



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

Puducherry

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

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

**CURRICULUM AND SYLLABI**



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## 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.



## 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 (HS)	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	8	4	-	-	-	29
4	Professional Core Courses (PC)	4	8	13	7	8	15	11	-	66
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**.

	SEMESTER – I									
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
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
Theory cum Practical										
6	U23ENBC01	Communicative English - I	HS	2	0	2	3	50	50	100
Practical										
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
Ability Enhancement Course										
10	U23ICC1XX	Certification Course I**	AEC	0	0	4	-	100	-	100
Mandatory Course										
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
Theory										
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
Theory cum Practical										
6	U23ENBC02	Communicative English - II	HS	2	0	2	3	50	50	100
Practical										
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
Ability Enhancement Course										
11	U23ICC2XX	Certification Course II**	AEC	0	0	4	-	100	-	100

Mandatory Course										
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**

	SEMESTER – III									
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
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 Measurements	PC	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ICB301	Circuit Theory	PC	2	0	2	3	50	50	100
Practical										
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
Ability Enhancement Course										
11	U23ICC3XX	Certification Course III**	AEC	0	0	4	-	100	-	100
12	U23ICS301	Skill Enhancement Course I*	AEC	0	0	2	-	100	-	100
Mandatory Course										
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
Theory										
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	Solid and Fluid Mechanics	ES	2	1	0	3	25	75	100
4	U23ICT405	Linear Control Systems	PC	2	1	0	3	25	75	100
5	U23ICE4XX	Professional Elective I #	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ICB402	Microcontroller Based System Design	PC	2	0	2	3	50	50	100
Practical										
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	Solid and Fluid Mechanics Laboratory	ES	0	0	2	1	50	50	100
10	U23ICP405	Simulation Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23ICC4XX	Certification Course IV**	AEC	0	0	4	-	100	-	100
12	U23ICS402	Skill Enhancement Course II*	AEC	0	0	2	-	100	-	100

Mandatory Course										
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**

	SEMESTER – V									
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
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 - I	PC	3	0	0	3	25	75	100
4	U23ECTC02	Embedded Systems 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
Practical										
7	U23ITPC03	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U23ECPC02	Embedded Systems Design Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP506	Instrumentation System Design Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23ICW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23ICC5XX	Certification Course V**	AEC	0	0	4	-	100	-	100
Mandatory Course										
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
Theory										
1	U23ICT607	Analytical Instrumentation	PC	3	0	0	3	25	75	100
2	U23ICT608	Industrial Instrumentation - II	PC	3	0	0	3	25	75	100
3	U23ICT609	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
Theory cum Practical										
6	U23ICB603	Internet of Things for Automation	PC	2	0	2	3	50	50	100
Practical										
7	U23ICP607	Industrial Instrumentation Laboratory	PC	0	0	2	1	50	50	100
8	U23ICP608	Process Control Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP609	Virtual Instrumentation Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23ICW602	Mini Project	PA	0	0	2	1	100	-	100

Ability Enhancement Course										
11	U23ICC6XX	Certification Course VI**	AEC	0	0	4	-	100	-	100
Mandatory Course										
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**

	SEMESTER – VII									
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ICT710	Computer Control of Processes	PC	3	0	0	3	25	75	100
2	U23ICT711	Instrumentation in Biomedical Applications	PC	3	0	0	3	25	75	100
3	U23ICT712	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
Practical										
6	U23ICP710	Computer Control of Processes Laboratory	PC	0	0	2	1	50	50	100
7	U23ICP711	Process Automation Laboratory	PC	0	0	2	1	50	50	100
Project Work										
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
Theory										
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
Project Work										
4	U23ICW805	Project Phase II	PA	0	0	16	8	50	100	150
							17	125	325	450
Total Credits							170			

## 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 and Drives
5	U23ICE404	Signals 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	MEMS and Nano Technology
4	U23ICE508	Multi Sensor Data Fusion
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	Industrial Data Networks
4	U23ICE611	Non-Linear control systems
5	U23ICE612	Power Plant 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	Fiber Optics and Laser Instrumentation
5	U23ICE716	Instrumentation in Petrochemical Industries
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



**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	Instrumentation for Industry 4.0	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



**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	U23ICC93	Cloud Security	Palo alto
94	U23ICC94	PMI – Ready	PMI
95	U23ICC95	Tally – GST & TDS	Tally
96	U23ICC96	Advance Tally	Tally
97	U23ICC97	Associate Artist	Unity
98	U23ICC98	Certified Unity Programming	Unity
99	U23ICC99	VR Development	Unity



**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
		• Piping and Instrumentation Diagram

**\* 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
Theory											
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
	Total							20	125	375	500
Equivalent NPTEL courses##											
1	Sensors and Actuators							3	12 Weeks Course		
2	Optical Fiber Sensors							3			
3	Transducers for Instrumentation							3			
4	Introduction to Internet of Things							3			
5	Design for Internet of Things							3			

## 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	Mathematics			Programme: B.Tech.						
Semester	I			Course Category: BS			End Semester Exam Type: TE			
Course Code	U23MATC01			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Engineering Mathematics – I			3	1	0	4	25	75	100
(Common to ALL Branches Except CSBS)										
Prerequisite	Basic Mathematics									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Understand the concept of Eigen values and Eigen vectors, Diagonalization of a Matrix							K3	
	CO2	Solve higher order differential equations							K3	
	CO3	Understand the different types of partial differential equations							K3	
	CO4	Know about the Applications of double and triple integrals							K3	
	CO5	Gain the knowledge about Vector Calculus and its Applications							K3	
UNIT – I	Matrices						Periods:12			
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.										CO1
UNIT – II	Differential Equations (Higher Order)						Periods:12			
Linear Differential equations of higher order with constant coefficients – Euler’s linear equation of higher order with variable coefficients – Method of Variation of parameters.										CO2
UNIT – III	Functions Of Several Variables						Periods:12			
Partial derivatives – Total derivatives – Maxima and Minima of two variables – Lagrange’s Method of multipliers.										CO3
UNIT – IV	Multiple Integrals						Periods:12			
Multiple Integrals – Change of order of integration (Cartesian form). Applications: Area as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).										CO4
UNIT – V	Vector Calculus						Periods:12			
Gradient – Divergence and Curl – Directional derivatives – Irrotational and Solenoidal vector fields – Properties (Statement only) – Gauss Divergence Theorem and Stoke’s Theorem (without proofs).										CO5
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -		Total Periods: 60		
Text Books										
1. M.K. Venkataraman, “Engineering Mathematics”, The National Publishing Company, 2 <sup>nd</sup> Edition, 2016. 2. N. P Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Lakshmi Publications, New Delhi, 9 <sup>th</sup> Edition, 2018. 3. S.Narayanan and T.K. Manickavasagam Pillay,” Differential Equations and its Applications”, Viswanathan. S, Printers & Publishers Pvt Ltd, 2009.										
Reference Books										
1. G. Balaji, “Matrices and Calculus (Engineering Mathematics – I)” Balaji Publications, 9th Edition June 2023 2. A. Singaravelu, “Engineering Mathematics – I”, Meenakshi publications, 1998. 3. Erwin Kreyszig, “Advanced Engineering Mathematics “, Wiley, 10 <sup>th</sup> Edition, 2019. 4. B.V. Ramana,” Higher Engineering Mathematics”, Tata McGraw – Hill, New Delhi, 6 <sup>th</sup> Edition, 2018. 5. C W. Evans, “Engineering Mathematics”, A Programmed Approach, 3 <sup>rd</sup> Edition, 2019.										
Web References										
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> 2. <a href="http://www.math.cum.edu/~wn0g/2ch6a.pdf">http://www.math.cum.edu/~wn0g/2ch6a.pdf</a> 3. <a href="https://nptel.ac.in/courses/122/104/122104017/">https://nptel.ac.in/courses/122/104/122104017/</a> 4. <a href="https://nptel.ac.in/courses/111/106/111106051/">https://nptel.ac.in/courses/111/106/111106051/</a> 5. <a href="https://nptel.ac.in/courses/111/108/111108081/">https://nptel.ac.in/courses/111/108/111108081/</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	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

## Academic Curriculum 2023 (R-2023)

Department	Physics / Chemistry			Programme: B.Tech.				
Semester	I / II			Course Category: BS			End Semester Exam Type: TE	
Course Code	U23BSTC01			Periods/Week		Credit	Maximum Marks	
				L	T	P	C	CAM
Course Name	Physical Science for Engineers			3	0	0	3	25
							ESE	TM
							75	100
(Common to all Branches)								
Prerequisite	Physics of 12 <sup>th</sup> standard or equivalent / Chemistry of 12 <sup>th</sup> standard or equivalent.							
Course Outcomes	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	Understand the basic of properties of magnetic, dielectric and superconductors.						K2
	CO2	Identify the wave nature of the particles, physical significance of wave functions						K3
	CO3	Understand the basic principles of laser and fiber optics communication						K2
	CO4	Understand and familiar with the water treatment.						K2
	CO5	Understand the electrode potential for its feasibility in electrochemical reaction and uses of various batteries.						K2
	CO6	Understand the specific operating condition under which corrosion occurs and suggest a method to control corrosion.						K2
SECTION A - PHYSICS								
UNIT-I	Magnetic, Dielectric and Superconducting Materials					Periods: 8		
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.								CO1
UNIT-II	Quantum Mechanics					Periods: 7		
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.								CO2
UNIT-III	Laser And Fiber Optics					Periods: 7		
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)								CO3
SECTION B – CHEMISTRY								
UNIT-IV	Water And Its Treatment					Periods: 8		
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.								CO4
UNIT-V	Electrochemical Cells and Storage Devices					Periods: 8		
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.								CO5
UNIT-VI	Corrosion					Periods: 7		
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.								CO6
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -			Total Periods: 45	
Text Books								
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).								
Reference Books								
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.								

## Academic Curriculum 2023 (R-2023)

3. Jain & Jain "Engineering chemistry", Dhanpat Rai Publishing Company. 23<sup>rd</sup> Edition, 2022
4. Mars Fontana "Corrosion Engineering", July 2017
5. Jina Redlin, "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

## Academic Curriculum 2023 (R-2023)

Department	Civil / Mechanical	Programme: B.Tech.						
Semester	I / II	Course Category: ES				*End Semester Exam Type: TE		
Course Code	U23ESTC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Basics of Civil and Mechanical Engineering	3	0	0	3	25	75	100

(Common to ECE, EEE, ICE, MECH, CIVIL Branches)

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 Nekaa 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. Serop 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/112/103/112103262/>
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	Computer Science and Engineering				Programme: B.Tech						
Semester	I				Course Category: ES		*End Semester Exam Type: TE				
Course Code	U23CSTC02				Periods / Week		Credit	Maximum Marks			
					L	T	P	C	CAM	ESE	TM
Course Name	Problem Solving Approach				3	-	-	3	25	75	100
(Common to CSE, ICE and CCE)											
Prerequisite	NIL										
Course Outcomes	After completion of the course, the students will be able to										BT Mapping (Highest Level)
	CO1	Explain the basic concepts of computational thinking and problem solving.									K2
	CO2	Explain basic concepts of algorithm and data organization.									K2
	CO3	Illustrate algorithmic solution to problem solving.									K3
	CO4	Explain the concepts of array, merging, sorting & searching.									K2
	CO5	Implement recursive algorithm to solve problems.									K3
UNIT-I	Computational Thinking and Logic-Solving Problems							Periods: 9			
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.											CO1
UNIT-II	Algorithmic Thinking and Data Organization							Periods: 9			
Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns – Pseudocode and Flow Chart.											CO2
UNIT-III	Fundamental Algorithms and Factoring Methods							Periods: 9			
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.											CO3
UNIT-IV	Array, Merging, Sorting and Searching							Periods: 9			
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.											CO4
UNIT-V	Text Processing, Pattern Searching and Recursive Algorithms							Periods: 9			
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.											CO5
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -		Total Periods: 45			
Text Books											
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.											
Reference Books											
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.											
Web References											
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>											

**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

## Academic Curriculum 2023 (R-2023)

Department	Instrumentation and Control Engineering				Programme: B. Tech.							
Semester	I				Course Category: PC		*End Semester Exam Type: TE					
Course Code	U23ICT101				Periods/Week		Credit	Maximum Marks				
					L	T	P	C	CAM	ESE	TM	
Course Name	Fundamentals of Electrical Machines				3	0	0	3	25	75	100	
(Common to all Branches)												
Prerequisite	Physics											
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)	
	CO1	Gain Knowledge about the basic concepts of magnetic circuits.									K2	
	CO2	Describe the working of transformer, auto transformer and assess the regulation and efficiency of transformer.									K2	
	CO3	Demonstrate the operation of DC machines and their performance characteristics.									K3	
	CO4	Explain the working concept of single phase, three phase induction motor and analyze the operating behavior of induction motor									K3	
	CO5	Understand the working concepts of special machines									K3	
UNIT-I	Magnetic Circuits (Qualitative Treatment Only)						Periods: 09					
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.												CO1
UNIT-II	Transformers (Qualitative Treatment Only)						Periods: 09					
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.												CO2
UNIT-III	D.C Machines (Qualitative Analysis Only)						Periods: 09					
Construction, Principles of operation of DC Generators - Types –EMF Equation - Performance Characteristics of Series and Shunt Generators.												CO3
DC Motor - Torque Equation- Speed - Torque Characteristics of Series and Shunt Motors – Speed Control methods and Applications. Need for starter – types.												
UNIT-IV	Induction Motors (Qualitative Treatment Only)						Periods: 09					
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.												CO4
UNIT-V	Synchronous Machines And Special Machines (Qualitative Treatment Only)						Periods: 09					
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.												CO5
Lecture Periods: 45			Tutorial Periods:-			Practical Periods:-			Total Periods: 45			
Text Books												
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.												
Reference Books												
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												
Web References												
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



## Academic Curriculum 2023 (R-2023)

Department	English				Programme: <b>B.Tech.</b>						
Semester	First				Course Category : HS		End Semester Exam Type: <b>TE</b>				
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>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>CO4</b>	
<b>UNIT-V</b>	<b>Interpersonal Communication-I</b>							<b>Periods:15</b>			
<b>List of Exercises</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>CO5</b>	
<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>											

## Academic Curriculum 2023 (R-2023)

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		40
Listening (L)*	10		Listening (L)*	10	
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**

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as softwood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10. Discussion and implementation of a mini project.
11. Documentation of the mini project (Report and video).

<b>Lecture Periods: -</b>	<b>Tutorial Periods: -</b>	<b>Practical Periods: 30</b>	<b>Total Periods: 30</b>
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**Text Books**

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

**Reference Books**

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

## 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	Instrumentation and Control Engineering				Programme: B. Tech.						
Semester	I				Course Category: ES		*End Semester Exam Type: LE				
Course Code	U23ICP101				Periods/Week		Credit	Maximum Marks			
					L	T	P	C	CAM	ESE	TM
Course Name	Problem Solving Approach Laboratory				0	0	2	1	50	50	100
(Common to all Branches)											
Prerequisite	Basics of Mathematics										
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)
	CO1	To understand and apply algorithmic thinking.									K2
	CO2	To demonstrate proficiency in flowcharting.									K2
	CO3	To implement a programming solution and apply mathematical concepts.									K3
	CO4	To develop problem-solving skills.									K3
	CO5	To enhance debugging and error handling.									K3
List of Experiments											
1. Write an algorithm, Flowchart, pseudo code and program to find the sum of two numbers											
2. Write an algorithm, Flowchart, pseudo code and program to find the average of three numbers											
3. Write an algorithm, Flowchart, pseudo code and program to find an odd number between 1 to 50.											
4. Write an algorithm, Flowchart, pseudo code and program to find even numbers between 1 to 50.											
5. Write an algorithm, Flowchart, pseudo code and program to swap two numbers with and without a temporary variable.											
6. Write an algorithm, Flowchart, pseudo code and a program to convert temperature from Celsius to Fahrenheit and vice versa.											
7. Write an algorithm, Flowchart, pseudo code and program to find the Area and Perimeter of a Square and Circle.											
8. Write an algorithm, Flowchart, pseudo code and program to find Simple Interest and compound interest.											
9. Write an algorithm, Flowchart, pseudo code and program to find the roots of a quadratic equation.											
10. Write an algorithm, Flowchart, pseudo code and program to check if the given year is leap year or not											
11. Write an algorithm, Flowchart, pseudo code and program to check if the given number is Armstrong or not.											
12. Write an algorithm, Flowchart, pseudo code and program to generate the first n terms of the Fibonacci sequence.											
Lecture Periods:			Tutorial Periods:-			Practical Periods: 45			Total Periods: 45		
Text Books											
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.											
Reference Books											
1. Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education, 2018.											
2. Don Mc Adam, 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.											
Web References											
1. Geeks for Geeks (www.geeksforgeeks.org)											
2. Stack Overflow (stackoverflow.com)											
3. W3Schools (www.w3schools.com)											

\* 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



## Academic Curriculum 2023 (R-2023)

Department	Instrumentation and Control Engineering				Programme: B. Tech.						
Semester	I				Course Category: PC		*End Semester Exam Type: LE				
Course Code	U23ICP102				Periods/Week		Credit	Maximum Marks			
					L	T	P	C	CAM	ESE	TM
Course Name	Fundamentals of Electrical Machines Laboratory				0	0	2	1	50	50	100
(Common to all Branches)											
Prerequisite											
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)
	CO1	Acquire knowledge on wiring electrical circuits such as domestic and Go-Down wiring.									K2
	CO2	Apply appropriate measurement techniques for the calculation of power and performance of machines.									K2
	CO3	Estimate the performance of DC and induction motor by conducting load and no-load tests.									K3
	CO4	Acquire hands on experience of conducting speed tests on DC machines and obtaining their characteristic curve using standard analytical as well as graphical methods									K3
	CO5	Acquire hands on experience of conducting various tests on alternators.									K3
List of Experiments											
1. Wiring circuits for A. Go Down wiring B. Staircase C. Ceiling fan and fluorescent lamp wiring 2. Load test on single phase transformer 3. Open circuit and short circuit test on single phase transformer 4. Load characteristics of dc shunt motor 5. Speed control of dc shunt motor. 6. Load characteristics of dc series motor 7. Open circuit characteristics of separately excited dc shunt generator 8. Load test on single phase Induction motor 9. Load test on single phase Alternator 10. Study of DC and AC starters											
Lecture Periods:			Tutorial Periods:-			Practical Periods: 45			Total Periods: 45		
Text Books											
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.											
Reference Books											
1. Umesh Agarwal, "Laboratory Manual Basic Electrical Engineering, 2019", Notion Press, 1 <sup>st</sup> Edition, 2019. 2. P. Tiwari & S. Sairola S.K. Kataria & Sons, "Electrical Engineering Laboratory Practice ",Reprint 2010 Edition 2010. 3. Kothari, D. P., Umre, B. S. Laboratory Manual for Electrical Machines. India: I.K. International Publishing House Pvt. Limited, 2016 4. Chaturvedi, D. K. (2010). Electrical Machines Lab Manual with MATLAB Programs. India: Laxmi Publications Pvt Limited. 5. Janardanan, E. Special Electrical Machines. India: PHI Learning, 2014.											
Web References											
1. <a href="https://nptel.ac.in/courses/108/108/108108076/">https://nptel.ac.in/courses/108/108/108108076/</a> 2. <a href="https://nptel.ac.in/courses/108/105/108105017/">https://nptel.ac.in/courses/108/105/108105017/</a> 3. <a href="http://www.cittumkur.org/eee/em.pdf">http://www.cittumkur.org/eee/em.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	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	Instrumentation and Control Engineering					Programme: B.Tech.							
Semester	I					Course Category: MC			End Semester Exam Type: -				
Course Code	U23ICM101					Periods/Week		Credit	Maximum Marks				
						L	T	P	C	CAM	ESE	TM	
Course Name	Induction Programme					2 weeks		Non-Credit	-	-	-	-	
Prerequisite	-												
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)		
	CO1	Develop holistic attitude and harmony in the individual, family, and Society										K2	
	CO2	Acquire grammar skills and capable to write and speak English confidently										K2	
	CO3	Understand the basic concepts in Mathematics and Programming										K2	
	CO4	Know about the art and culture, language and literature of this vast secular nation										K2	
	CO5	Identify the inherent talent and develop it professionally										K3	
UNIT-I	Universal Human Values							Periods: 12					
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.												CO1	
UNIT-II	Proficiency in English							Periods: 12					
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.												CO2	
UNIT-III	Bridge Course in Mathematics and C Programming							Periods: 12					
Mathematics: 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. C Programming: 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.												CO3	
UNIT-IV	Literary Activities							Periods: 12					
Team building activities - Quiz - Oral Exercises - Group discussion, Debate, Extempore, Role play, -												CO4	
UNIT-V	Creative Arts							Periods: 12					
Introduction to painting and renowned artworks -Documentary and Short films -Music -Vocal, Instrumental - Dance - Classical, Cinematic - Mimicry - Mime.												CO5	
Lecture Periods: 60			Tutorial Periods: -			Practical Periods: -			Lecture Periods: 60				
Reference Books													
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.													
Web References													

## 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



## Academic Curriculum 2023 (R-2023)

Department	Mathematics				Programme : B.Tech.						
Semester	II				Course Category: BS		End Semester Exam Type: TE				
Course Code	U23MATC02				Periods/Week		Credit	Maximum Marks			
					L	T	P	C	CAM	ESE	TM
Course Name	Engineering Mathematics – II				3	1	0	4	25	75	100
(Common to ALL Branches Except CSBS, FT)											
Prerequisite	Basic Mathematics										
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)
	CO1	Convert a periodic function into series form.									K2
	CO2	Compute Fourier transforms of various functions.									K3
	CO3	Solve Differential Equations using Laplace transforms.									K3
	CO4	Apply inverse Laplace transform of simple functions.									K3
	CO5	Solve difference equations using Z – transforms.									K3
UNIT – I	Fourier Series						Periods:12				
Dirichlet's conditions – General Fourier series – Odd and Even functions – Half-Range sine series and cosine series – Change of intervals – Parseval's Identity.											CO1
UNIT – II	Fourier Transforms						Periods:12				
Fourier Transforms and its inverse – Properties of Fourier Transform (without proof) – Fourier sine and cosine Transforms and their properties (excluding proof).											CO2
UNIT – III	Laplace Transforms						Periods:12				
Laplace transforms of elementary functions and Periodic functions – Basic properties (excluding proof) – Laplace transforms of derivatives and integrals – Initial and final value theorems.											CO3
UNIT – IV	Inverse Laplace Transforms						Periods:12				
Definition of inverse Laplace Transforms – Convolution theorem (excluding proof) – Solutions of Linear Ordinary Differential Equations of second order with constant coefficients.											CO4
UNIT – V	Z – Transforms						Periods:12				
Z-transforms – Elementary Properties – Inverse Z-transforms (using partial fraction and Residues) – Solution of difference equations using Z - transform.											CO5
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -			Total Periods: 60		
Text Books											
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.											
Reference Books											
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> Edition, 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.											
Web References											
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

## Academic Curriculum 2023 (R-2023)

Department	Computer Science and Engineering				Programme: B.Tech.							
Semester	II				Course Category: ES		*End Semester Exam Type: TE					
Course Code	U23CSTC01				Periods / Week		Credit	Maximum Marks				
					L	T	P	C	CAM	ESE	TM	
Course Name	Programming in C				3	0	0	3	25	75	100	
(Common to All Branches)												
Prerequisite	-											
Course Outcome	On completion of the course, the students will be able to										BT Mapping (Highest Level)	
	CO1	Comprehend the basics of Computers.									K2	
	CO2	Illustrate the concepts of control structures and looping.									K2	
	CO3	Implement programs using arrays and functions.									K3	
	CO4	Demonstrate programs using Structure and Pointers.									K3	
	CO5	Build the programs using Union and File management Operations.									K3	
UNIT-I	Introduction							Periods: 09				
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.												CO1
UNIT-II	C Programming Basics							Periods: 09				
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.												CO2
UNIT-III	Arrays And Functions							Periods: 09				
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												CO3
UNIT-IV	Structure And Pointers							Periods: 09				
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.												CO4
UNIT-V	Unions And Files							Periods: 09				
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.												CO5
Lecture Periods: 45			Tutorial Periods:			Practical Periods: -			Total Periods: 45			
Text Books												
1. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, 8thEdition,2019.												
2. YashvantKanetkar, “Let us C”, BPB Publications, 16th Edition, 2017												
3. Herbert Schildt, “C: The Complete Reference”, McGraw Hill, FourthEdition,2014												
Reference Books												
1. Vikas B. Agarwal Jyoti P. Mirani, “Computer Fundamentals , Nirali Prakashan Aug-2019,												
2. Ashok N Kamthane, “Computer Programming”, Pearson education, 2 <sup>nd</sup> Impression,2012.												
3. VikasVerma, “A Workbook on C “, Cengage Learning, 2 <sup>nd</sup> Edition,2012.												
4. P.Visu, R.Srinivasan and S.Koteeswaran, “Fundamentals of Computing and Programming”, Sri Krishna Publications, 4 <sup>th</sup> Edition, 2012.												
5. PradipDev, ManasGhoush, “Programming in C”, Oxford University Press, 2 <sup>nd</sup> Edition, 2011.												
Web References												
1. <a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a>												
2. <a href="https://www.geeksforgeeks.org/c-language-set-1-introduction/">https://www.geeksforgeeks.org/c-language-set-1-introduction/</a>												
3. <a href="https://www.tutorialspoint.com/cprogramming">https://www.tutorialspoint.com/cprogramming</a>												
4. <a href="https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c">https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c</a>												
5. <a href="https://nptel.ac.in/courses/106/104/106104128/">https://nptel.ac.in/courses/106/104/106104128/</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	-	-	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	10		5	5	5	75	100

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

## Academic Curriculum 2023 (R-2023)

Department	Biomedical Engineering			Programme: B.Tech.						
Semester	II			Course Category: PC			*End Semester Exam Type: TE			
Course Code	U23BMTC01			Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Electron Devices and Circuits			3	0	0	3	25	75	100
(Common to BME and ICE Branches)										
Prerequisite	Physics									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Explains the operation of basic semiconductor diodes and its applications							K2	
	CO2	Classify the transistors configuration and analyze its characteristics							K3	
	CO3	Distinguish the special semiconductor devices and its applications							K3	
	CO4	Analyze the transistor using small signal model and understand the operation of different categories of amplifiers							K4	
	CO5	Investigate the operation of different types of feedback amplifiers and oscillators							K3	
UNIT-I	Diodes and their Applications						Periods: 9			
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.									CO1	
UNIT-II	Bipolar Junction Transistor and Field Effect Transistor						Periods:9			
Bipolar Junction Transistor: 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.									CO2	
Field Effect Transistor: Classification - JFET and its characteristics – JFET parameters, MOSFET – principle of operation- Depletion and enhancement modes.										
UNIT-III	Special Semiconductor Devices						Periods: 9			
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.									CO3	
UNIT-IV	Amplifiers						Periods: 9			
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.									CO4	
UNIT-V	Feedback Amplifiers and Oscillators						Periods: 9			
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.									CO5	
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -			Total Periods: 45	
Text Books										
1. S.Salivahanan, N. Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata Mcgraw-Hill, 2nd Edition, 2017 2. Jacob Millman,Chritos C Halkias,“ Electronic Devices and Circuits”, McGraw Hill, 4 <sup>th</sup> edition, 2015 3. R S Sedha “A Textbook of Applied Electronics” S.Chand Publications, 2008										
Reference Books										
1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits Theory, Pearson, 9th Edition, 2013. 2. Thomas L. Floyd, “Electronic devices” Prentice Hall”, 10 <sup>th</sup> Edition, 2018 3. Kumar and Jain, “Electronic devices and Circuits” PHI learning, 2016 4. Bakshi, U. A., & Godse, A. P.,“Electronic Devices and Circuits”, Technical Publications,2008 5. Anil Kumar Maini., Varsha Agrawal, “Electronic devices and circuits”, Wiley, 2019										
Web References										
1. <a href="https://nptel.ac.in/courses/117/103/117103063/">https://nptel.ac.in/courses/117/103/117103063/</a> 2. <a href="https://nptel.ac.in/courses/108108122/">https://nptel.ac.in/courses/108108122/</a> 3. <a href="https://www.electronics-tutorials.ws/">https://www.electronics-tutorials.ws/</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	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	10		5	5	5	75	100

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

## Academic Curriculum 2023 (R-2023)

Department	Instrumentation and Control Engineering			Programme: B.Tech.						
Semester	II			Course Category: PC			*End Semester Exam Type: TE			
Course Code	U23ICT202			Periods / Week			Credit		Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	Transducer Engineering			3	0	0	3	25	75	100
Prerequisite	Basics of Electronics									
Course Outcomes	On completion of the course, the students will be able to									BT Mapping (Highest Level)
	CO1	Comprehend the basic concepts of measurement systems and sensors								K2
	CO2	Analyze the resistive transducers and apply them for various applications								K2
	CO3	Gain knowledge on the types of inductive transducers and apply them for various applications								K2
	CO4	Classify and apply various types of capacitive transducers and analyze various types of sensors								K2
	CO5	Gain knowledge on Smart Sensors								K3
UNIT-I	Measurements And Instrumentation of Transducers						Periods: 09			
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.										CO1
UNIT-II	Variable Resistance Transducers						Periods: 09			
Resistive Transducers: Resistance Potentiometer: Loading effect on Potentiometer. Resistance Strain gauges: Un bonded and Bonded type strain gauges. Applications: 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.										CO2
UNIT-III	Variable Inductance Transducers						Periods: 09			
Inductive Transducers: Simple inductance and Mutual inductance Transducers – Induction Potentiometers. Linear Variable Differential Transformers – Variable reluctance transducers – Eddy current transducers. Applications: Displacement measurement - Thickness Measurement – Position Measurement.										CO3
UNIT-IV	Variable Capacitance Transducers And Other Transducers						Periods: 09			
Capacitive Transducers: Variable area type – Variable dielectric type – Variable distance type. Applications: Capacitive Thickness Transducers– Capacitive Moisture Transducers - Capacitive Level Transducer. Other Transducers: Piezoelectric Transducers - Magnetostrictive Transducers – Hall Effect Transducers – Photo electric Transducer										CO4
UNIT-V	Smart Sensors						Periods: 09			
Introduction to Smart Sensors and Semiconductor sensors: MEMS, Nano-sensors, SQUID Sensors- Applications: Environmental Monitoring sensors (Water Quality & Air Pollution) - Sensor for Motion and Position Measurement: GPS, SONAR, Thermal Sensors.										CO5
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -			Total Periods: 45	
Text Books										
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.										
Reference Books										
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, 2008.										

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

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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	1	-	-	-	-	-	1	3	2	3
2	3	3	3	2	2	1	-	-	-	-	-	1	3	2	3
3	3	3	3	2	2	1	-	-	-	-	-	1	3	2	3
4	3	3	3	2	2	1	-	-	-	-	-	1	3	2	3
5	3	3	3	2	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	10		5	5	5	75	100

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

## Academic Curriculum 2023 (R-2023)

Department	Instrumentation and Control Engineering					Programme: <b>B.Tech.</b>							
Semester	II					Course Category: <b>HS</b>		End Semester Exam Type: -					
Course Code	U23HSTC01					Periods/Week		Credit	Maximum Marks				
						L	T	P	C	CAM	ESE	TM	
Course Name	Universal Human Values -II					2	0	0	2	25	75	100	
Prerequisite	UHV-I: Universal Human Values-Introduction												
Course Outcome	The course will enable the student to										BT Mapping (Highest Level)		
	CO1	Aware of themselves, and their family, society and nature.										K2	
	CO2	Be responsible in life, and in handling problems while keeping human relationships and human nature in mind.										K2	
	CO3	Apply creativity in their education and develop holistic model.										K2	
	CO4	Apply what they have learnt to their real life.										K2	
	CO5	Be proficient to provide sustainable solutions to the problems in society and nature.										K2	
UNIT-I	Introduction to Value Education							Periods:09					
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												CO1	
UNIT-II	Harmony in the Human Being							Periods:09					
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												CO2	
UNIT-III	Harmony in the Family and Society							Periods:09					
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.												CO3	
UNIT-IV	Harmony in the Nature/Existence							Periods:09					
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												CO4	
UNIT-V	Implications of the Holistic Understanding – a Look at Professional Ethics							Periods:09					
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												CO5	
Lecture Periods:45				Tutorial Periods: -			Practical Periods: -			Total Periods:45			
Text Books													
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.													
Reference Books													
1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999													
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.													
3. The Story of Stuff (Book).													
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi													
5. Small is Beautiful - E. F Schumacher													
6. Slow is Beautiful - Cecile Andrews													
7. Economy of Permanence - J C Kumarappa													
8. Bharat Mein Angreji Raj – Pandit Sunderlal													
9. Rediscovering India - by Dharampal													
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi													
11. India Wins Freedom - Maulana Abdul Kalam Azad													
12. Vivekananda - Romain Rolland (English)													
13. Gandhi - Romain Rolland (English)													

**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

## Academic Curriculum 2023 (R-2023)

Department	English				Programme: <b>B.Tech.</b>						
Semester	Second				Course Category : HS		End Semester Exam Type:TE				
Course Code	U23ENBC02			Periods/Week		Credit	Maximum Marks				
				L	T	P	C	CAM	ESE	TM	
Course Name	Communicative English - II			2	-	2	3	50	50	100	
(Common to ALL Branches except CSBS)											
Prerequisite	Basics of English Language										
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)		
	CO1	Draft effective written communication in professional environment								K2	
	CO2	Apply the mechanics of creative writing with precision and clarity								K3	
	CO3	Acquire language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation								K2	
	CO4	Develop language fluency and gain self-confidence								K3	
	CO5	Express thoughts and ideas with clarity and focus								K2	
UNIT-I	Business Correspondence						Periods:10				
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										CO1	
UNIT-II	Functional Writing Skills						Periods:10				
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										CO2	
UNIT-III	Etiquettes						Periods:10				
Etiquette: Meaning, Kinds: Corporate Etiquette, Meeting Etiquette, Telephone Etiquette, Email Etiquette, Social Media Etiquette, Dining Etiquette, Communication Etiquette										CO3	
UNIT-IV	Communication Practice-II						Periods:15				
List of Exercises										CO4	
Listening: Letter writing tips											
Speaking: Just a Minute, Impromptu Speech, Contemporary Issues											
Reading: Variety of examples for Modes of Writing											
Writing: Different types of letters										CO5	
UNIT-V	Interpersonal Communication-II						Periods:15				
List of Exercises											
Listening: Videos on different types of Etiquettes											
Speaking: Team Presentation, Negotiation Skills											
Reading: Phrases and Clauses											
Writing: Free writing on any given topic, Paraphrasing Practice											
LecturePeriods:30			Tutorial Periods: -			Practical Periods:30			Total Periods:60		
Text Books											
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.											
Reference Books											
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.											
Web References											
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		40
Listening (L)*	10		Listening (L)*	10	
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	Mechanical			Programme : B.Tech.							
Semester	II			Course Category: ES			End Semester Exam Type: LE				
Course Code	U23ESPC03			Periods/Week			Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM	
Course Name	Engineering Graphics Using AutoCAD			0	0	2	1	50	50	100	
(Common to all Branches)											
Prerequisite	-										
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)		
	CO1	Familiarize with the fundamentals and standards of engineering graphics.								K3	
	CO2	Perform drawing of basic geometrical constructions and multiple views of objects.								K2	
	CO3	Visualize the isometric and perspective sections of simple solids.								K3	
	CO4	Connect side view associate on front view.								K4	
	CO5	Correlate sectional views and lateral surface developments of various solids.								K4	
List of Experiments											
1. 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. 2. Drawing a Title Block with necessary text and projection symbol. 3. Drawing 2D sketch by applying modify tools like fillet, mirror, array, etc., 4. Drawing front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning. 5. Drawing front view, top view and side view of objects from the given pictorial views (eg. Simple stool, V-block, Mixie Base). 6. Drawing a plan of residential building (Two bed rooms, kitchen, hall, etc.) 7. Drawing sectional views of prism, pyramid, cylinder, cone, etc, 8. Drawing lateral surface development of prism, pyramid, cylinder, cone, etc, 9. Drawing isometric projection of simple objects. 10. Creating 3D model of simple object and obtaining 2D multi-view drawings. 11. Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.											
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 30			Total Periods: 30		
Reference Books											
1. James D. Bethune, Engineering Graphics with AutoCAD A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020. 2. NS Parthasarathy and Vela Murali, Engineering Drawing, Oxford university press, 2015. 3. M.B Shah, Engineering Graphics, ITL Education Solutions Limited, Pearson Education Publication, 2011. 4. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017. 5. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd., 7th Edition, New Delhi, 2016. 6. C M Agrawal, Basant Agrawal, Engineering Graphics, McGraw Hill, 2012. 7. Dhananjay A. Jolhe, Engineering Drawing: With An Introduction To CAD McGraw Hill, 2016. 8. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.											
Web References											
1. <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> 2. <a href="http://www.nptelvideos.in/2012/12/computer-aided-design.html">http://www.nptelvideos.in/2012/12/computer-aided-design.html</a> 3. <a href="https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/">https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/</a> 4. <a href="https://autocadtutorials.com">https://autocadtutorials.com</a> 5. <a href="https://dwgmodels.com">https://dwgmodels.com</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
<b>1</b>	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
<b>2</b>	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
<b>3</b>	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
<b>4</b>	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
<b>5</b>	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

## Academic Curriculum 2023 (R-2023)

Department	Computer Science and Engineering			Programme: B.Tech.						
Semester	II			Course Category: ES			*End Semester Exam Type: LE			
Course Code	U23CSPC01			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Programming In C Laboratory			0	0	2	1	50	50	100
(Common to all Branches)										
Prerequisite	-									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Implement logical formulations to solve simple problems leading to specific applications.							K3	
	CO2	Execute C programs for simple applications making use of basic constructs, arrays and strings.							K3	
	CO3	Experiment C programs involving functions, recursion, pointers, and structures.							K3	
	CO4	Demonstrate applications using sequential and random access file processing.							K3	
	CO5	Build solutions for online coding challenges.							K3	
List of Exercises							Periods:09			
<div>1. Create a C program to find the Area of the triangle.</div> <div>2. 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.</div> <div>3. Write a C program to check whether a given character is vowel or not using Switch – Case statement.</div> <div>4. Print the numbers from 1 to 10 along with their squares using C program.</div> <div>5. Demonstrate do—While loop in C to find the sum of 'n' numbers.</div> <div>6. Find the factorial of a given number using Functions in C.</div> <div>7. Write a C program to check whether a given string is palindrome or not?</div> <div>8. Write a C program to check whether a value is prime or not?</div> <div>9. Develop a C program to swap two numbers using call by value and call by reference.</div> <div>10. Construct a C program to find the smallest and largest element in an array.</div> <div>11. Implement matrix multiplication using C program.</div> <div>12. Create a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp.</div> <div>13. Develop a C program to remove all characters in a string except alphabets.</div> <div>14. Create a C program to find the sum of an integer array using pointers.</div> <div>15. Write a C program to find the Maximum element in an integer array using pointers.</div> <div>16. Construct a C program to display Employee details using Structures</div> <div>17. Write a C program to display the contents of a file on the monitor screen.</div> <div>18. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.</div> <div>19. Write a C program to create two files with a set of values. Merge the two file contents to form a single file</div> <div>20. Create a C program to pass the parameter using command line arguments.</div>										
Lecture Periods:			Tutorial Periods:			Practical Periods:30		Total Periods:30		
Reference Books										
<div>1. Zed A Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley,2016.</div> <div>2. Anita Goel and Ajay Mittal," Computer Fundamentals and programming in C", Pearson Education, First edition, 2011.</div> <div>3. Maureen Sprinkle Hubbard," Problem Solving and Programming Concepts," Pearson,9<sup>th</sup> Edition, 2011.</div> <div>4. Yashwanth Kanethkar, "Let us C", BPB Publications,13<sup>th</sup> Edition,2008.</div> <div>5. B.W.Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2<sup>nd</sup> Edition, 2006.</div>										
Web References										
<div>1. <a href="https://alison.com/course/introduction-to-c-programming">https://alison.com/course/introduction-to-c-programming</a></div> <div>2. <a href="https://www.geeksforgeeks.org/c-programming-language/">https://www.geeksforgeeks.org/c-programming-language/</a></div> <div>3. <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></div> <div>4. <a href="https://www.tenouk.com/clabworksheet/clabworksheet.html">https://www.tenouk.com/clabworksheet/clabworksheet.html</a></div> <div>5. <a href="https://fresh2refresh.com/c-programming/">https://fresh2refresh.com/c-programming/</a></div>										

**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

## Academic Curriculum 2023 (R-2023)

Department	Biomedical Engineering				Programme: B.Tech.							
Semester	II				Course Category: PC		*End Semester Exam Type: LE					
Course Code	U23BMPC01				Periods/Week		Credit	Maximum Marks				
					L	T	P	C	CAM	ESE	TM	
Course Name	Electron Devices and Circuits Laboratory				0	0	2	1	50	50	100	
(Common to BME and ICE Branches)												
Prerequisite	-											
Course Outcomes	On completion of the course, the students will be able to									BT Mapping (Highest Level)		
	CO1	Demonstrate the characteristic of PN Junction diode and Zener diode									K3	
	CO2	Construct and analyze the applications of diodes									K4	
	CO3	Analyze the characteristics of different types of transistors and special diodes.									K4	
	CO4	Design the LC oscillators and analyze the frequency response of CE amplifier.									K4	
	CO5	Simulate the power amplifiers and feedback amplifiers.									K3	
List of Experiments:												
1. Characteristics of PN Junction Diode and Zener Diode. 2. Analysis of Half wave and Full wave Rectifiers. 3. Analysis of wave shaping circuits (Clippers and Clampers). 4. Characteristics of LED and Photo diode. 5. Characteristics of BJT in CB configuration 6. Characteristics of BJT in CE configuration 7. Characteristics of JFET 8. Negative resistance characteristics of UJT 9. Characteristics of Thyristors 10. Study the frequency response of CE Amplifier. 11. Design and Testing of LC Oscillators. 12. Simulation of Power Amplifiers and Feedback Amplifiers.												
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 30			Total Periods:30			
Reference Books												
1. Srinivasa Murthy, "Electronic Devices and Circuits Laboratory Manual", 4 <sup>th</sup> Edition, October 2015 2. David A.Bell," Lab Manual For Electronic Devices & Circuits", Fourth edition, PHI learning private limited, January 2004 3. Robert Boylestad , Louis Nashelsky, Franz Monssen , " Lab Manual for Electronic Devices and Circuit Theory", Pearson, 11 <sup>th</sup> Edition, August 2012. 4. Maheswari. L.K and Anand.M.M.S, "Laboratory Manual for Introductory Electronic Experiments", New Age, 2010. 5. Muhammad H. Rashid "Introduction to PSpice using OrCAD for circuits and electronics, Pearson, 3 <sup>rd</sup> Edition , 2004.												
Web References												
1. <a href="http://www.allaboutcircuits.com">www.allaboutcircuits.com</a> 2. <a href="http://www.circuitstoday.com">www.circuitstoday.com</a> 3. <a href="http://www.tutorialspoint.com">www.tutorialspoint.com</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	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

Department	Instrumentation and Control Engineering			Programme: <b>B.Tech.</b>							
Semester	II			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										
Course Outcomes	<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>											
1. Characteristics of Strain gauge and load cell. 2. Characteristics of potentiometer. 3. Characteristics of temperature transducer using RTD, Thermistor and Thermocouple. 4. Characteristics of Filled in system thermometer 5. Characteristics of LVDT. 6. Angular displacement Measurement using capacitive transducers. 7. Speed measurement using photoelectric tachometer. 8. Pressure measurement using piezoelectric transducers. 9. Measurement of Voltage, Current and Power using Hall Effect Sensor. 10. Characteristics of I /P Converters. 11. Characteristics of Optical Transducers. 12. Measurement of position and error detector using synchro transmitter and Receiver											
<b>Lecture Periods: -</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods:</b>			<b>Total Periods:</b>		
<b>Reference Books</b>											
1. Handbook of Laboratory Measurements and Instrumentation IFSA Publishing (2011) 2. Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18 <sup>th</sup> Edition, Dhanpat Rai & Company Private Limited, 2017. 3. Renganathan. S, “Transducer Engineering”, 4 <sup>th</sup> edition Allied Publishers, Chennai, 2003. 4. Sensors and transducers by Patranabis, 2 <sup>nd</sup> Edition, 2003. 5. John G. Webster, Sensors and Signal Conditioning, Wiley Inter Science, 2 <sup>nd</sup> Edition, 2008											
<b>Web References</b>											
1. <a href="https://lecturenotes.in/subject/30/sensors-and-transducers-st">https://lecturenotes.in/subject/30/sensors-and-transducers-st</a> 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> 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>											

\* 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

Department	Instrumentation and Control Engineering				Programme: B.Tech.							
Semester	II				Course Category: MC			End Semester Exam Type: -				
Course Code	U23ICM202				Periods / Week		Credit	Maximum Marks				
					L	T	P	C	CAM	ESE	TM	
Course Name	Sports Yoga and NSS				0	0	2	Non-Credit	100	-	100	
Prerequisite	-											
Course Outcomes	On completion of the course, the students will be able to									BT Mapping (Highest Level)		
	CO1	Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility and relaxation.									K2	
	CO2	Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.									K2	
	CO3	Develop understanding of psychological problems associated with age and lifestyle.									K2	
	CO4	Recognize the importance of national service in community development.									K2	
	CO5	Convert existing skills into socially relevant life skills.									K2	
UNIT-I	Introduction To Physical Education							Periods: 06				
Definition, Aims and Objectives of Physical Education - Changing trends in Physical Education Physical Fitness, Wellness and Lifestyle: 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.												CO1
UNIT-II	Yoga And Lifestyle							Periods: 06				
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.												CO2
UNIT-III	Training And Planning In Sports							Periods: 06				
Training - Warming up and limbering down-Skill, Technique and Style - Objectives of Planning – Tournament - Knock-Out, League/Round Robin and Combination. Psychology and Sports - 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												CO3
UNIT-IV	Introduction To National Service Scheme							Periods: 06				
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.,												CO4
UNIT-V	Community Issues And The Use Of Technology							Periods: 06				
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.												CO5
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 30			Total Periods: 30			
Reference Books												
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.												
Web References												
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/admininstruct">http://nss.nic.in/admininstruct</a> 3. <a href="http://nss.nic.in">http://nss.nic.in</a>												

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