
<b>UNIT – V</b>	<b>Small Samples</b>						<b>Periods:12</b>			
Test for Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.										<b>CO5</b>
<b>Lecture Periods:45</b>			<b>Tutorial Periods:15</b>			<b>Practical Periods:-</b>		<b>Total Periods:60</b>		
<b>Text Books</b>										
1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 3 <sup>rd</sup> Edition, 2017.										
2. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill, 3 <sup>rd</sup> Edition, 2008.										
3. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, 2019.										
<b>Reference Books</b>										
1. Ravish R. Singh, Mukul Bhatt "Engineering Mathematics", McGraw-Hill, 1 <sup>st</sup> Edition, 2017.										
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning, 15 <sup>th</sup> Edition, 2019.										
3. Richard. A. Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9 <sup>th</sup> Edition, 2018.										
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, "An Introduction to Probability and Statistics", Wiley, 3 <sup>rd</sup> Edition 2008.										
<b>Web References</b>										
1. <a href="http://www.stat110.net">www.stat110.net</a>										
2. <a href="http://www.nptel.ac.in/courses/111105035">http://www.nptel.ac.in/courses/111105035</a> (R.V)										
3. <a href="http://www.probabilitycourse.com">http://www.probabilitycourse.com</a> .										
4. <a href="http://www.edx.org/Probability">www.edx.org/Probability</a>										
5. <a href="http://www2.aueb.gr/users/demos/pro-stat.pdf">http://www2.aueb.gr/users/demos/pro-stat.pdf</a>										

\* TE – Theory Exam, LE – Lab Exam



Dr. L. M. Varalakshmi

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	1	1	1
2	3	2	1	1	-	-	-	-	-	-	-	1	1	1	1
3	2	2	-	-	-	1	-	-	-	-	-	1	1	1	1
4	3	2	1	1	-	1	-	-	-	-	-	1	1	1	1
5	3	2	1	1	-	1	-	-	-	-	-	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Methods**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech</b>						
Semester	<b>III</b>		Course Category Code: <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ADTC01</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Programming in Python</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to All Branches)									
Prerequisite	NIL								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Interpret the basic concepts of Python programs.							<b>K2</b>
	<b>CO2</b>	Articulate the concepts of Sets, Dictionaries and Object-Oriented concepts.							<b>K2</b>
	<b>CO3</b>	Experiment with Numpy package.							<b>K3</b>
	<b>CO4</b>	Apply and analyze Data Manipulation with Pandas.							<b>K3</b>
	<b>CO5</b>	Illustrate programming concept for Visualization with Matplotlib.							<b>K3</b>
<b>UNIT-I</b>	<b>Introduction To Python</b>					<b>Periods: 09</b>			
Structure of Python Program – Underlying mechanism of Module Execution – Branching and Looping – Problem Solving Using Branches and Loops – Functions – Lambda Functions – Lists and Mutability – Problem Solving Using Lists and Functions.									<b>CO1</b>
<b>UNIT-II</b>	<b>Sequence Datatypes and Object-Oriented Programming</b>					<b>Periods: 09</b>			
Sequences – Mapping and Sets – Dictionaries. Classes: Classes and Instances – Inheritance – Exception Handling – Introduction to Regular Expressions using “re” module.									<b>CO2</b>
<b>UNIT-III</b>	<b>Using Numpy</b>					<b>Periods: 09</b>			
Basics of NumPy – Computation on NumPy – Aggregations – Computation on Arrays – Comparisons – Masks and Boolean Arrays – Fancy Indexing – Sorting Arrays – Structured Data: NumPy’s Structured Array.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Data Manipulation with Pandas</b>					<b>Periods: 09</b>			
Introduction to Pandas Objects – Data indexing and Selection – Operating on Data in Pandas – Handling Missing Data – Hierarchical Indexing – Combining Data Sets. Aggregation and Grouping – Pivot Tables –Vectorized String Operations – Working with Time Series – High Performance Pandas – eval() and query().									<b>CO4</b>
<b>UNIT-V</b>	<b>Visualization With Matplotlib</b>					<b>Periods: 09</b>			
Basic functions of Matplotlib – Simple Line Plot – Scatter Plot – Density and Contour Plots – Histograms – Binnings and Density – Customizing Plot Legends – Colour Bars – Three-Dimensional Plotting in Matplotlib.									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
1. Jake VanderPlas, “Python Data Science Handbook - Essential Tools for Working with Data”, O’Reilly Media Inc, 2016. 2. Zhang.Y, “An Introduction to Python and Computer Programming”, Springer Publications, 2016. 3. Wesley J Chun, “Core Python Programming”, Pearson Education, 2 <sup>nd</sup> Edition, 2006.									
<b>Reference Books</b>									
1. John Paul Mueller, Luca Massaron, “Python for Data Science for Dummies”, 2 <sup>nd</sup> Edition, John Wiley& Sons, 2019. 2. Jesus Rogel-Salazar, “Data Science and Analytics with Python”, CRC Press Taylor and Francis Group, 2017. 3. Brian Draper, “Python Programming A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language”, CreateSpace Independent Publishing Platform, 2016. 4. Mark Lutz, Laura Lewin, Frank Willison, “Programming Python”, O’Reilly Media, 3 <sup>rd</sup> Edition, 2006. 5. Gowrishankar S, Veena A, “Introduction to Python Programming”, CRC Press, 2018.									
<b>Web References</b>									
1. <a href="https://nptel.ac.in/courses/106/106/106106212/">https://nptel.ac.in/courses/106/106/106106212/</a> 2. <a href="https://www.geeksforgeeks.org/data-analysis-visualization-python/">https://www.geeksforgeeks.org/data-analysis-visualization-python/</a> 3. <a href="https://www.coursera.org/learn/python-data-analysis">https://www.coursera.org/learn/python-data-analysis</a> 4. <a href="https://www.python.org/">https://www.python.org/</a> 5. <a href="https://www.programiz.com/python-programming">https://www.programiz.com/python-programming</a>									





**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	2	1	3	-	-	-	-	-	-	-	2	2	2	3
3	3	2	2	3	-	-	-	-	-	-	-	2	3	2	3
4	3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
5	3	3	2	3	-	-	-	-	-	-	-	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Methods**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>III</b>			Course Category: <b>PC</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ICTC01</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Linear Integrated Circuits</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to ICE & BME Branches)										
Prerequisite	Basic Electronics									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Acquire knowledge on the basic operation of Operational Amplifier							<b>K2</b>	
	<b>CO2</b>	Understand the applications of Operational Amplifier							<b>K3</b>	
	<b>CO3</b>	Gain knowledge on the operation of comparators and waveform generators							<b>K3</b>	
	<b>CO4</b>	Design first order active filters and understand the concepts of data converters							<b>K4</b>	
	<b>CO5</b>	Acquaint with the basics of timer IC, Phase Locked Loops and Voltage regulators.							<b>K3</b>	
<b>UNIT – I</b>	<b>Op-amp and its Characteristics</b>					<b>Periods:09</b>				
Basics of operational amplifier (op amp) and its ideal characteristics, Internal Building Block, Inverting and non-inverting amplifier, Voltage follower, Differential Amplifier, DC characteristics and AC characteristics.										<b>CO1</b>
<b>UNIT – II</b>	<b>Op-amp Applications</b>					<b>Periods:09</b>				
Basic Op Amp Applications- Summing Amplifier, Subtractor, Differentiator and Integrator, Half wave rectifier and Full wave rectifier, Peak detector, Clipper and Clamper, Sample and hold circuit, log amplifier, Instrumentation amplifier, V-I and I-V converter.										<b>CO2</b>
<b>UNIT – III</b>	<b>Comparators and Waveform Generators</b>					<b>Periods:09</b>				
Comparator and its applications - Schmitt trigger, Astable multivibrator, Monostable multivibrator, Triangular wave generator, Sawtooth wave generator, RC Phase shift oscillator, Wien bridge oscillator.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Active Filters and Data Converters</b>					<b>Periods:09</b>				
<b>Active Filters:</b> First order low pass and high pass filter, Band Pass Filter, Band Stop Filter.										<b>CO4</b>
<b>Digital to Analog converters (DAC):</b> Weighted Resistor DAC, R-2R ladder DAC, Inverted R-2R DAC.										
<b>Analog to Digital converters (ADC):</b> Flash type ADC, Successive approximation ADC, Dual slope ADC.										
<b>UNIT – V</b>	<b>Timer, PLL and Voltage Regulators</b>					<b>Periods:09</b>				
555 timer IC pin diagram and functional diagram, 555 timer in monostable mode and its application as pulse width modulation, 555 timer in astable mode and its application as frequency shift keying (FSK), Phase Lock Loop IC 565.										<b>CO5</b>
<b>Voltage Regulators:</b> Series op-amp regulator, LM78XX, 79XX fixed voltage regulator, 723 General Purpose Regulator, Switched Mode Power Supply (SMPS).										
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>			<b>Total Periods: 45</b>	
<b>Text Books</b>										
1. D Roy Choudhury and Shail B. Jain, "Linear integrated circuits", New Age Science Limited, Fourth edition, 2018										
2. Ramakant A. Gayakwad, "OP-AMP and Linear ICs", Fourth Edition, Prentice Hall / Pearson Education, 2015										
3. S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2010.										
<b>Reference Books</b>										
1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Fourth Edition, Tata Mc Graw-Hill, 2016.										
2. S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", Second Edition, TMH, 4th Reprint, 2016.										
3. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2008.										
4. B.S.Sonde, "System design using Integrated Circuits", Second Edition, New Age Pub, 2010										
5. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2009.										
<b>Web References</b>										
1. <a href="http://www.ti.com/applications/industrial/medical/technical-documents.html">http://www.ti.com/applications/industrial/medical/technical-documents.html</a>										
2. <a href="https://e-box.co.in/linear-integrated-circuits.shtml">https://e-box.co.in/linear-integrated-circuits.shtml</a>										
3. <a href="https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.html">https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.html</a>										

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	-	-	-	-	-	-	-	1	3	1	-
2	3	2	2	2	-	-	-	-	-	-	-	1	3	1	-
3	3	3	3	2	-	-	-	-	-	-	-	1	3	1	-
4	3	2	2	2	-	-	-	-	-	-	-	1	3	1	-
5	3	3	3	2	-	-	-	-	-	-	-	1	3	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>III</b>		Course Category: <b>PC</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICTC02</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Digital Logic Circuits</b>		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to ICE & BME Branches)									
Prerequisite	-								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Interpret the concepts of number systems and binary codes.							<b>K2</b>
	<b>CO2</b>	Analyze the operations of boolean algebra and logic gates.							<b>K3</b>
	<b>CO3</b>	Design and implement combinational logic circuits							<b>K3</b>
	<b>CO4</b>	Design and implement sequential logic circuits							<b>K3</b>
	<b>CO5</b>	Acquaint with memory devices, Programmable Logic Devices and Logic families							<b>K3</b>
<b>UNIT – I</b>	<b>Number Systems and Binary Codes</b>					<b>Periods:12</b>			
<b>Number Systems</b> -Binary, Octal, Decimal, Hexadecimal. Number system conversions, Binary Arithmetic, Representation of signed binary numbers, 1s and 2s Complements.									
<b>Binary Codes</b> - Classification, Binary coded decimal (BCD), Weighted, and Non weighted, Reflective, sequential, Alphanumeric codes. Error detection codes. Error correction codes.									
<b>UNIT – II</b>	<b>Boolean Algebra and Logic Gates</b>					<b>Periods:12</b>			
<b>Boolean Algebra:</b> Basic Theorems and Properties, Standard Forms of Boolean Expression-Sum of Product(SOP), Product of Sum(POS), Canonical and Standard forms, Simplification of Boolean expressions - Algebraic simplification, Karnaugh-Map simplification, Quine McClusky simplification.									
<b>Logic gates:</b> Basic logic gates ; Universal gates ;Implementation of Boolean function using gates									
<b>UNIT – III</b>	<b>Combinational Logic Circuits</b>					<b>Periods:12</b>			
Binary adders- Half adder, Full adder, Parallel Adder, Look ahead carry adder, Binary Subtractors - Half subtractor, Full subtractor, 1bit and 2bit Magnitude comparators, Code converters, Decoders and encoders, Multiplexers and Demultiplexers, Parity bit generator and checker.									
<b>UNIT – IV</b>	<b>Sequential Logic Circuits</b>					<b>Periods:12</b>			
Types of sequential circuits, Comparison between combinational and sequential circuits, Latches-RS latch; Flip flops(FF) – RS,D, JK, and T, JK Master/Slave FF, triggering of flip flops, Excitation tables, Flip flop conversions. Design of Counters- Asynchronous(Ripple) Counters, synchronous counters, Shift registers, Classification of shift registers, Universal Shift Register, Ring Counter, Johnson counter.									
<b>UNIT – V</b>	<b>Memory, Programmable Logic Circuits and Logic Families</b>					<b>Periods:12</b>			
<b>Memory</b> Classification- Random Access Memory (RAM), Static RAM, Dynamic RAM, Read Only Memory (ROM); PROM, EPROM, EEPROM.									
<b>Programmable Logic Devices:</b> Programmable ROM (PROM), Programmable Array Logic (PAL), Programmable Logic Array (PLA), Implementation of combinational circuits using PROM, PAL, PLA.									
<b>Logic families:</b> Characteristics - propagation delay, power dissipation, fan-in, fan-out, noise margin, TTL, ECL, CMOS.									
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: - 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 60</b>	
<b>Text Books</b>									
1. M. Morris Mano, Digital Design, Fourth Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.									
2. Anand Kumar, Fundamentals of Digital Circuits Prentice Hall of India, Pvt Ltd, New Delhi, Second Edition, 2014.									
3. R.P. Jain, Modern Digital Electronics, Fourth edition, Tata McGraw Hill, 2010.									
<b>Reference Books</b>									
1. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.									
2. Charles H. Roth, Larry L. Kinney, Raghunandan G.H. Fundamentals of Logic Design, Cengage Learning India Pvt. Ltd.; 1 <sup>st</sup> edition, 1 September 2019									
3. William H. Gothmann, Digital Electronics Prentice Hall, 2001									
4. John M. Yarbrough, Digital logic: Applications and Design Thomas Vikas Publishing House, 2002.									
5. Ananda Natarajan R, Digital Design, Second edition, Eastern Economy Editions, PHI Learning Pvt. Ltd., 2015.									
<b>Web References</b>									

1. <https://nptel.ac.in/courses/117106086/>
2. <https://learn.ni.com/teach/resources/1104/digital-electronics>
3. <http://nptel.ac.in/courses/117/106/117106086/>

\* TE – Theory Exam, LE – Lab Exam

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
2	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
4	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
5	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>INSTRUMENTATION AND CONTROL ENGINEERING</b>			Programme: <b>B.Tech.</b>							
Semester	<b>III</b>			Course Category: <b>PC</b>		End Semester Exam Type: <b>TE</b>					
Course Code	<b>U23ICT303</b>			Periods/Week			Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM	
Course Name	<b>Electrical and Electronic Instrumentation</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>	
Prerequisite	Basic Electronics										
Course Outcomes	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the principle and operation of electrical instruments and measurement								<b>K2</b>	
	<b>CO2</b>	Develop skills in power and energy measurement techniques.								<b>K3</b>	
	<b>CO3</b>	Understand the measurement of resistance, inductance, and capacitance in circuits.								<b>K3</b>	
	<b>CO4</b>	Evaluate the performance of instruments under various operating conditions								<b>K3</b>	
	<b>CO5</b>	Develop the ability to select appropriate instruments for specific applications.								<b>K3</b>	
<b>UNIT – I</b>	<b>Electrical Measurements</b>						<b>Periods:9</b>				
Basics of Measurements, General features and Classification of electro mechanical instruments. Principles of Moving coil, moving iron, dynamometer type, rectifier type, thermal instruments. Errors and compensation, Extension of instrument range: shunt and multipliers, calibration of voltmeter and ammeters, CT and PT.											<b>CO1</b>
<b>UNIT – II</b>	<b>Measurement of Power and Energy</b>						<b>Periods:9</b>				
Electro-dynamic wattmeter, Low Power Factor (LPF) wattmeter, errors, Single and three phase power measurement, Hall Effect wattmeter, thermal type wattmeter. Energy measurement - Single phase and polyphase induction type energy meter - theory and adjustments - Principle of operation of single-phase energy meter, Creep in energy meter and its compensation, testing of energy meter, Phantom loading- Calibration of wattmeter and energy meter											<b>CO2</b>
<b>UNIT – III</b>	<b>Measurement of Resistance, Inductance and Capacitance</b>						<b>Periods:9</b>				
Measurement of Resistance: Wheatstone's bridge, Sensitivity, Limitations. Kelvin's double bridge. Earth resistance measurement by fall of potential method and by using Megger. Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance and capacitance bridge, Hay's bridge, Anderson's bridge, Schering bridge. Application of AC bridges. Introduction to cable fault and eddy current measurement.											<b>CO3</b>
<b>UNIT – IV</b>	<b>Electronic and Digital Measurements</b>						<b>Periods:9</b>				
Introduction essentials of electronic instruments, Advantages of electronic instruments. True RMS reading voltmeter. Electronic multimeters. Digital voltmeters (DVM) - Ramp type DVM, Integrating type DVM, Continuous – balance DVM and Successive - approximation DVM. Q meter. Principle of working of electronic energy meter (block diagram treatment), Extra features offered by present day meters and their significance in billing.											<b>CO4</b>
<b>UNIT – V</b>	<b>Display Devices, Waveform Generators and Analyzers</b>						<b>Periods:9</b>				
DSO, DPO, MSO, Analog Recorders – Strip Chart and X-Y recorders, Digital Recorders Function generators, Signal generators, Waveform analyzers, Spectrum analyzers, Distortion analyzers.											<b>CO5</b>
<b>Lecture Periods:45</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: -</b>			<b>Total Periods: 45</b>		
<b>Text Books</b>											
1. Golding, E.W. and Widdis, F.C., "Electrical Measurements and Measuring Instruments", A.H. Wheeler and Co, 5th Edition, 2011. 2. David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press, 2013. 3. Shawney A K, "A course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons.19th revised edition, 2014.											
<b>Reference Books</b>											
1. Kalsi.H.S, "Electronic Instrumentation", Tata McGraw Hill Education Private Limited, 3rd Edition, 2012. 2. Patranabis, Principles of Electronic Instrumentation - PHI, 2008 3. Joseph. J. Carr, Elements of Electronic Instrumentation & Measurements, III edition, Pearson Education, 2003. 4. Albert D.Helfrick & William D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, Prentice Hall of India, 2002. 5. Doebelin, E.O., Measurement systems, McGraw Hill, Sixth edition, 2017.											
<b>Web References</b>											
1. <a href="https://lecturenotes.in/subject/265/electrical-measurement-and-instrumentation-emi">https://lecturenotes.in/subject/265/electrical-measurement-and-instrumentation-emi</a> 2. <a href="http://www.brainkart.com/subject/Measurements-and-Instrumentation_204/">http://www.brainkart.com/subject/Measurements-and-Instrumentation_204/</a> 3. <a href="https://onlinecourses.nptel.ac.in/noc19_ee44/preview">https://onlinecourses.nptel.ac.in/noc19_ee44/preview</a> 4. <a href="https://www.careerride.com/mcq/electrical-and-electronic-measurements-instrumentation-electrical-engineering-mcq-questions-and-answers-272.aspx">https://www.careerride.com/mcq/electrical-and-electronic-measurements-instrumentation-electrical-engineering-mcq-questions-and-answers-272.aspx</a>											

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	-	-	-	-	-	-	-	-	3	1	1
2	3	1	2	1	-	-	-	-	-	-	-	-	3	1	1
3	3	1	2	1	-	-	-	-	-	-	-	-	3	1	1
4	3	1	2	1	-	-	-	-	-	-	-	-	3	1	1
5	3	1	2	1	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>INSTRUMENTATION AND CONTROL ENGINEERING</b>			Programme: <b>B.Tech.</b>						
Semester	<b>III</b>			Course Category: <b>PC</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ICB301</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Circuit Theory</b>			<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>
Prerequisite	Basics of Maths									
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Gain knowledge on the basic concepts of electrical circuits							<b>K2</b>	
	<b>CO2</b>	Apply the Network Theorems.							<b>K3</b>	
	<b>CO3</b>	Explore the steady state analysis of circuits							<b>K4</b>	
	<b>CO4</b>	Simulate the network reduction laws and theorems on DC circuits							<b>K3</b>	
	<b>CO5</b>	Simulate the frequency response of resonant circuits with AC supply.							<b>K3</b>	
<b>UNIT – I</b>	<b>DC Fundamental</b>						<b>Periods:10</b>			
Electrical Quantities- Types of Network: Linear and nonlinear, unilateral, bilateral, lumped, distributed. Ohm's Law, Resistors in Series and parallel Combinations - voltage and current division, Source: Voltage and Current Source - Ideal and Practical source - Dependent and Independent Source. Kirchhoff's Laws. Mesh and node Analysis.										<b>CO1</b>
<b>UNIT – II</b>	<b>Network Reduction and Theorems (DC Circuits)</b>						<b>Periods:10</b>			
Source Transformation: Current to Voltage, Voltage to Current. Network reduction – star delta conversion. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer Theorem, Reciprocity Theorem.										<b>CO2</b>
<b>UNIT – III</b>	<b>Steady State Analysis and Transient Analysis</b>						<b>Periods:10</b>			
Steady state analysis of RL, RC and RLC Series Circuits. Transient response of RL, RC & RLC Networks with DC Input - Solution using Laplace transforms. RL and RC Decaying Transient										<b>CO3</b>
<b>UNIT – IV</b>							<b>Periods:15</b>			
<b>List of Exercises : Both DC and AC Input</b>										<b>CO4</b>
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										
<b>UNIT – V</b>							<b>Periods:15</b>			
<b>List of Exercises</b>										<b>CO5</b>
1. Simulation and Experimental validation of RL and RC electric circuit transients.										
2. Simulation and Experimental validation of frequency response of RLC electric circuit.										
3. Design and Simulation of series and parallel resonance circuit.										
4. Determination of self, mutual inductance and coefficient of coupling										
5. Study of Analog and digital oscilloscopes and measurement of average value, RMS value, form factor and peak factor of sinusoidal waveform										
<b>Lecture Periods: 30</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 60</b>		
<b>Text Books</b>										
1. Sudhakar and Shyam Mohan Palli, "Circuits and Networks; Analysis and Synthesis", 5rd Edition, Tata McGraw Hill Education, 2017										
2. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 9th Edition, 2020.										
3. M.E.VanValkenburg "Network Analysis", Third Edition, Prentice Education, 2019										





**Reference Books**

1. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Seventh Edition, Tata McGraw Hill, 2017.
2. P. Ramesh Babu, "Circuit theory" Second Edition, Scitech Publications Pvt. Ltd, 2014.
3. N.C. Jagan&C.Lakshminarayana, 'Network Theory' B.S Publications, 2006.
4. Kuriakose, "Circuit Theory", PHI Learning, 2005.
5. Allan.H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013

**Web References**

1. <https://lecturenotes.in/subject/265/electrical-measurement-and-instrumentation-emi>
2. [http://www.brainkart.com/subject/Measurements-and-Instrumentation\\_204/](http://www.brainkart.com/subject/Measurements-and-Instrumentation_204/)
3. [https://onlinecourses.nptel.ac.in/noc19\\_ee44/preview](https://onlinecourses.nptel.ac.in/noc19_ee44/preview)
4. <https://www.careerride.com/mcq/electrical-and-electronic-measurements-instrumentation-electrical-engineering-mcq-questions-and-answers-272.aspx>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	-	-	-	-	-	-	-	3	1	2
2	3	3	3	3	-	-	-	-	-	-	-	-	3	1	2
3	3	3	3	3	-	-	-	-	-	-	-	-	3	1	2
4	3	3	3	3	-	-	-	-	-	-	-	-	3	1	2
5	3	3	3	3	-	-	-	-	-	-	-	-	3	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Assessment method for theory cum practical course**

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks										End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)						
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	# End Semester Examination (ESE) Marks (Practical – Internal Evaluation)		
Marks	5	5	5	5	20*	15	10	5	30*		75**	-
	*To be weighted for 10 Marks				10	*To be weighted for 10 Marks			10	30	**To be weighted for 50 Marks	100

# Final End Semester practical exam to be conducted with internal and external examiner by Head of the institution and HoD.



Dr. L. M. Varalakshmi

Department	<b>English</b>		Programme: <b>B.Tech.</b>						
Semester	<b>III</b>		Course Category Code: <b>HS</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ENPC01</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>General Proficiency - I</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to ALL Branches except CSBS)									
Prerequisite	Basics of English Language								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Interpret meaning and apply reading strategies in technical and non-technical context							<b>K3</b>
	<b>CO2</b>	Develop interpersonal communication skills professionally							<b>K4</b>
	<b>CO3</b>	Demonstrate various forms of formal writing							<b>K3</b>
	<b>CO4</b>	Decode graphical data coherently							<b>K2</b>
	<b>CO5</b>	Apply the techniques of verbal aptitude in competitive exams							<b>K3</b>
<b>UNIT- I</b>	<b>Comprehension Analysis</b>					<b>Periods:6</b>			
Listening: Dialogue based on social contexts (IELTS based) - Speaking: Break the iceberg (IELTS based) Submitting Video Recording - Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 2 (IELTS Academic) - Vocabulary: Synonyms (IELTS)									
<b>UNIT- II</b>	<b>Personality Development</b>					<b>Periods:6</b>			
Listening: Monologue about the everyday social issues (IELTS based) - Interview Videos - Speaking: Speak about the topic in the Flash Card (IELTS based) - Reading: British & American Vocabulary - Writing: SWOT Analysis - Vocabulary: Idioms and Phrases (IELTS)									
<b>UNIT- III</b>	<b>Inferential Learning</b>					<b>Periods:6</b>			
Listening: Conversation between 4 people regarding education (IELTS based), Anecdotes - Speaking: Structure Discussion (IELTS based) - Reading: Distinguish between facts & opinions (IELTS based), - Writing: Writing Conversation to different context - Vocabulary: Phrasal Verbs (IELTS)									
<b>UNIT- IV</b>	<b>Interpretation and Functional Writing</b>					<b>Periods:6</b>			
Listening: Monologue on an academic subject (IELTS based), Group Discussion videos - Speaking: Group Discussion Practice - Reading: Read and review (Books, Magazines) - Writing: Writing Task 1: (IELTS Academic: Graph/ chart/tables description) - Vocabulary: Collocations (IELTS)									
<b>UNIT-V</b>	<b>Verbal Aptitude - I</b>					<b>Periods:6</b>			
<b>Language Enhancement:</b> Articles, Preposition, Conjunction									
<b>Verbal Ability Enhancement:</b> Ordering of sentences, Blood Relation, Completing Statements- Cloze test, Spotting Errors - Sentence Improvement, Word Analogy, Word Groups ( <b>GATE</b> )									
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods:30</b>		<b>Total Periods:30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Lewis, Norman, "Word Power Made Easy". Goyal Publishers and Distributors Pvt.Ltd., Latest Edition, 2020.</li> <li>2. Patterson, Kerry, Joseph Grenny, Ron McMillan, Al Switzler, "Crucial Conversation Tools for talking when Stakes are High", Kindle Publication, 2nd Edition, 2011.</li> <li>3. Comfort, Jeremy, et.al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.</li> <li>4. Agarwal, R. S. "A Modern Approach to Verbal &amp; Non Verbal Reasoning". S. Chand, 2010.</li> <li>5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.ielts-exam.net/grammar/">https://www.ielts-exam.net/grammar/</a></li> <li>2. <a href="https://ieltsfocus.com/2017/08/02/collocations-ielts/">https://ieltsfocus.com/2017/08/02/collocations-ielts/</a></li> <li>3. <a href="https://www.fresherslive.com/online-test/blood-relations-questions-and-answers">https://www.fresherslive.com/online-test/blood-relations-questions-and-answers</a></li> <li>4. <a href="https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/">https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/</a></li> <li>5. <a href="https://www.examsbook.com/word-analogy-test-questions-with-answers">https://www.examsbook.com/word-analogy-test-questions-with-answers</a></li> </ol>									

## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

Correlation Level: 1-Low, 2-Medium, 3-High

## Evaluation Method

Practical						
Continuous Assessment Internal Evaluation			End Semester External Evaluation		Total Marks	
50 marks			50 marks		100	
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)			15	Listening (L)		20
Record			5	Speaking(S)		10
Viva			5	Reading(R)		10
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)			15	Writing(W)		10
Attendance			10			



Department	<b>Mathematics</b>			Programme: <b>B.Tech.</b>						
Semester	<b>III</b>			Course Category Code: <b>BS</b>		*End Semester Exam Type: <b>LE</b>				
Course Code	<b>U23MAPC01</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Engineering Mathematics Laboratory</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to all Branches Except CSBS)										
Prerequisite	Matrices, Fourier Transforms, Laplace Transforms									
Course Outcomes	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Perform and evaluate Matrix Operations								<b>K3</b>
	<b>CO2</b>	Solve Differential and Integral Equations								<b>K3</b>
	<b>CO3</b>	Construct Fourier series and Fourier Transforms of the given function								<b>K3</b>
	<b>CO4</b>	Find the Measures of Central tendency								<b>K3</b>
	<b>CO5</b>	Analyze Correlation and Regression lines								<b>K3</b>
<b>List of Experiments:</b>										
<ol style="list-style-type: none"> <li>Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix.</li> <li>Solve the first order differential equation.</li> <li>Find the integration of <math>\int_a^b (x)</math>.</li> <li>Find the Fourier series of f(x).</li> <li>Find the Fourier Transform of f(x).</li> <li>Find the Laplace Transform of f(x).</li> <li>Find the Mean, Median and Mode.</li> <li>Construct the Pie and Bar Diagram.</li> <li>Find the Correlation coefficient.</li> <li>Find the Regression lines.</li> </ol>										
<b>Lecture Periods:- Nil</b>			<b>Tutorial Periods:- Nil</b>			<b>Practical Periods: 30</b>			<b>Total Periods :30</b>	
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>T. Veerarajan, "Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018.</li> <li>M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.</li> <li>Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li><a href="https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf">https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf</a></li> <li><a href="https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf">https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf</a></li> <li><a href="https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410">https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410</a></li> </ol>										

### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High



Dr. L. M. Varalakshmi

### Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech</b>						
Semester	<b>III</b>		Course Category : <b>ES</b>			End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ADPC01</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Programming in Python Laboratory</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to All Branches)									
Prerequisite	NIL								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Describe common Python functionality and features used for data science.							<b>K2</b>
	<b>CO2</b>	Query Data Frame structures for cleaning and processing.							<b>K2</b>
	<b>CO3</b>	Configure your programming environment							<b>K3</b>
	<b>CO4</b>	Experiment the concept using data visualization.							<b>K3</b>
	<b>CO5</b>	Analyze real time datasets,							<b>K3</b>
<b>List of Exercises</b>									
<ol style="list-style-type: none"> <li>Build a python program to implement Fibonacci series.</li> <li>Build a python program to get a range of numbers from user and to separate even numbers and odd numbers respectively.</li> <li>Build a function in Python to check duplicate letters. It must accept a string, i.e., a sentence. The function should return True if the sentence has any word with duplicate letters, else return False.</li> <li>Build a program to perform arithmetic operations using lambda function.</li> <li>Build a Python program that takes a list of numbers as input and returns a new list containing only the even numbers from the input list.</li> <li>Build a python program to create a class called Car with attributes Company, model, and year. Implement a method that returns the age of the car in years.</li> <li>Build a python program to create a base class called Shape that has a method called area which returns the area of the shape (set it to 0 for now). Then, create two derived classes Rectangle and Circle that inherit from the Shape class to calculate the area of derived classes.</li> <li>Build a python program to implement aggregation using Numpy.</li> <li>Build a python program to perform Indexing and Sorting.</li> <li>Build a python program to perform Handling of missing data.</li> <li>Build a python program to perform usage of Pivot table using Titanic datasets</li> <li>Build a python program to perform use of eval () and query ()</li> <li>Build a python program to perform Scatter Plot</li> <li>Build a python program to perform 3D plotting</li> <li>Implement an application to process a real time data.</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.</li> <li>Siddhartha Chatterjee, Michal Krystyanczuk, "Python Social Media Analytics", Packt Publishing, 2017.</li> <li>Jake VanderPlas, "Python Data Science Handbook - Essential Tools for Working with Data", O'Reilly Media Inc, 2016.</li> <li>Zhang.Y, "An Introduction to Python and Computer Programming", Springer Publications, 2016.</li> <li>Wesley J Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2006.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/106/106/106106212/">https://nptel.ac.in/courses/106/106/106106212/</a></li> <li><a href="https://www.geeksforgeeks.org/data-analysis-visualization-python/">https://www.geeksforgeeks.org/data-analysis-visualization-python/</a></li> <li><a href="https://www.coursera.org/learn/python-data-analysis">https://www.coursera.org/learn/python-data-analysis</a></li> <li><a href="https://www.python.org/">https://www.python.org/</a></li> <li><a href="https://www.programiz.com/python-programming">https://www.programiz.com/python-programming</a></li> </ol>									



## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	1	3	-	-	-	-	-	-	-	2	2	2
2	2	3	2	2	3	-	-	-	-	-	-	-	2	3	2
3	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

## Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B. Tech.</b>						
Semester	<b>III</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICPC01</b>		Periods/Week			Credit	Maximum Marks		
	L	T	P	C	CAM	ESE	TM		
Course Name	<b>Linear and Digital Integrated Circuits Laboratory</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to ICE & BME Branches)									
Prerequisite	Basic Electronics Laboratory								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Design application circuits using IC741.							<b>K3</b>
	<b>CO2</b>	Design instrumentation amplifier and filter circuits.							<b>K3</b>
	<b>CO3</b>	Design multivibrator circuits using 555 timer IC.							<b>K3</b>
	<b>CO4</b>	Design and implement combinational circuits.							<b>K3</b>
	<b>CO5</b>	Design and implement sequential circuits.							<b>K2</b>
<p><b>PART –A</b></p> <ol style="list-style-type: none"> <li>Design and Testing of Inverting amplifier, Non inverting amplifier and Voltage Follower.</li> <li>Design and Testing of Summer and Subtractor circuits.</li> <li>Design and Testing of Differentiator and Integrator.</li> <li>Design and Testing of Instrumentation amplifier</li> <li>Design and Testing of First order active filters (LPF, HPF).</li> <li>Design and Testing of Astable and monostable multivibrators using 555 Timer.</li> </ol> <p><b>PART –B</b></p> <p>Study of Logic Gates.</p> <ol style="list-style-type: none"> <li>Design and implementation of Adder and Subtractor circuits.</li> <li>Implementation of Code converters.</li> <li>Implementation of Encoder / Decoder / Multiplexer / Demultiplexer</li> <li>Implementation of Flip flops.</li> <li>Design and implementation of counters.</li> <li>Design and implementation of 4-bit shift registers.</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>D Roy Choudhury and Shail Jain, "Linear integrated circuits", New Age Science Limited, Fourth edition, 2018.</li> <li>Ramakant A. Gayakwad, "OP-AMP and Linear ICs", Fourth Edition, Prentice Hall / Pearson Education, 2015.</li> <li>M. Morris Mano and Michael D. Cilette, Digital DesignII, Prentice Hall, Fifth Edition, 2012</li> <li>Thomas L Floyd, "Digital Fundamentals", Prentice Hall, 11<sup>th</sup> Edition, 2014.</li> <li>Anand Kumar, Fundamentals of Digital CircuitsII, Prentice Hall of India, Pvt Ltd, New Delhi, 4th Edition, 2016.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li><a href="https://www.electronics-lab.com/">https://www.electronics-lab.com/</a></li> <li><a href="http://vlabs.iitkgp.ernet.in/be/#">http://vlabs.iitkgp.ernet.in/be/#</a></li> <li><a href="https://nptel.ac.in/courses/122/106/122106025/">https://nptel.ac.in/courses/122/106/122106025/</a></li> </ol>									

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	2	-	-	-	-	-	-	-	3	1	1
2	3	1	-	1	2	-	-	-	-	-	-	-	3	1	1
3	3	1	-	-	2	-	-	-	-	-	-	-	3	1	1
4	3	2	3	3	2	-	-	-	-	-	-	-	3	1	1
5	3	2	3	3	2	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High



### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Dr. L. M. Varalakshmi

Department	<b>Instrumentation and Control Engineering</b>	Programme: <b>B. Tech.</b>						
Semester	<b>III</b>	Course Category: <b>AEC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICC3XX</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>CERTIFICATION COURSE III</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>

Students shall choose an international certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

<b>Lecture Periods: -</b>	<b>Tutorial Periods: -</b>	<b>Practical Periods: 50</b>	<b>Total Periods:50</b>
---------------------------	----------------------------	------------------------------	-------------------------

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
<b>Marks</b>	10	90	100



Dr. L. M. Varalakshmi

Department	<b>Instrumentation and Control Engineering</b>	Programme : <b>B. Tech.</b>						
Semester	<b>III</b>	Course Category: <b>AEC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICS301</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Skill Enhancement Course I</b> (Choose anyone of the below three courses)	-	-	<b>2</b>	-	<b>100</b>	-	<b>100</b>

Course Outcome	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	<b>CO1</b>	Analyze common electronic equipments malfunctions.	
<b>CO2</b>	Utilize testing equipment and diagnostic tools for troubleshooting.		<b>K3</b>
<b>CO3</b>	Identify errors in measurement systems and apply corrective actions.		<b>K3</b>
<b>CO4</b>	Gain knowledge in programming Arduino microcontrollers using IDE.		<b>K3</b>
<b>CO5</b>	Develop skills in designing complex electronic circuits in Arduino.		<b>K3</b>

**Course Content:****TROUBLESHOOTING OF ELECTRONIC EQUIPMENTS**

1. Fundamental Troubleshooting Procedures.
2. Testing of Active and Passive Components.
3. Testing of Semiconductor Devices.
4. PCB Testing and Soldering Techniques.
5. Regulated Power Supply Troubleshooting.
6. Testing of CRO.
7. Troubleshooting Digital Circuits.
8. Tools and Aids for Servicing and Maintenance.

**Lecture Periods:**                      **Tutorial Periods:**                      **Practical Periods: 30**                      **Total Periods: 30**

**Textbooks**

1. Shashi Bhushan Sinha , "Handbook of Repair and Maintenance of Domestic Electronics Appliances", BPB Publications, January 2022.
2. K. Sudeep Singh, "Trouble Shooting & Maintenance of Electronic Equipments", S.K.Kataria & Sons, January 2022.

**Reference Books**

1. Dr R.S. Khandpur, "Troubleshooting Electronic Equipment: Includes Repair and Maintenance, MC Graw Hill, Second Edition, 2006.
2. Ronald Quan, " Troubleshooting Electronic Circuits: A Guide to Learning Analog Electronics: Debugging and Improving Your DIY Projects and Experiments: A Guide to Learning Analog Electronics Paperback", MC Graw Hill, February 2020.

**Web References**

1. <https://www.candorind.com/blog/circuit-board-troubleshooting-techniques/>
2. <https://www.onlinecomponents.com/en/blogpost/how-to-test-electronic-components-191/>
3. <https://www.udemy.com/course/learn-to-repair-troubleshoot-electronics/>
4. <https://maker.pro/blog/basics-of-electronic-systems-troubleshooting-for-engineers>
5. <https://www.sciencedirect.com/book/9780750662789/practical-troubleshooting-of-electrical-equipment-and-control-circuits>



Dr. L. M. Varalakshmi

## CALIBRATION OF MEASURING INSTRUMENTS

1. Parts of the Typical Control Loop
2. Process & Instrument Diagrams (P&ID's).
3. Introduction to Measurement System.
4. Commonly used process control signals.
5. Signal quality terminology (accuracy, linearity, span, etc.)
6. System standards and instrument calibration.
7. Study of measurement errors-zero, span, hysteresis, non-linear, dead-band errors.
8. Sensor/Transducer and Transmitter principles
9. Calibration of low and high Pressure Bourden's Gauges.
10. Principle and operation of Strain gauge Pressure Sensors.
11. Operation and calibration of Differential Pressure Transmitter.
12. Calibration of Temperature Indicators (RTD & Thermocouple).

Lecture Periods:

Tutorial Periods:

Practical Periods: 30

Total Periods: 30

### Textbooks

1. Brunelli, Alessandro. Calibration Handbook of Measuring Instruments. United States, ISA, 2017.
2. Measurement, Instrumentation, and Sensors Handbook: Spatial, Mechanical, Thermal, and Radiation measurement, United States, CRC Press, 2017.
3. Petersons, Oskars. Calibration of Test Systems for Measuring Power Losses of Transformers (Classic Reprint), United States, 1kg Limited, 2018

### Reference Books

1. Kularatna, Nihal. Digital and analogue instrumentation: testing and measurement. London, Institution of Engineering and Technology, 2003.
2. Lay-Ekuakille, Aimé. Advanced Instrument Engineering: Measurement, Calibration, and Design. United States, IGI Global, 2013.
3. Asadi, Farzin, and Eguchi, Kei. Electronic Measurements: A Practical Approach. Switzerland, Morgan & Claypool Publishers, 2021.
4. Measurement, Instrumentation, and Sensors Handbook, Second Edition: Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement. United Kingdom, Taylor & Francis, 2014.

### Web References

1. <https://as.flukecal.com/literature/articles-and-education/electrical-calibration/video/5790b-measurement-standard-demo>
2. [https://www-pub.iaea.org/mtcd/publications/pdf/tcs-33\\_cd\\_web/html/\\_pur/content/86.html#:~:text=Electrical%20calibration%20implies%20that%20the,and%20traceable%20to%20international%20standards](https://www-pub.iaea.org/mtcd/publications/pdf/tcs-33_cd_web/html/_pur/content/86.html#:~:text=Electrical%20calibration%20implies%20that%20the,and%20traceable%20to%20international%20standards).
3. <https://allometrics.com/benefits-of-electronics-calibration/>
4. [https://onlinecourses.nptel.ac.in/noc24\\_ee45/preview](https://onlinecourses.nptel.ac.in/noc24_ee45/preview)
5. <https://nvlpubs.nist.gov/nistpubs/Legacy/TN/nbstechnicalnote1179.pdf>



Dr. L. M. Varalakshmi

## APPLICATION OF ARDUINO

### 1. Introduction to IOT

- Understanding IoT fundamentals
- IOT Architecture and protocols
- Various Platforms for IoT
- Real time Examples of IoT
- Overview of IoT components and IoT Communication Technologies
- Challenges in IOT

### 2. Arduino Simulation Environment

- Arduino Uno Architecture
- Setup the IDE, Writing Arduino Software
- Arduino Libraries
- Basics of Embedded C programming for Arduino
- Interfacing LED, push button

### 3. Sensor and Actuators with Arduino

- Overview of Sensors working
- Analog and Digital Sensors
- Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino
- Interfacing of Actuators with Arduino.
- Interfacing of Relay Switch and Servo Motor with Arduino

Lecture Periods:

Tutorial Periods:

Practical Periods: 30

Total Periods: 30

### Textbooks

1. Banzi, Massimo, "Getting Started with Arduino", O'Reilly Media, Germany Incorporated, 2011.
2. Javed, Adeel, "Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications", United States, Apress, 2016.
3. Cameron, Neil, "Arduino Applied: Comprehensive Projects for Everyday Electronics", Apress, Germany, 2018.

### Reference Books

1. Bolanakis, Dimosthenis E, "Microcontroller Prototypes with Arduino and a 3D Printer: Learn, Program, Manufacture", United Kingdom, Wiley, 2021.
2. Kurniawan, Agus, "Arduino Programming with .NET and Sketch", United States, Apress, 2017.
3. Monk, Simon, "Arduino + Android Projects for the Evil Genius: Control Arduino with Your Smartphone or Tablet", Ukraine, McGraw Hill LLC, 2011.
4. Misra, Yogesh, "Programming and Interfacing with Arduino", United States, CRC Press, 2021.

### Web References

1. <https://www.mathworks.com/videos/how-to-use-the-arduino-explorer-app-in-matlab-1673332715177.html>
2. [https://www.youtube.com/playlist?list=PLSVmc7PvXPXL5bjfjL\\_1NXyVUsYfGwvBa](https://www.youtube.com/playlist?list=PLSVmc7PvXPXL5bjfjL_1NXyVUsYfGwvBa)
3. <http://nittrc.edu.in/nptel/courses/video/106105159/L17.html>
4. <https://www.digimat.in/nptel/courses/video/106105193/L21.html>
5. <https://trainings.internshala.com/blog/arduino-applications/>

## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	Report	Presentation / Demo / Skill Test	
Marks	10	40	50	100

Department	<b>Instrumentation and Control Engineering</b>	Programme: <b>B.Tech.</b>						
Semester	<b>III</b>	Course Category: <b>MC</b>			*End Semester Exam Type:-			
Course Code	<b>U23ICM303</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Climate Change</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
<b>UNIT- I</b>	<b>Atmosphere and its Components</b>	<b>Periods:6</b>						
Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.								
<b>UNIT- II</b>	<b>Global Climate</b>	<b>Periods:6</b>						
Account of past climate Environmental indicators and instrumental records Human Footprints on global warming- Predicting future climates- Temperature regime - Extreme climate events								
<b>UNIT- III</b>	<b>Impacts of Climate Change</b>	<b>Periods:6</b>						
Causes of Climate change: Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors Agriculture, Forestry and Ecosystem - Water Resources Human Health Industry, Settlement and Society Methods and Scenarios - Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change - Risk of Irreversible Changes.								
<b>UNIT- IV</b>	<b>Observed Changes and its Causes</b>	<b>Periods:6</b>						
Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks-The Montreal Protocol UNFCCC - IPCC Evidences of Changes in Climate and Environment on a Global Scale and in India.								
<b>UNIT-V</b>	<b>Climate Change and Mitigation Measures</b>	<b>Periods:6</b>						
Clean Development Mechanism -Carbon Trading- examples of future Clean Technology - Biodiesel Natural Compost Eco Friendly Plastic Alternate Energy Hydrogen Bio-fuels-Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices-Carbon sequestration - Carbon capture and storage (CCS) - International and Regional cooperation- Remedial measures.								
<b>Lecture Periods:-</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods:30</b>		<b>Total Periods:30</b>		
<b>Textbooks</b>								
1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.								
2. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).								
3. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),								
4. Andrew Dessler and Edward A. Parson "The Science and Politics of Global Climate Change" 2009								
5. Dash Sushil Kumar, "Climate Change An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.								
<b>Reference Books</b>								
1. Bill McKibben (2012), The Global Warming Reader: A Century of Writing About Climate Change,Penguin.								
2. Jason Smerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University								
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.								
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.								
5. Jan C. van Dam, (2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press,.								
<b>Web References</b>								
1. <a href="https://nptel.ac.in/courses/105102089/">https://nptel.ac.in/courses/105102089/</a>								
2. <a href="https://www.warmheartworldwide">https://www.warmheartworldwide</a>								
3. <a href="https://nptel.ac.in/content/storage">https://nptel.ac.in/content/storage</a>								

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

Department	<b>Mathematics</b>			Programme : <b>B.Tech.</b>						
Semester	<b>IV</b>			Course Category Code: <b>BS</b>		*End Semester Exam Type: <b>TE</b>				
CourseCode	<b>U23MATC04</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Numerical Methods and Optimization</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to EEE, ECE, ICE, BME, MECH, CIVIL & MECHATRONICS)										
Prerequisite	Basic Mathematics									
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	<b>CO1</b>	Solve Algebraic and Transcendental equations							<b>K3</b>	
	<b>CO2</b>	Solve Simultaneous Equations by various Numerical Techniques.							<b>K3</b>	
	<b>CO3</b>	Apply the Numerical Techniques of interpolation in various Intervals.							<b>K3</b>	
	<b>CO4</b>	Solve Linear programming problems by using Optimization Techniques.							<b>K3</b>	
	<b>CO5</b>	Find the solution of Transportation and Assignment Problems.							<b>K3</b>	
<b>UNIT – I</b>	<b>Solution of Algebraic and Transcendental Equations and Eigen Value Problems</b>					<b>Periods:12</b>				
Solution of Algebraic and Transcendental equations – Bisection method - Method of False position – Newton Raphson method – Eigen value and Eigen vector by Power method.										<b>CO1</b>
<b>UNIT – II</b>	<b>Linear Simultaneous Equations</b>					<b>Periods:12</b>				
Solutions of Linear simultaneous equations and Matrix Inversion – Gauss Elimination and Gauss - Jordan methods – Iterative methods – Gauss Jacobi – Gauss Seidel.										<b>CO2</b>
<b>UNIT – III</b>	<b>Interpolation and Solution of Ordinary Differential Equations</b>					<b>Periods:12</b>				
Interpolation by Newton's Forward and Backward Difference formula for equal intervals – Lagrange's method for unequal intervals – Integration by Trapezoidal and Simpson's rules (Single integration only) – Fourth order Runge-Kutta method for solving first order Differential Equations.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Linear Programming Problems</b>					<b>Periods:12</b>				
Linear Programming Problems – Graphical Method – Simplex Method – Big M method.										<b>CO4</b>
<b>UNIT – V</b>	<b>Transportation and Assignment Problems</b>					<b>Periods:12</b>				
Transportation Problems – Initial basic feasible solution using North-West Corner rule, Least Cost Method, Vogel's Approximation Method – Optimality in Transportation Problem by Modified Distribution (MODI) Method. Assignment Problems – Solutions of Assignment Problems by Hungarian Method – Unbalanced Assignment Problems.										<b>CO5</b>
<b>Lecture Periods:45</b>			<b>Tutorial Periods:15</b>			<b>Practical Periods:-</b>			<b>Total Periods:60</b>	
<b>Text Books</b>										
1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, "Numerical Methods", S. Chand Limited, 2008.										
2. R. Panneerselvam "Operations Research" Prentice Hall of India, 2 <sup>nd</sup> Edition, 2004.										
3. P.K. Gupta, D.S. Hira, "Operations Research", S. Chand, 5 <sup>th</sup> Edition, 2018.										
<b>Reference Books</b>										
1. AtulGoyal, Madhuchanda Rakshit Suchet Kumar, "Numerical Methods", New India publishing Agency, 1 <sup>st</sup> Edition, 2019.										
2. Rajesh Kumar Gupta, "Numerical Methods - Fundamental and Applications", Cambridge University Press, 1 <sup>st</sup> Edition, 2019.										
3. S.Kalavathy, "Operation Research", Vikas Publishing house, 4 <sup>th</sup> Edition, 2012.										
4. Kevin J. Hastings, "Introduction to the Mathematics of Operations Research with Mathematica", Taylor and Francis, 2 <sup>nd</sup> Edition, 2019.										
5. T. Veerarajan, "Operations Research", McGraw Hill, 1 <sup>st</sup> Edition, 2018.										
<b>Web References</b>										
1. <a href="https://nptel.ac.in/courses/111106101/">https://nptel.ac.in/courses/111106101/</a>										
2. <a href="https://www.geektonight.com/operation-research-notes-pdf/#.XrXzoP8za00">https://www.geektonight.com/operation-research-notes-pdf/#.XrXzoP8za00</a>										
3. <a href="https://freecomputerbooks.com/Numerical-Methods-with-Applications.html">https://freecomputerbooks.com/Numerical-Methods-with-Applications.html</a>										
4. <a href="https://www.pphmj.com/journals/IJNMA.htm">https://www.pphmj.com/journals/IJNMA.htm</a>										
5. <a href="https://nptel.ac.in/courses/106/108/106108056/">https://nptel.ac.in/courses/106/108/106108056/</a>										

\* TE – Theory Exam, LE – Lab Exam



## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	1	-	1	-	-	-	-	-	1	1	1	1
2	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
3	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
4	3	3	3	2	1	1	1	-	-	-	1	1	1	1	1
5	3	3	3	2	1	1	1	-	-	-	1	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus





Department	<b>Computer Science and Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category Code: <b>ES</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CSTC03</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Data Structures</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to all Branches)									
Prerequisite	Any Programming Knowledge								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Compute time and space complexity for given problems							<b>K3</b>
	<b>CO2</b>	Demonstrate stack, queue and its operation.							<b>K3</b>
	<b>CO3</b>	Illustrate the various operations of linked list.							<b>K3</b>
	<b>CO4</b>	Use the concepts of tree for various applications.							<b>K3</b>
	<b>CO5</b>	Outline the various Tables, Graphs and Sets techniques.							<b>K3</b>
<b>UNIT-I</b>	<b>BASIC TERMINOLOGIES OF DATA STRUCTURES</b>					<b>Periods: 9</b>			
Introduction: Basic Terminologies – Asymptotic Notations: Complexity analysis. Array and its operations - Searching: Linear Search and Binary Search Techniques. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort. Performance and Comparison among the sorting methods.									<b>CO1</b>
<b>UNIT-II</b>	<b>STACK AND QUEUE OPERATIONS</b>					<b>Periods: 9</b>			
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.									<b>CO2</b>
<b>UNIT-III</b>	<b>LINKED LIST OPERATIONS</b>					<b>Periods: 9</b>			
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.									<b>CO3</b>
<b>UNIT-IV</b>	<b>TREES</b>					<b>Periods: 9</b>			
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree- Red Black Tree.									<b>CO4</b>
<b>UNIT-V</b>	<b>GRAPHS , TABLES AND SETS</b>					<b>Periods: 9</b>			
Graph: Basic Terminologies and Representations – Graph traversal algorithms. Tables: Different types of tables – Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.									<b>CO5</b>
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.</li> <li>2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.</li> <li>3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4<sup>th</sup> Edition, 2009.</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. D.Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.</li> <li>2. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c" . Prentice-Hall of India, Second Edition, 2007.</li> <li>3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second. Edition,2006.</li> <li>4. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.</li> <li>5. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Addison- Wesley Publishing Company, Illustrated Edition, 1995.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.geeksforgeeks.org/data-structures/">https://www.geeksforgeeks.org/data-structures/</a></li> <li>2. <a href="https://www.javatpoint.com/data-structure-tutorial/">https://www.javatpoint.com/data-structure-tutorial/</a></li> <li>3. <a href="https://www.studytonight.com/data-structures/">https://www.studytonight.com/data-structures/</a></li> <li>4. <a href="https://www.tutorialspoint.com/data_structures_algorithms/">https://www.tutorialspoint.com/data_structures_algorithms/</a></li> <li>5. <a href="https://www.w3schools.in/data-structures-tutorial/intro/">https://www.w3schools.in/data-structures-tutorial/intro/</a></li> </ol>									

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PC</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICT404</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Linear Control Systems</b>		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Basic Mathematics, Signals and Systems, Physics								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Understand the basic concepts on the modelling of control systems.							<b>K2</b>
	<b>CO2</b>	Determine the time response analysis of systems.							<b>K4</b>
	<b>CO3</b>	Perform the frequency response analysis of control systems.							<b>K4</b>
	<b>CO4</b>	Analyze the stability of the system.							<b>K2</b>
	<b>CO5</b>	Design the compensation techniques.							<b>K3</b>
<b>UNIT – I</b>	<b>Mathematical Modeling of Systems</b>					<b>Periods:12</b>			
Types of System - Open Loop Systems, Closed Loop Systems, Basic Elements in Control System - Electrical Analogy of Mechanical and thermal systems - Transfer function - D.C and A.C Servo Motor - Block Diagram Reduction Techniques - Signal Flow Graphs.									<b>CO1</b>
<b>UNIT – II</b>	<b>Time Response Analysis</b>					<b>Periods:12</b>			
Standard Test Signals - Time Response of First and Second Order System, Time Domain- Specifications - Generalized Error Series - Steady State Error - Static and Dynamic Error Constants.									<b>CO2</b>
<b>UNIT – III</b>	<b>Frequency Response Analysis</b>					<b>Periods:12</b>			
Sinusoidal Transfer Function- Frequency Domain Specifications - Correlation between Time and Frequency Response – Construction of Bode Plots - Determination of Gain and Phase Margin from Bode Plots - Polar plots - Determination of Phase Margin and Gain margin from Polar plots – Gain Adjustment using polar plots.									<b>CO3</b>
<b>UNIT – IV</b>	<b>Stability of Control Systems</b>					<b>Periods:12</b>			
Characteristics Equation - Location of Roots in S Plane for Stability - Routh Hurwitz Criterion - Root Locus Analysis - Effect of Pole Zero Additions on Root Locus - Nyquist Stability Criterion.									<b>CO4</b>
<b>UNIT – V</b>	<b>Compensator and State Space Analysis</b>					<b>Periods:12</b>			
Introduction to compensation networks - Lag, Lead and Lag Lead networks - Effect of providing Lag, Lead and Lag-Lead compensation on system performance and design using bode plot - Concepts of state – state Variable and state models – physical, phase and canonical model.									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 60</b>	
<b>Text Books</b>									
1. Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017									
2. Ogata K, —Modern Control EngineeringI, Prentice-Hall of India Pvt Ltd., New Delhi, Fifth Edition, 2015.									
3. Benjamin C Kuo, —Automatic Control Systems II, Prentice Hall India Pvt. Ltd, Ninth Edition, 2014.									
<b>Reference Books</b>									
1. Norman S Nise, Control System Engineering , John Wiley and sons, inc., Seventh Edition, 2015									
2. Smarajith Ghosh, —Control Systems Theory and ApplicationsII, Pearson Education, Singapore, Sixth Edition, 2015									
3. Richard C. Dorf, Robert H Bishop, —Modern Control SystemsII, Pearson Education, Twelfth Edition, 2017.									
4. Gopal, M., “Control Systems, Principles and Design”, Tata McGraw-Hill Pub. Co., 4 <sup>th</sup> Edition, New Delhi, 2012.									
5. Nagoor kani. A., ‘Control System Engineering’, CBS Publishers and Distributors, 2021.									
<b>Web References</b>									
1. <a href="https://lecturenotes.in/notes/6579-note-for-control-system-engineering-cse-by-gyana-ranjan-biswal">https://lecturenotes.in/notes/6579-note-for-control-system-engineering-cse-by-gyana-ranjan-biswal</a>									
2. <a href="https://www.smartworld.com/notes/control-systems-pdf-notes-cs">https://www.smartworld.com/notes/control-systems-pdf-notes-cs</a> .									
3. <a href="https://easyengineering.net/control-systems-engineering-by-nagoor-kani/">https://easyengineering.net/control-systems-engineering-by-nagoor-kani/</a>									
4. <a href="https://civildatas.com/download/control-systems-engineering-by-i-j-nagrath">https://civildatas.com/download/control-systems-engineering-by-i-j-nagrath</a>									
5. <a href="https://www3.nd.edu/~pantsakl/Publications/348A-EEHandbook05.pdf">https://www3.nd.edu/~pantsakl/Publications/348A-EEHandbook05.pdf</a> .									

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
2	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
4	3	-	1	2	-	-	-	-	-	-	-	-	3	1	1
5	3	2	1	2	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category : <b>PC</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICT405</b>		Periods/Week			Credit	Maximum Marks		
Course Name	<b>Microcontroller Based System Design</b>		L	T	P	C	CAM	ESE	TM
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	<b>Digital Logic Circuits</b>								
Course Outcomes	<b>On completion of the course, the students will be able to</b>						BT Mapping (Highest Level)		
	<b>CO1</b>	Elucidate the architecture and addressing modes of 8-bit microprocessor					<b>K2</b>		
	<b>CO2</b>	Illustrate the architecture of PIC18F4550 microcontroller					<b>K2</b>		
	<b>CO3</b>	Ability to write embedded C program for PIC18F4550 microcontroller.					<b>K3</b>		
	<b>CO4</b>	Gain knowledge about timer and interrupts					<b>K3</b>		
	<b>CO5</b>	Learn about design of different peripheral using PIC18F4550					<b>K3</b>		
<b>UNIT- I</b>	<b>REVIEW OF 8085 MICROPROCESSOR</b>					<b>Periods:09</b>			
Evolution of microprocessor, Types of various architectures; Harvard and Von-Neumann, RISC and CISC, 8085 microprocessor- Pin Functions, Architecture, Addressing modes Interrupts, Direct Memory Access, I/O Mapping.									<b>CO1</b>
<b>UNIT- II</b>	<b>ARCHITECTURE OF PIC18F4550 MICROCONTROLLER</b>					<b>Periods:09</b>			
PIC microcontrollers overview and features- PIC18F4550 architecture, status register, Special function registers, memory organization, PIC16F877A pin configuration.									<b>CO2</b>
<b>UNIT- III</b>	<b>PIC18F4550 With Embedded C</b>					<b>Periods:09</b>			
MPLAB IDE with compiler, Data Types and Time Delays in C, I/O Programming, Logic Operations, Data Serialization, Program ROM Allocation, Data RAM Allocation, MACROS — Intel HEX file.									<b>CO3</b>
<b>UNIT- IV</b>	<b>TIMER AND INTERRUPTS</b>					<b>Periods:09</b>			
GPIO programming, Timers Programming, Counter programming, PWM programming, Serial Communication, Interrupts.									<b>CO4</b>
<b>UNIT-V</b>	<b>PERIPHERAL AND INTERFACING</b>					<b>Periods:09</b>			
LCD Interfacing, Keyboard Interfacing, ADC Programming in the PIC18F4550, DAC Interfacing, Relay interfacing, Sensor Interfacing, Stepper Motor Interfacing.									<b>CO5</b>
<b>Lecture Periods:45</b>		<b>Tutorial Periods:-</b>			<b>Practical Periods:-</b>			<b>Total Periods:45</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Application', Penram International (P) Ltd., Mumbai, 6<sup>th</sup> edition, 2013.</li> <li>2. Mazidi M.A., PIC Microcontroller and Embedded Systems: Using assembly and C for PIC, Pearson publishing, 2016.</li> <li>3. Andrew N. Sloss Dominic Symes and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaughmann/Elsevier Publishers, 2016.</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Sunil Mathur, Jeebananda Panda, "Microprocessor and microcontroller", PHI Learning Private Limited, New Delhi, 1<sup>st</sup> Edition, 2016.</li> <li>2. Peatman J., Embedded system Design using PIC18Fxxx, Prentice Hall, 2013.</li> <li>3. Peatman J., Design with PIC microcontrollers, Pearson Education, 2010.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.youtube.com/watch?v=rSFIUkQYLrk">https://www.youtube.com/watch?v=rSFIUkQYLrk</a></li> <li>2. <a href="https://www.youtube.com/watch?v=S1QCZW92fU4">https://www.youtube.com/watch?v=S1QCZW92fU4</a></li> <li>3. <a href="https://www.youtube.com/watch?v=iecMfsMxCHI">https://www.youtube.com/watch?v=iecMfsMxCHI</a></li> <li>4. <a href="https://www.microchip.com/promo/explorer-8-development-board">https://www.microchip.com/promo/explorer-8-development-board</a></li> <li>5. <a href="https://pic-microcontroller.com/pic18f4550-programming-and-tutorial-hardware-c/#PIC18F_Microcontroller_Programming_Tutorial">https://pic-microcontroller.com/pic18f4550-programming-and-tutorial-hardware-c/#PIC18F_Microcontroller_Programming_Tutorial</a></li> </ol>									



## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	2	-	-	-	-	-	-	-	-	2	2	2
2	2	1	2	2	-	-	-	-	-	-	-	-	2	2	2
3	2	1	2	2	-	-	-	-	-	-	-	-	2	2	2
4	2	1	2	2	-	-	-	-	-	-	-	-	2	2	2
5	2	1	2	2	-	-	-	-	-	-	-	-	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category : <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICB402</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Solid and Fluid Mechanics</b>		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>
Prerequisite	-								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Analyze the state of stress and strain at any point in a member. <b>(K2)</b>						<b>K2</b>	
	<b>CO2</b>	Evaluate the properties of material Deformation. <b>(K2)</b>						<b>K2</b>	
	<b>CO3</b>	Apply Hagen Poiseuille's equation to solve numerical Problems. <b>(K3)</b>						<b>K3</b>	
	<b>CO4</b>	Understand the concepts of stress and strain in mechanics of solids and structures and material Properties. <b>(K3)</b>						<b>K2</b>	
<b>CO5</b>	Conduct experiments on hydraulic turbines and pumps to draw characteristics.						<b>K3</b>		
<b>UNIT- I</b>	<b>Deformation of Solids</b>					<b>Periods:10</b>			
Concept of stress and strain– stress strain curve – Simple and compound Stresses - Elasticity and elastic moduli – Poisson's ratio – Thin Cylinder.									<b>CO1</b>
<b>UNIT- II</b>	<b>Shafts and Springs</b>					<b>Periods:10</b>			
Torsion – Shear stresses in circular solid and hollow shafts -Torque and power – Helical and leaf springs – Load, deflection, stress and stiffness relationships.									<b>CO2</b>
<b>UNIT- III</b>	<b>Fluid Property and Flow Characteristics</b>					<b>Periods:10</b>			
Fluid Property - Newton's law of Viscosity – Types of Flow– Reynolds number –Continuity equation - Euler's Equation of Motion. Bernoulli's Equations –Venturi meter and orifice meter - Pressure losses along the flow –Major and minor losses									<b>CO3</b>
<b>UNIT- IV</b>	<b>Part – A: Fluid Mechanics Laboratory</b>					<b>Periods:15</b>			
<b>List of Exercises</b>									<b>CO4</b>
1. Determination of Coefficient of discharge of given Venturimeter. 2. Determination of Coefficient of discharge of given Orifice meter. 3. Characteristics study on Centrifugal Pump. 4. Characteristics study on Submergible Pump. 5. Characteristic study on turbines.									
<b>UNIT-V</b>	<b>Part – B: Strength of Materials Laboratory</b>					<b>Periods:15</b>			
<b>List of Exercises</b>									<b>CO5</b>
1. Tension test and Young's modulus of steel. 2. Hardness test: Rockwell and Brinell. 3. Torsion test: Rods and Flats. 4. Impact test: Charphy and Izod on metals. 5. Ductility test: Sheet metals (Al and MS)									
<b>Lecture Periods:30</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods:30</b>		<b>Total Periods:60</b>	
<b>Text Books</b>									
1. R. K. Rajput, Strength of Materials, S. Chand & Company Ltd., 2018. 2. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Machinery,- M/s. Lakshmi Publications (P) Ltd, 2018. 3. Junarkar S. B, "Mechanics of Structures", Vol. 2, 24 <sup>th</sup> edition, Charotar Publising House, Anand, India, 2015.									
<b>Reference Books</b>									



1. William A. Nash, "Theory and problems of strength of materials", Schaum's Outline Series, McGraw-Hill International Editions, Sixth Edition (Paperback), 2013
2. Streeter, V.L., and Wylie, E.B. "Fluid Mechanics", McGraw-Hill, Ninth Edition (Paperback), 2017
3. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
4. Som, S.K., and Biswas, G. "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2nd Edition (Paperback), 2010
5. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (Reprint edition), 2010.
6. R.S. Khurmi, Strength of Materials, S.Chand & company, 24<sup>th</sup> Edition, 2006

#### Web References

1. [https://link.springer.com/chapter/10.1007/978-3-319-46407-7\\_1](https://link.springer.com/chapter/10.1007/978-3-319-46407-7_1)
2. <https://nptel.ac.in/courses/105/103/105103095/>
3. <https://nptel.ac.in/courses/103/104/103104043/>
4. <https://www.iitk.ac.in/me/fluid-mechanics-laboratory>
5. <https://fm-nitk.vlabs.ac.in/>
6. <https://rc.library.uta.edu/uta-ir/bitstream/handle/10106/28623/Applied-Fluid-Mechanics-Lab-Manual-1565646222.pdf?sequence=1&isAllowed=y>

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

#### Assessment method for theory cum practical course

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks										End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)						
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	# End Semester Examination (ESE) Marks (Practical – Internal Evaluation)		
Marks	5	5	5	5	20*	15	10	5	30*		75**	-
	*To be weighted for 10 Marks				10	*To be weighted for 10 Marks			10	30	**To be weighted for 50 Marks	100

# Final End Semester practical exam to be conducted with internal and external examiner by Head of the institution and HoD.



Dr. L. M. Varalakshmi



Department	<b>English</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category Code: <b>HS</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ENPC02</b>		Periods/Week		Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM
Course Name	<b>General Proficiency- II</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
(Common to ALL Branches except CSBS)									
Prerequisite	Basics of English Language								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Infer ideas to attend international standardized test by broadening receptive and productive skills							<b>K2</b>
	<b>CO2</b>	Interpret the types of writing in different state of affairs							<b>K3</b>
	<b>CO3</b>	Acquire meticulous exposure in speaking and get rid of performance anxiety							<b>K2</b>
	<b>CO4</b>	Articulate the ideas and opinions effectively and coherently							<b>K2</b>
	<b>CO5</b>	Progress the skills to compete in various competitive exams like GATE, GRE, UPSC, etc.							<b>K4</b>
<b>UNIT- I</b>	<b>CAREER SKILLS</b>					<b>Periods:6</b>			
Listening: Listening at specific contexts - Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps) - <b>CO1</b> Reading: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) - Writing: Integrated Writing Task (TOEFL) - Vocabulary: Synonyms and Antonyms (IELTS)									
<b>UNIT- II</b>	<b>CORPORATE SKILLS</b>					<b>Periods:6</b>			
Listening: Listening English news and reproducing in own words - Speaking: Team Presentation - Reading: Short texts and Longer Passages (cloze reading) - Writing: Analytical Writing: Analyzing an issue and Argument task (GRE based) - Vocabulary: Prefix and Suffix <b>CO2</b>									
<b>UNIT- III</b>	<b>FUNCTIONAL SKILLS</b>					<b>Periods:6</b>			
Listening: Listening TED Talks - Speaking: Brainstorming & Individual Presentation - Reading: Text Completion (GRE Based) - <b>CO3</b> Writing: Picture Inference - Vocabulary: Word Formation									
<b>UNIT- IV</b>	<b>TRANSFERRABLE SKILLS</b>					<b>Periods:6</b>			
Listening: Listening Documentaries and making notes - Speaking: Mock Interview - Reading: Read texts on emerging trends - <b>CO4</b> Writing: Agreeing & Disagreeing Essay (IELTS) - Vocabulary: Euphemism, Redundancy, Clichés and Intensifiers									
<b>UNIT-V</b>	<b>VERBAL APTITUDE - II</b>					<b>Periods:6</b>			
<b>Transformational Grammar:</b> Tenses, Change of Voice, Concord <b>Verbal Ability Enhancement:</b> Letter Series, Coding &Decoding, Sentence Equivalence (GRE)Analytical Reasoning and Logical Reasoning (GATE), Syllogism, One-word Substitution, Jumbled Sentences <b>CO5</b>									
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods:30</b>		<b>Total Periods:30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic &amp; general training". Cambridge, 2014.</li> <li>2. Prasad, Hari Mohan, Sinha, Uma Rani, "Objective English for Competitive Examinations", Tata Mc Graw Hill: Noida,2010.</li> <li>3. Loughheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.</li> <li>4. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford, 2007.</li> <li>5. Murphy, Raymond English Grammar in Use with answers: Reference and Practice for Intermediate students, Cambridge: CUP,2004.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.englishclub.com/grammar/nouns-compound.htm">https://www.englishclub.com/grammar/nouns-compound.htm</a></li> <li>2. <a href="https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/13p1">https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/13p1</a></li> <li>3. <a href="https://www.grammarwiz.com/phrases-and-clauses-quiz.html">https://www.grammarwiz.com/phrases-and-clauses-quiz.html</a></li> <li>4. <a href="https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/">https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/</a></li> <li>5. <a href="http://www.englishvocabularyexercises.com/general-vocabulary/">http://www.englishvocabularyexercises.com/general-vocabulary/</a></li> </ol>									



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	-	-	3	-	2	1	1	1

Correlation Level: 1-Low, 2-Medium, 3-High

**Evaluation Methods**

Practical				
Continuous Assessment Internal Evaluation		End Semester External Evaluation		Total Marks
50 marks		50 marks		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			



Department	<b>COMPUTER SCIENCE AND ENGINEERING</b>		Programme: <b>B.Tech.</b>							
Semester	<b>IV</b>		Course Category Code: <b>ES</b>		*End Semester Exam Type: <b>LE</b>					
Course Code	<b>U23CSPC02</b>		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	<b>Data Structures Laboratory</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>	
(Common to all Branches)										
Prerequisite	Basic Programming Knowledge									
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Analyse the algorithm's / program's efficiency in terms of time and space complexity.							<b>K3</b>	
	<b>CO2</b>	Solve the given problem by identifying the appropriate Data Structure.							<b>K3</b>	
	<b>CO3</b>	Solve the problems of searching and sorting techniques.							<b>K3</b>	
	<b>CO4</b>	Solve problems in linear Data Structures.							<b>K4</b>	
	<b>CO5</b>	Solve problems in non-linear Data Structures.							<b>K4</b>	
<b>List of Experiments:</b>										
<ol style="list-style-type: none"> <li>Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.</li> <li>Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.</li> <li>Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT</li> <li>Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a) Delete an element from list b) Search for a key element in list c) count number of nodes in list.</li> <li>Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.</li> <li>Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.</li> <li>Write a C program to perform the following operations: <ol style="list-style-type: none"> <li>Insert an element into a binary search tree.</li> <li>Delete an element from a binary search tree.</li> <li>Search for a key element in a binary search tree.</li> </ol> </li> <li>Write a C program that use recursive functions to traverse the given binary tree in <ol style="list-style-type: none"> <li>Preorder b) Inorder c) Postorder.</li> </ol> </li> <li>Write a C program to perform the AVL tree operations.</li> <li>Write a C program to implement Graph Traversal Techniques.</li> <li>Write a C program to implement the Set operations. <ol style="list-style-type: none"> <li>Union b) Intersection c) Difference.</li> </ol> </li> </ol>										
<b>Lecture Periods:</b> -			<b>Tutorial Periods:</b> -			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>		
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.</li> <li>Tenebaum Aaron M, "Data Structures using C", Pearson Publisher, 1st Edition, 2019.</li> <li>Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.</li> <li>Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.</li> <li>Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li><a href="https://www.tutorialspoint.com/data_structures_algorithms/">https://www.tutorialspoint.com/data_structures_algorithms/</a></li> <li><a href="https://www.w3schools.in/data-structures-tutorial/intro/">https://www.w3schools.in/data-structures-tutorial/intro/</a></li> <li><a href="https://nptel.ac.in/courses/106103069/">https://nptel.ac.in/courses/106103069/</a></li> <li><a href="https://swayam.gov.in/nd1_noc20_cs70/preview">https://swayam.gov.in/nd1_noc20_cs70/preview</a></li> <li><a href="https://nptel.ac.in/courses/106103069/">https://nptel.ac.in/courses/106103069/</a></li> </ol>										

\* TE – Theory Exam, LE – Lab Exam



## COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B. Tech.</b>						
Semester	<b>IV</b>			Course Category: <b>PC</b>		End Semester Exam Type: <b>LE</b>				
Course Code	<b>U23ICP404</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Microcontroller Based System Design Laboratory</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Prerequisite	Digital Laboratory									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Gain conceptual understanding of using 8085 microprocessor								<b>K2</b>
	<b>CO2</b>	Learn about interfacing of various peripheral devices with PIC18F4550 Microcontrollers								<b>K2</b>
	<b>CO3</b>	Design and generate pulses for real time applications.								<b>K3</b>
	<b>CO4</b>	Analyze the programming aspects of PIC microcontroller								<b>K3</b>
	<b>CO5</b>	Design and simulate microcontroller based systems used for control and monitoring								<b>K3</b>
<b>List of Experiments</b>										
<ol style="list-style-type: none"> <li>1. Study of 8085 microprocessor Programming</li> <li>2. Implementation of GPIO of PIC18F4550.</li> <li>3. Implementation of UART features of PIC microcontroller.</li> <li>4. Implementation of ADC of PIC microcontroller.</li> <li>5. Generation of square waveform of given duty cycle using PIC microcontroller.</li> <li>6. LCD interfacing using PIC microcontroller.</li> <li>7. Relay interfacing using PIC microcontroller</li> <li>8. Interfacing of 7 Segment display with PIC microcontroller.</li> <li>9. Stepper motor interfacing using PIC microcontroller.</li> <li>10. DC motor speed control using PIC microcontroller.</li> </ol>										
<b>Lecture Periods:</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>		
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>1. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw-Hill, 2005.</li> <li>2. Andrew N. Sloss Dominic Symes and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaughmann/Elsevier Publishers, 2006.</li> <li>3. Mazidi M.A., PIC Microcontroller and Embedded Systems: Using assembly and C for PIC, 2008.</li> <li>4. Peatman J., Embedded system Design using PIC18Fxxx, Prentice Hall, 2003.</li> <li>5. Peatman J., Design with PIC microcontrollers, Pearson Education, 2006.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li>1. <a href="https://www.mikroe.com/easymx-pro-stm32">https://www.mikroe.com/easymx-pro-stm32</a></li> <li>2. <a href="https://ww1.microchip.com/downloads/aemDocuments/documents/OTH/ProductDocuments/DataSheets/39632e.pdf">https://ww1.microchip.com/downloads/aemDocuments/documents/OTH/ProductDocuments/DataSheets/39632e.pdf</a></li> <li>3. <a href="https://microcontrollerslab.com/introduction-pic18f4550-microcontroller/">https://microcontrollerslab.com/introduction-pic18f4550-microcontroller/</a></li> <li>4. <a href="https://www.youtube.com/watch?v=MtxKP81Dy1E">https://www.youtube.com/watch?v=MtxKP81Dy1E</a></li> <li>5. <a href="https://www.microchip.com">https://www.microchip.com</a> <a href="https://www.youtube.com/watch?v=S1QCZW92fU4">https://www.youtube.com/watch?v=S1QCZW92fU4</a></li> </ol>										

\* TE – Theory Exam, LE – Lab Exam



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	3	-	2	-	-	-	-	-	2	2	1
2	3	-	3	-	3	-	2	-	-	-	-	-	3	2	1
3	3	-	3	--	3	-	2	-	2	-	-	-	3	2	1
4	2	-	3	-	3	-	2	-	-	-	-	-	2	2	1
5	3	2	3	-	3	-	2	-	-	-	-	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B. Tech.</b>							
Semester	<b>IV</b>			Course Category: <b>PC</b>		*End Semester Exam Type: <b>LE</b>					
Course Code	<b>U23ICP405</b>			Periods/Week		Credit	Maximum Marks				
				L	T	P	C	CAM	ESE	TM	
Course Name	<b>Simulation Laboratory</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>	
Prerequisite	Basics of Mathematics										
Course Outcomes	<b>On completion of the course, the students will be able to</b>										BT Mapping (Highest Level)
	<b>CO1</b>	Gain adequate knowledge on the basics of control system tools.									<b>K2</b>
	<b>CO2</b>	Obtain the model of the system and investigate its performance in open and closed loop.									<b>K3</b>
	<b>CO3</b>	Determine the time response analysis of first and second order systems.									<b>K4</b>
	<b>CO4</b>	Obtain the system stability in time domain and frequency domain.									<b>K4</b>
	<b>CO5</b>	Understand the effect of PI and PD controller.									<b>K3</b>
<b>List of Experiments</b>											
<ol style="list-style-type: none"> <li>Determination of (i) Transfer Functions and (ii) Poles and Zeros of the system.</li> <li>Determination of Step, Impulse and Ramp Response for a First Order Unity Feedback System</li> <li>Determination of Step, Impulse and Ramp Response for a Second Order Unity Feedback System.</li> <li>Determination of transfer functions of a DC servo motor and its speed control.</li> <li>Determination of transfer function of AC servo motor and its speed control.</li> <li>Stability analysis of Linear Systems.</li> <li>Compensation of Closed Loop System.</li> <li>Frequency Response analysis using Bode Plot.</li> <li>Frequency Response analysis using Polar Plot.</li> <li>Frequency Response analysis using Nyquist Plot.</li> <li>Time domain Analysis using Simulink blocks.</li> <li>Study the Effect of Addition of Poles to the Forward Path Transfer Function of a Closed Loop System.</li> </ol>											
<b>Lecture Periods:</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods: 30</b>			<b>Total Periods: 30</b>		
<b>Reference Books</b>											
<ol style="list-style-type: none"> <li>Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017.</li> <li>DingyüXue, YangQuan Chen, Modeling, Analysis and Design of Control Systems in MATLAB and Simulink, World Scientific Publishing, 2014</li> <li>Liuping Wang, PID Control System Design and Automatic Tuning Using MATLAB/Simulink, Wiley, 2020</li> <li>Norman S Nise, Control System Engineering, John Wiley and sons, inc., Seventh Edition, 2015</li> <li>Smarajith Ghosh, —Control Systems Theory and Applications II, Pearson Education, Singapore, Sixth Edition, 2015.</li> </ol>											
<b>Web References</b>											
<ol style="list-style-type: none"> <li><a href="https://in.mathworks.com/products/matlab.html">https://in.mathworks.com/products/matlab.html</a></li> <li><a href="https://nptel.ac.in/courses/108108122/">https://nptel.ac.in/courses/108108122/</a></li> <li><a href="https://www.smarzworld.com/notes/control-systems-pdf-notes-cs/">https://www.smarzworld.com/notes/control-systems-pdf-notes-cs/</a></li> </ol>											

\* TE – Theory Exam, LE – Lab Exam

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	3	2	-	-	-	-	-	-	-	2	2	2
2	3	1	3	3	3	-	-	-	-	-	-	-	2	2	2
3	3	-	-	3	2	-	-	-	-	-	-	-	2	3	2
4	3	-	-	3	2	-	-	-	-	-	-	-	2	3	3
5	3	-	-	3	2	-	-	-	-	-	-	-	2	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High



## Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100





Department	<b>Instrumentation and Control Engineering</b>	Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>	Course Category: <b>AEC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23ICC4XX</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Certification Course – IV</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
<p>Students shall choose an international certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.</p> <p>Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.</p>								
<b>Lecture Periods:-</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: 50</b>		<b>Total Periods:50</b>		

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>AEC</b>			*End Semester Exam Type: -			
Course Code	<b>U23ICS402</b>		Periods/Week		Credit	Maximum Marks			
	L	T	P	C	CAM	ESE	TM		
Course Name	<b>Skill Enhancement Course II</b> (Choose any one of the below three courses)		<b>0</b>	<b>0</b>	<b>2</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
Prerequisite									
Course Outcomes	<b>On completion of the course, the students will be able to</b>							<b>BT Mapping (Highest Level)</b>	
	<b>CO1</b>	Basic Concepts of Raspberry Pi.						<b>K2</b>	
	<b>CO2</b>	Students will be able to understand Cloud and Sensor Networks.						<b>K3</b>	
	<b>CO3</b>	Able to perform different types of PLC Programming.						<b>K2</b>	
	<b>CO4</b>	Able to implement Ladder diagrams for process control applications.						<b>K3</b>	
	<b>CO5</b>	Develop skills in creating and drafting P&IDs using industry-standard software tools						<b>K2</b>	
<b>Course Content:</b>									
<b>APPLICATIONS USING RASPBERRY PI</b>									
<ol style="list-style-type: none"> <li>1. Blink an LED to learn GPIO basics.</li> <li>2. Respond to button presses for input-output practice.</li> <li>3. Read temperature with a sensor and display the value.</li> <li>4. Measure distance using an ultrasonic sensor.</li> <li>5. Control a servo motor for precise movement.</li> <li>6. Drive a stepper motor in specific steps.</li> <li>7. Display messages and graphics on an LCD screen.</li> <li>8. Create simple sounds or alarms with a buzzer.</li> <li>9. Set up a web server using Python to build web apps.</li> <li>10. Log sensor data over time for data collection and analysis.</li> <li>11. Monitor network traffic to troubleshoot potential issues.</li> <li>12. Control your Raspberry Pi remotely with SSH or VNC.</li> <li>13. Build a simple home automation system to control devices.</li> <li>14. Create your own games using libraries like Pygame.</li> <li>15. Connect your Pi to the internet and explore the world of IoT.</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods:30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw-Hill, 2005.</li> <li>2. Andrew N. Sloss Dominic Symes and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaughmann/Elsevier Publishers, 2006.</li> <li>3. Mazidi M.A., PIC Microcontroller and Embedded Systems: Using assembly and C for PIC, 2008.</li> <li>4. Peatman J., Embedded system Design using PIC18Fxxx, Prentice Hall, 2003. Peatman J., Design with PIC microcontrollers, Pearson Education, 2006.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.mikroe.com/easymx-pro-stm32">https://www.mikroe.com/easymx-pro-stm32</a></li> <li>2. <a href="https://ww1.microchip.com/downloads/aemDocuments/documents/OTH/ProductDocuments/DataSheets/39632e.pdf">https://ww1.microchip.com/downloads/aemDocuments/documents/OTH/ProductDocuments/DataSheets/39632e.p df.</a></li> <li>3. <a href="https://microcontrollerslab.com/introduction-pic18f4550-microcontroller/">https://microcontrollerslab.com/introduction-pic18f4550-microcontroller/</a></li> <li>4. <a href="https://www.youtube.com/watch?v=MtxKP81Dy1E">https://www.youtube.com/watch?v=MtxKP81Dy1E</a></li> <li>5. <a href="https://www.microchip.com">https://www.microchip.com</a> <a href="https://www.youtube.com/watch?v=S1QCZW92fU4">https://www.youtube.com/watch?v=S1QCZW92fU4</a></li> </ol>									



## PLC PROGRAMMING

1. Identify various parts and front panel status indicators of the given PLC.
2. Use PLC to test the START STOP logic for two inputs and one output.
3. Develop /Execute a ladder program for the given application using following:- timer, counter, comparison, logical, arithmetic instruction.
4. Measure temperature of the given liquid using RTD or Thermocouple and PLC.
5. Develop/ test ladder program to blink LED/lamp.
6. Develop/ test ladder program for sequential control application of lamps/ DC motors.
7. Develop/ test ladder program for traffic light control system.
8. Develop/ test ladder program for pulse counting using limit switch/proximity sensor.
9. Develop/ test ladder program for automated car parking system.
10. Develop/ test ladder program for automated elevator control.
11. Implementation of logical function using PLC programming
12. Implementation of Timer and counter for a given applications using PLC programming
13. Development of GUI for a typical plant.
14. Development of an alarm, and historian system for a typical process.

**Lecture Periods:**

**Tutorial Periods:**

**Practical Periods: 30**

**Total Periods:30**

### Reference Books

1. McMillan, G. K., Process Industrial Instrument and controls handbook, McGraw Hill, Newyork, 1999.
2. Berge.J., Field buses for process control: Engineering, operation and maintenance, ISA Press, 2004.
3. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP 3", Summit Valley Press; 2nd Edition, 2014.
4. Mikel P. Grover, et. Al. "Industrial Robots – Technology Programming and Applications", McGraw Hill, 1980.  
Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

### Web References

1. <https://nptel.ac.in/courses/108105063/>
2. <https://www.google.com/amp/s/controlstation.com/what-is-a-distributed-control-system/amp/>
3. <https://nptel.ac.in/courses/108/105/108105088/>
4. [https://onlinecourses.nptel.ac.in/noc20\\_me39/preview](https://onlinecourses.nptel.ac.in/noc20_me39/preview)
5. [https://nptel.ac.in/content/syllabus\\_pdf/108105088.pdf](https://nptel.ac.in/content/syllabus_pdf/108105088.pdf).

## PIPING AND INSTRUMENTATION DIAGRAM

### 1. Introduction to P&IDs

- What are P&IDs?
- Purpose and importance of P&IDs in various industries
- Applications of P&IDs in different stages of a project lifecycle
- Different types of P&IDs (e.g., flow diagrams, process flow diagrams, control loop diagrams)
- Industry standards and symbols used in P&IDs (e.g., ISA, ASME)
- Introduction to P&ID software (optional)

### 2. Piping and instrumentation diagram evaluation and preparation

- P & I D Symbols
- P&I D for pumps, compressors process vessels
- P&I D absorber, evaporator.
- P&I D development & Various stages
- Line diagram symbols
- Logic gates, representation of line diagram.

### 3. Control systems and interlocks for process operation

- Introduction and need of interlock
- Types of interlocks
- Interlock for pumps, compressor
- Heater-control system for heater
- Distillation column and expander

### 4. Practical Applications

- Reading and interpreting real-world P&IDs from different industries
- Identifying and explaining specific components and control loops in a P&ID
- Hands-on exercises:
  - Creating a simple P&ID for a given process
  - Analyzing an existing P&ID and identifying potential issues

**Lecture Periods:**

**Tutorial Periods:**

**Practical Periods: 30**

**Total Periods:30**

#### Reference Books

1. Moe Toghraei, "Piping and Instrumentation Diagram Development", Wiley-AIChE, May 2019.
2. Avinashkumar, Vinodkumar Karre, Piping and Instrumentation Diagram A Stepwise Approach. De Gruyter.2023
3. Roy A. Parisher, Robert A. Rhea · Pipe Drafting and Design. Elsevier Science, 2001

#### Web References

1. <https://www.smartdraw.com/cad/piping-and-instrumentation-diagram-software.htm>
2. <https://www.edrawsoft.com/what-is-piping-instrumentation-diagram.html>
3. <https://online.visual-paradigm.com/de/knowledge/engineering/p-and-id-diagram/>
4. <https://www.sydle.com/blog/p-id-64ef8c5d2ecc0b101ec075c1>
5. <https://www.slideshare.net/karnavrana007/piping-and-instrumentation-diagram-pampid>

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	Report	Presentation / Demo / Skill Test	
Marks	10	40	50	100



Department	<b>Instrumentation and Control Engineering</b>	Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>	Course Category: <b>MC</b>			*End Semester Exam Type:-			
Course Code	<b>U23ICM404</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Right to Information and Good Governance</b>	<b>2</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
<b>UNIT- I</b>	<b>Introduction</b>							<b>Periods:6</b>
Conceptual background - Right to know - Open Government - Transparency in governance and accountability - Right to information under the Indian Constitution - Article 19 (1)(a) and Article 21 of the Constitution - Role of NGOs and movement for right to information - Right to Information Act, 2005 - Scope and objectives.								
<b>UNIT- II</b>	<b>Obligation of Public Authorities</b>							<b>Periods:6</b>
Obligations of public authorities: Section 4 Designation of Public Information Officers: Section 5 Disposal of request: Section 7 Exemption from disclosure of information: Section 8 Grounds for rejection to access in certain cases: Section 9 Severability: Section 10 Third party information: Section 11								
<b>UNIT- III</b>	<b>Central and State Information Commission</b>							<b>Periods:6</b>
Constitution of Central and State Information Commissions Terms of office and conditions of service Removal of Chief Information Commissioner or Information Commissioner. Powers and functions of Information Commissions.								
<b>UNIT- IV</b>	<b>Judiciary and Right to Information Act</b>							<b>Periods:6</b>
Protection of right to access the information - Role of the Supreme Court and High Courts Recent attempts of dilution of the right to information Law								
<b>UNIT-V</b>	<b>Right to Information Act, 2005 and its relevance to other laws</b>							<b>Periods:6</b>
Public Records Act, 1993 Whistle Blowers Protection Act, 2014 Official Secrets Act, 1923								
<b>Lecture Periods: 30</b>		<b>Tutorial Periods:</b>		<b>Practical Periods:</b>		<b>Total Periods:30</b>		

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100



# Professional Elective Courses Semester – IV



Dr. L. M. Varalakshmi

Department	<b>Biomedical Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>			Course Category: <b>PE</b>	End Semester Exam Type: <b>TE</b>					
Course Code:	<b>U23BMECO1</b>			Periods/Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Communication Systems</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite										
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Understand the various Analog modulation techniques						<b>K2</b>		
	<b>CO2</b>	Gain knowledge in Digital modulation techniques						<b>K3</b>		
	<b>CO3</b>	Knowledge about fiber optic and satellite communication systems						<b>K2</b>		
	<b>CO4</b>	Analyse spread spectrum and multiple access techniques						<b>K3</b>		
<b>CO5</b>	Realize the concepts of wireless communication						<b>K3</b>			
<b>UNIT – I</b>	<b>Analog modulation</b>				<b>Periods:9</b>					
Need for modulation - Amplitude modulation – Frequency spectrum of AM wave – Representation of AM – Power relation – Frequency modulation – Frequency spectrum of FM wave –AM transmitter – FM transmitter – Super heterodyne AM receiver –FM receivers.								<b>CO1</b>		
<b>UNIT – II</b>	<b>Digital modulation</b>				<b>Periods:9</b>					
Principles of pulse modulation – sampling theorem, PAM, PWM, PPM, Conversion of PWM wave to PPM wave – Generation of PAM, PPM and PWM waves – Demodulation of PAM, PWM, PPM – An introduction to digital modulation systems – PCM, DPCM, Delta Modulation, ADM, ASK, FSK and PSK.								<b>CO2</b>		
<b>UNIT – III</b>	<b>Fiber optic and satellite communication</b>				<b>Periods:9</b>					
Need for fiber optics- principle of light transmission through a fiber- fiber classification-fiber losses- Light sources and photo detectors- Block diagram of a fiber optic system - Power budget analysis for an optical link- Recent medical application of fiber optics. Block diagram of a satellite communication system, Satellite Orbits, satellite parameters, satellite link model, GPS services.								<b>CO3</b>		
<b>UNIT – IV</b>	<b>Spread spectrum and multiple access techniques</b>				<b>Periods:9</b>					
Pseudo-noise sequence, DS spread spectrum, FH spread spectrum, multiple access techniques –TDMA and FDMA, source coding of speech for wireless communication.								<b>CO4</b>		
<b>UNIT – V</b>	<b>Wireless communication</b>				<b>Periods:9</b>					
Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand off- Introduction to 4G & 5G technologies								<b>CO5</b>		
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: 15</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>				
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>Wayne Tomasi, "Advanced Electronic Communication Systems", Sixth Edition, Pearson Education, 2010.</li> <li>Kennedy Davis, "Electronic Communication Systems", Fifth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.</li> <li>Rappaport T.S, "Wireless Communications: Principles and Practice", Second Edition, Pearson Education, 2010</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>Simon Haykin, "Communication Systems", Fourth Edition, John Wiley and Sons, 2009.</li> <li>William C.Y. Lee, "Mobile Cellular Telecommunication Systems", McGraw Hill International Edition, Third edition, 2008.</li> <li>H.Taub, D L Schilling and G Saha, "Principles of Communication", Third Edition, Pearson Education, 2010</li> <li>B. P.Lathi, "Modern Analog and Digital Communication Systems", Third Edition, Oxford University Press, 2009</li> <li>Martin S.Roden, "Analog and Digital Communication System", Fifth Edition, Prentice Hall of India, 2012.</li> </ol>										



**Web References**

1. <https://nptel.ac.in/courses/108104091/>
2. <https://www.docsity.com/en/lecture-notes-of-intro-to-communication-systems/4580827/>
3. <https://nptel.ac.in/courses/117/105/117105143/>
4. <https://nptel.ac.in/courses/108104091/>
5. <https://www.docsity.com/en/lecture-notes-of-intro-to-communication-systems/4580827/>

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO1	PO2	PO6	PO1	PO2	PO9	PO1	PO2	PO12	PO1	PO2	PSO3
1	3	3	2	1	2	-	-	-	-	3	1	1	2	2	-
2	3	2	2	1	2	-	-	-	-	3	1	1	2	2	-
3	3	3	-	1	1	-	-	-	-	3	1	1	2	2	-
4	3	2	-	1	1	-	-	-	-	3	1	1	2	2	-
5	3	3	2	1	2	-	-	-	-	3	1	1	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Methods**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100





Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PE</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICE401</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Fundamentals of Pneumatics and Hydraulics</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Basics in fluid mechanics								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Acquire knowledge about the working of Pneumatic systems.							<b>K2</b>
	<b>CO2</b>	Identify the controlling components of Pneumatic systems							<b>K3</b>
	<b>CO3</b>	Understand the working of hydraulic systems							<b>K2</b>
	<b>CO4</b>	Identify the controlling components of hydraulic systems							<b>K3</b>
	<b>CO5</b>	Trouble shoots malfunctioning of the hydraulic and pneumatic systems and identifies the various application of the system.							<b>K3</b>
<b>UNIT – I</b>	<b>Introduction to Pneumatic Control</b>					<b>Periods:09</b>			
Structure of pneumatic control system.- Choice of working medium - characteristics of compressed air - Production of compressed air - Driers, filters, regulators, lubricators, distribution of compressed air. - Pneumatic Actuators: Linear cylinders – types, conventional type of cylinder working, mounting arrangements applications.									<b>CO1</b>
<b>UNIT – II</b>	<b>Directional Control Valves</b>					<b>Periods:09</b>			
Simple Pneumatic Control - Direct and indirect actuation pneumatic cylinders, use of memory valve. Flow control valves - speed control of cylinders supply air throttling - Exhaust air throttling and use of quick exhaust valve. Use of Logic gates – OR and AND gates pneumatic applications - Practical examples involving the use of logic gates.									<b>CO2</b>
<b>UNIT – III</b>	<b>Introduction to Hydraulic Systems</b>					<b>Periods:09</b>			
Structure of Hydraulic Control System - The Source of Hydraulic Power - Pumps Pumping theory, pump classification, gear pumps, vane pumps, piston pumps, pump performance, pump selection. Variable displacement pumps, Hydraulic Actuators - Linear Hydraulic Actuators [cylinders], Mechanics of Hydraulic Cylinder loading.									<b>CO3</b>
<b>UNIT – IV</b>	<b>Hydraulic Motors</b>					<b>Periods:09</b>			
Hydraulic Rotary Actuators, Gear motors, vane motors, piston motors, Hydraulic motor theoretical torque, power and flow rate, hydraulic motor performance, Control Components in Hydraulic Systems - Constructional features, pressure control valves – direct and pilot operated types, flow control valves.									<b>CO4</b>
<b>UNIT – V</b>	<b>Trouble Shooting and Applications</b>					<b>Periods:09</b>			
Trouble shooting and Remedies in Hydraulic and Pneumatic systems - Electrical and electronic components in fluid power systems (sensors, controllers). <b>Applications of Hydraulic and Pneumatic Systems</b> - Press and Forklift – <b>Low Cost Automation</b> -CO5 Hydraulic and pneumatic power packs.									
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
1. Anthony Esposito, Fluid Power with applications, Pearson education, Inc., 5th Edition, 2000. 2. Andrew Parr, Pneumatics and Hydraulics, Jaico Publishing Co. 2000. 3. Dr. Niranjan Murthy and Dr.R.K. Hegde, Hydraulics and Pneumatics, Sa8\pna Publications, 2013.									
<b>Reference Books</b>									
1. Srinivasan. R, Hydraulic and Pneumatic Control, Tata McGraw - Hill Education, 2 <sup>nd</sup> Edition, 2012. 2. Shanmugasundaram.K, Hydraulic and Pneumatic controls, Chand&Co, 2006. 3. Jagadeesha. T., “Pneumatics Concepts, Design and Applications “, Universities Press, 2011 4. Majumdar S.R., Oil Hydraulics Systems - Principles and Maintenance, Tata McGraw-Hill, 2001. 5. Majumdar, S.R., Pneumatic Systems – Principles and Maintenance, Tata McGraw Hill, 2007.									



**Web References**

1. <https://archive.nptel.ac.in/courses/112/106/112106300/#>
2. <https://www.youtube.com/watch?v=Dim0fLFIF0g>
3. <https://www.youtube.com/watch?v=lqgDDS7x1Gc>

\* TE – Theory Exam, LE – Lab Exam

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	-	-	-	-	-	-	-	-	3	-	1
2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	1
3	3	3	3	-	-	-	-	-	-	-	-	-	3	-	1
4	3	2	2	-	-	-	-	-	-	-	-	-	3	-	1
5	3	3	3	-	-	-	-	-	-	-	-	-	3	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PE</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICE402</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Hybrid Electric Vehicles</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	<b>Fundamentals of Machines</b>								
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the need for alternative system						<b>K2</b>	
	<b>CO2</b>	Impart knowledge on hybridization for a conventional system.						<b>K2</b>	
	<b>CO3</b>	Acquaint the Performance and characteristics of the electric propulsion systems						<b>K2</b>	
	<b>CO4</b>	Gain knowledge on energy storage devices						<b>K2</b>	
	<b>CO5</b>	Familiarize the concept of hybrid solar vehicles						<b>K2</b>	
<b>UNIT – I</b>	<b>NEED FOR ALTERNATIVE SYSTEM</b>					<b>Periods:09</b>			
Need for hybrid and electric vehicles – main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. Case study on specification of electric and hybrid vehicles.									
<b>UNIT – II</b>	<b>HYBRID TRACTION</b>					<b>Periods:09</b>			
Hybrid electric drive trains – Basic concepts of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, fuel efficiency analysis, Merits and Demerits.									
<b>UNIT – III</b>	<b>ELECTRIC PROPULSION SYSTEMS</b>					<b>Periods:09</b>			
DC motor drives, induction motor drives, permanent magnet motor drives and switched reluctance motor drives. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis									
<b>UNIT – IV</b>	<b>ENERGY STORAGE DEVICES</b>					<b>Periods:09</b>			
Battery Parameters- Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium-ion Sodium based- Metal Air. Battery Modelling- Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types Half reactions of fuel cell, Ultra-capacitors, Battery Management System.									
<b>UNIT – V</b>	<b>HYBRID SOLAR VEHICLES</b>					<b>Periods:09</b>			
Impact on hybrid Solar vehicles, Photovoltaic cell, maximum power point tracking, solar powered accessories, hybrid solar vehicles.									
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
1. MehrdadEhsani, Yimin Gao, sebastien E. Gay and Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, Third edition,2018.									
2. Iqbal Husain, —Electric and Hybrid Vehicles: Design Fundamentals, Third Edition CRC Press, 2021.									
3. Chris Mi, M. AbulMasrur, David WenzhongGao, Hybrid Electric Vehicles Principles and Applications With Practical Perspectives, Second Edition, Wiley Publication, 2017.									
<b>Reference Books</b>									
1. Seref Soylu —Electric Vehicles - The Benefits and Barriers II, InTech Publishers, Croatia, 2011.									
2. Aulice Scibioh M. and Viswanathan B., —Fuel Cells – Principles and ApplicationsII, University Press, India, 2007.									
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.									
4. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005.									
5. Denton, Tom. Electric and Hybrid Vehicles. United Kingdom: Routledge, 2020.									
<b>Web References</b>									

1. <https://nptel.ac.in/courses/108103009/>
2. <http://ceb.ac.in/knowledge-center/E-BOOKS/Modern%20Electric%2C%20Hybrid%20Electric%20%26%20Fuel%20Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf>
3. <https://www.youtube.com/watch?v=uoBuOQn9XAQ>

\* TE – Theory Exam, LE – Lab Exam

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	-	3	1	1
2	3	2	2	-	-	-	-	-	-	-	-	-	3	1	1
3	3	2	2	-	-	-	-	-	-	-	-	-	3	1	1
4	3	-	1	-	-	-	-	-	-	-	-	-	3	1	1
5	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PE</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ICE403</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Industrial Electronics</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Basic Electronics								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Gain knowledge on principle and operation of regulated supplies and types of SCR.						<b>K1</b>	
	<b>CO2</b>	Elucidate the applications of SCR in various circuitry operation.						<b>K2</b>	
	<b>CO3</b>	Examine the Role of SCR in DC motor control circuit.						<b>K1</b>	
	<b>CO4</b>	Acquaintance the knowledge on industrial timers.						<b>K2</b>	
	<b>CO5</b>	Understand the concept of industrial Heating applications.						<b>K1</b>	
<b>UNIT – I</b>	<b>REGULATED SUPPLIES AND SCRS</b>					<b>Periods:9</b>			
Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3- terminal Voltage regulators, Current boosting .Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors, Ratings of SCR.								<b>CO1</b>	
<b>UNIT – II</b>	<b>APPLICATIONS OF SCRS-I</b>					<b>Periods:9</b>			
Static circuit breaker, Protection of SCR, Inverters, Classification, Single Phase inverters, Converters, single phase Half wave and Full wave. Chopper circuits, Principle, methods and Configurations, Diac and Triac, Triacs, Triggering modes, Firing Circuits, Commutation.								<b>CO2</b>	
<b>UNIT – III</b>	<b>APPLICATIONS OF SCRS-II</b>					<b>Periods:9</b>			
Voltage compensator – solid state DC voltage regulation – DC shunt motor – armature control and field control of motor speed – electronic control of DC motor – speed regulator action – full wave motor speed regulation by one SCR.								<b>CO3</b>	
<b>UNIT – IV</b>	<b>INDUSTRIAL TIMERS</b>					<b>Periods:9</b>			
Industrial timers -Classification, types, Electronic Timers, Classification, RC and Digital timers, Time base Generators. Electric Welding, Classification, types and methods of Resistance and ARC welding								<b>CO4</b>	
<b>UNIT – V</b>	<b>INDUSTRIAL HEATING APPLICATIONS</b>					<b>Periods:9</b>			
High Frequency heating, principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating, principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics, Generation and Applications.								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Industrial and Power Electronics, G.K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003. 2. Integrated Electronics, J. Millman and C.C Halkias, McGraw Hill, 2017.									
<b>Reference Books</b>									
1. Industrial electronics and control, S.K. Bhattacharya and S.chatterjee, Tata Me Graw Hill, 2017. 2. Thyristors and applications – M. Rammurthy, East-West Press, 1977. 3. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996.									
<b>Web References</b>									
1. <a href="https://nptel.ac.in/courses/108/105/108105066/">https://nptel.ac.in/courses/108/105/108105066/</a> 2. <a href="https://swayam.gov.in/nd1_noc19_ee37/">https://swayam.gov.in/nd1_noc19_ee37/</a>									



**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	-	1	-	-	-	-	-	-	2	2	2
2	3	-	-	-	-	2	-	-	-	-	-	-	2	2	1
3	3	-	-	-	-	1	-	-	-	-	-	-	2	2	2
4	3	-	1	-	-	1	-	-	-	-	-	-	2	2	1
5	3	-	1	-	-	2	-	-	-	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	<b>Instrumentation and Control Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PE</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ICE404</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Signal Processing for Instrumentation</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to ALL Branches Except CSBS)									
Prerequisite	Basic Mathematics								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Understand the continuous and discrete time signals and systems.							<b>K3</b>
	<b>CO2</b>	Acquire knowledge on continuous time signal using fourier transform and laplace transform							<b>K3</b>
	<b>CO3</b>	Analyze the frequency spectrum of discrete-time signals.							<b>K3</b>
	<b>CO4</b>	Familiarize the concept of DFT and FFT							<b>K3</b>
	<b>CO5</b>	Acquaint knowledge on digital signal processor for various applications.							<b>K3</b>
<b>UNIT – I</b>	<b>Classification of Signals and Systems</b>					<b>Periods:12</b>			
Continuous time signals , Discrete time signals , Representation of signals: Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Classification of continuous time and discrete time signals: Periodic, aperiodic and Random signals, Energy and power signals, Continuous time and discrete time systems: Classification of systems, Properties of systems.									<b>CO1</b>
<b>UNIT – II</b>	<b>Analysis of Continuous Time Signals</b>					<b>Periods:12</b>			
Fourier Series : Properties - Trigonometric and Exponential Fourier Series -Parsavel's relation for periodic signals - Fourier Transform: Properties - Laplace Transformation : Properties, R.O.C - Inverse Laplace transform.									<b>CO2</b>
<b>UNIT – III</b>	<b>Analysis of Discrete Time Signals</b>					<b>Periods:12</b>			
Discrete Time Fourier Series: Properties, Discrete Time Fourier Transform: Properties, Z Transformation: Properties, Inverse Z-Transformation.									<b>CO3</b>
<b>UNIT – IV</b>	<b>Computation of DFT and FFT</b>					<b>Periods:12</b>			
Discrete Fourier Transform (DFT), Relationship of the DFT to other transforms, Properties of DFT, circular convolution, filtering long duration sequences, parameter selection to calculate DFT. Computation of DFT using Fast Fourier Transforms (FFT) algorithm, DIT & DIF - FFT using radix 2 – Butterfly structure- FFT applications									<b>CO4</b>
<b>UNIT – V</b>	<b>Digital Signal Processors</b>					<b>Periods:12</b>			
Introduction – Architecture of one DSP processor for motor control – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors.									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 60</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>Allan V.Oppenheim, Allan S.Willsky and S.Hamid Nawab, "Signals and Systems", Pearson, Second Edition, NewDelhi, 2015.</li> <li>Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.</li> <li>Proakis, J.G. and Manolakis, D.G., Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 2007.</li> <li>Rabiner, C.R. and Gold, B., Theory and Applications of Digital Signal Processing, Prentice Hall of India Private Limited, 2000.</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>J Simon Haykins and Barry Van Veen, "Signals and Systems", Second Edition, Wiley, 2021.</li> <li>H.P.Hsu and R.Ranjan, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, third Edition, 2013</li> <li>Johny R. Johnson : Introduction to Digital Signal Processing, Prentice Hall, 2015.</li> <li>J.GProakis and D.G.Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Pearson Education/ PHI, New Delhi, 2014.</li> <li>Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2015.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li><a href="http://eeweb.poly.edu/~onur/lectures/lectures.html">http://eeweb.poly.edu/~onur/lectures/lectures.html</a>.</li> <li><a href="http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html">http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html</a></li> <li><a href="https://nptel.ac.in/courses/117/105/117105079/">https://nptel.ac.in/courses/117/105/117105079/</a></li> </ol>									



4. <https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/>  
 5. <https://nptel.ac.in/courses/117101055>

\* TE – Theory Exam, LE – Lab Exam

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	1	-	-	-	-	-	-	-	3	3	3
2	3	2	3	2	1	-	-	-	-	-	-	-	3	3	3
3	3	2	2	3	1	-	-	-	-	-	-	-	3	3	3
4	3	2	2	2	1	-	-	-	-	-	-	-	3	3	3
5	3	2	1	2	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus





# Honours Course Semester - IV



Dr. L. M. Varalakshmi

B.Tech – Instrumentation and Control Engineering

Department	<b>Instrumentation and Control Engineering</b>			Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>			Course Category: <b>PC</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ICH401</b>			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>Design of Sensors and Transducers</b>			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Transducer Engineering									
<b>Course Outcomes</b>	<b>On completion of the course, the students will be able to</b>									BT Mapping (Highest Level)
	<b>CO1</b>	Select and design diaphragm for different practical applications.								<b>K3</b>
	<b>CO2</b>	Design strain gauge based torque, force, load and pressure measurement systems.								<b>K3</b>
	<b>CO3</b>	Design capacitance/ inductance transducers for the measurement of displacement, pressure and level.								<b>K3</b>
	<b>CO4</b>	Acquire knowledge in design of accelerometer and hall effect.								<b>K3</b>
<b>CO5</b>	Design chemical Sensors and its characteristic								<b>K3</b>	
<b>UNIT – I</b>	<b>Introduction to diaphragm</b>						<b>Periods:12</b>			
Introduction to diaphragm; Diaphragm performance and materials, Design of flat diaphragms, flat diaphragms with rigid Centre convex diaphragms, rectangular diaphragms corrugated diaphragms and semiconductor diaphragms.										<b>CO1</b>
<b>UNIT – II</b>	<b>Design of strain gauge</b>						<b>Periods:12</b>			
Design of strain gauge-based load cells, Wheatstone bridge circuit for signal amplification and compensation , torque sensors- Types of torque sensors: rotary, reaction, and non-contact, force sensors- General principles for designing force sensors and pressure sensors - Types of pressure sensors: diaphragm, capsule, and piezo resistive.										<b>CO2</b>
<b>UNIT – III</b>	<b>Design of capacitance and inductance sensors</b>						<b>Periods:12</b>			
Design of capacitance-based displacement, pressure and level sensors; Design of mutual inductance transducers for measurement of displacement- Linear Variable Differential Transformer (LVDT), Rotary Variable Differential Transformer (RVDT). Design of proximity sensors and practical demonstration.										<b>CO3</b>
<b>UNIT – IV</b>	<b>Accelerometer and Hall Effect Sensor Design</b>						<b>Periods:12</b>			
Design of Accelerometer- cantilever and seismic mass, applications. Design of Hall Effect sensors- sensitivity, magnetic field range, operating temperature, and power consumption, Electromagnetic sensors, Magneto-elastic sensors.										<b>CO4</b>
<b>UNIT – V</b>	<b>Introduction to chemical Sensors</b>						<b>Periods:12</b>			
Introduction to chemical Sensors, electrochemical, optical, enzymatic, characteristics. Design of DO2 sensor- membrane selection, electrode material, and signal processing techniques. Working principles of ChemFETs, working principles of PEMFCs.										<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: 15</b>			<b>Practical Periods: -</b>		<b>Total Periods: 60</b>		
<b>Text Books</b>										
<ol style="list-style-type: none"> <li>Doebelin E.O. and Manik D.N., "Measurement Systems", 7<sup>th</sup> Edition, McGraw-Hill Education Pvt. Ltd., 2019.</li> <li>Karl Hoffmann, An introduction to stress analysis and transducer design using strain gauges, HBM, 2012.</li> <li>James W. Dally, William F. Riley, Kenneth G. McConnell, Instrumentation for Engineering Measurements, Wiley, 1993.</li> <li>Di Giovanni, Flat and Corrugated Diaphragm Design Handbook, CRC Press, 1982.</li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>BelaG. Liptak, Instrument Engineers&amp;#39; Handbook, Process Measurement and Analysis,5th edition, Vol.2 ASME PTC, 2018.</li> <li>Richard S. Figliola, Donald E. Beasley, Theory and Design for Mechanical Measurements, John Wiley &amp; Sons, Inc, 6th Edition, 1991.</li> <li>Fraden, Jacob, Handbook of Modern Sensors: Physics, Designs, and Applications, Springe, 3rd Editions, 2010.</li> <li>Alexander D. Khazan, Transducers and Their Elements: Design and Application, PTR Prentice Hall, 1994.</li> <li>Fraden, Jacob, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer, 3rd Editions, 1993.</li> </ol>										
<b>Web References</b>										
<ol style="list-style-type: none"> <li><a href="https://srinix.org/itc/SENSOR%20AND%20TRANSDUCER.pdf">https://srinix.org/itc/SENSOR%20AND%20TRANSDUCER.pdf</a></li> <li><a href="https://web.itu.edu.tr/yalcinme/files/courses/MMG/ch2_1%20Sensors%20and%20transducers.pdf">https://web.itu.edu.tr/yalcinme/files/courses/MMG/ch2_1%20Sensors%20and%20transducers.pdf</a></li> <li><a href="https://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf">https://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf</a></li> </ol>										



4. [https://research.iaun.ac.ir/pd/abbas.chatraei/pdfs/UploadFile\\_8643.pdf](https://research.iaun.ac.ir/pd/abbas.chatraei/pdfs/UploadFile_8643.pdf).

\* TE – Theory Exam, LE – Lab Exam

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	-	1	2	-	-	-	2	-	-	-	1
2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	1
3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	1
4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	1
5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

