



SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Department of Instrumentation and Control Engineering

**Minutes of 7th BoS Meeting
(UG)**

Venue : Audio Visual Room,
Department of ICE,
Sri Manakula Vinayagar Engineering College

Date & Time : 1st March, 2024 at 10:30 A.M



Department of Instrumentation and Control Engineering

Minutes of Seventh Meeting of the Board of Studies

The **Seventh meeting** of the Board of Studies in the Department of Instrumentation and Control Engineering was held on **1st March 2024 at 10:30 A.M** in the Audio Visual Room, Department of ICE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	Dr. L.M. Varalakshmi Professor and Head Department of ICE, SMVEC	Chairman
External Member		
2	Dr. G. Sakthivel Professor and Director i/c in EMMC (Educational Multimedia Centre) Department of Electronics and Instrumentation Engineering, Annamalai University	External Member (University Nominee)
3	Dr. S. Mourouga Prakash Professor and Head Department of Electronics and Instrumentation Engineering Pondicherry Engineering College	External Member (Academic Expert)
4	Dr. A. Asokan Professor Dept of Electronics and communication Government college of Engineering Sengipatti –Thanjavur	External Member (Academic Expert)
5	Dr. V. Nagarajan Professor Department of Electronics Engineering School of Engineering & Technology Pondicherry University	External Member (Academic Expert - Special Courses)

6	Mr. K. Ruba Anand Quality Manager Benlab	Industry Member
7	Mr. Ankit Shah Instrumentation Engineer Forbes Marshal	Alumni
Internal Members		
8	Dr. D. Sivanandakumar Associate Professor Department of ICE, SMVEC	Internal Member
9	Prof. K. Naveenkumar Assistant Professor Department of ICE, SMVEC	Internal Member
10	Dr. M. Rekha Associate Professor Department of ICE, SMVEC	Internal Member
11	Prof. T. Sudha Assistant Professor Department of ICE, SMVEC	Internal Member
12	Prof. J. Jeevanantham Assistant Professor Department of ICE, SMVEC	Internal Member
13	Prof. S. Karthikeyan Assistant Professor Department of ICE, SMVEC	Internal Member
14	Prof. P. Kiruthika Assistant Professor Department of ICE, SMVEC	Internal Member
15	Prof. V. Udayavalli Assistant Professor Department of ICE, SMVEC	Internal Member
16	Prof. W. Godfrey Daniel Assistant Professor Department of ICE, SMVEC	Internal Member
17	Prof. A. Sai Nishhok Krrishnaa Department of ICE, SMVEC	Internal Member
18	Prof. G. Laxminarayanan Department of ICE, SMVEC	Internal Member
19	Prof. C. Muthupraba Department of ICE, SMVEC	Internal Member
20	Prof. R. Vijayarajan Department of ICE, SMVEC	Internal Member
21	Prof. V. Kamalanathan Department of ICE, SMVEC	Internal Member

22	Dr. K. Karthikeyan Associate Professor, Department of Chemistry, SMVEC	Internal Member
23	Dr. S. Rajakumar Professor, Dept. of Mathematics, SMVEC	Internal Member
24	Dr. D. Devi Professor, Department of English, SMVEC	Internal Member
25	Prof. S. Geetha Department of Physics, SMVEC	Internal Member

Agenda 1/BoS/7/2024/ICE/UG	
	Welcome Address by chairman, Board of Studies (BoS) and introduction of external and internal members.
Agenda 2/ BoS/7/2024/ICE/UG	
	To apprise the College Achievements.
Agenda 3/ BoS/7/2024/ICE/UG	
	To review the Composition of Governing Body, Academic Council and Finance committee as per UGC Regulations 2018 and 2023.
Agenda 4/ BoS/7/2024/ICE/UG	
	To discuss the composition of Previous BoS members as per UGC Regulations 2018, Revised BoS composition as per UGC Regulations 2023, Highlights of R-2020 Regulations, Curriculum, syllabi and the suggestions received from previous meetings of BoS.
Agenda 5/ BoS/7/2024/ICE/UG	
	To deliberate the suggestions received from Curriculum advisory committee and the stakeholders for the revision of R-2020 Regulations and Curriculum.
Agenda 6/ BoS/7/2024/ICE/UG	
	To confirm the minutes of the sixth Board of Studies Meeting held on 17.07.2023.
Agenda 7/ BoS/7/2024/ICE/UG	
	To consider and approve the B.Tech. Degree Regulation 2023, Curriculum and Syllabi of third and fourth semesters for the B.Tech. – Instrumentation and Control Engineering students admitted from the academic year 2023-24. <ul style="list-style-type: none"> • Credit Distribution • Course structure • Professional Core Courses • Professional Elective Courses • Open Elective Courses offered to other departments
Agenda 8/ BoS/7/2024/ICE/UG	
	To discuss the uniqueness of the Curriculum (R-2023) <ul style="list-style-type: none"> • Theory cum Practical Courses • Micro and Mini Projects • Honours Degree • Ability Enhancement Courses <ul style="list-style-type: none"> • Skill Enhancement Courses • Certification Courses • Mandatory courses • Introduction of Universal Human Values II • Sustainable Development Goals (SDG) - equivalent courses as per NEP 2020.
Agenda 9/ BoS/7/2024/ICE/UG	

	<p>To discuss and approve the Evaluation Systems for regulation R-2023.</p> <ul style="list-style-type: none"> • Mark weightage for Continuous Assessment and End Semester Examination • Question paper pattern • Mark requirement to pass the course
Agenda 10/ BoS/7/2024/ICE/UG	
	To discuss and approve the academic calendar for the even semester 2024.
Agenda 11/ BoS/7/2024/ICE/UG	
	To review the B.Tech. Degree Regulations 2020 (R-2020), Curriculum and Syllabi from I to VIII semesters. To consider and approve the professional elective / open elective / employability enhancement courses offered to II/IV, III/VI and IV/VIII semester students under R-2020 regulation during the period Feb 2024 to May 2024. To discuss and approve the online Swayam / MOOC Courses for the students under R-2020 Regulation (Jan 24 – Apr 24).
Agenda 12/ BoS/7/2024/ICE/UG	
	<p>To discuss the research activities in the department.</p> <p>Seminar Organized Paper Publications Patent Publications Faculty pursuing Ph.D.</p>
Agenda 13/ BoS/7/2024/ICE/UG	
	<p>To consider the Teaching Pedagogies adopted to handle the courses.</p> <ul style="list-style-type: none"> • Information and Communication Technology (ICT) • Model Based Teaching • Affective and Cognitive Teaching
Agenda 14/ BoS/7/2024/ICE/UG	
	<p>To discuss the Industry Institute Interaction of the department of Instrumentation and Control Engineering.</p> <p>Guest lectures Internship details Placement details MOUs Industrial Visits</p>
Agenda 15/ BoS/7/2024/ICE/UG	
	<p>To review the student activities.</p> <p>Student Details End Semester Exam Results Participation of Students Club Activities</p>
Agenda 16/ BoS/7/2024/ICE/UG	

	To discuss and recommend the panel of examiners to the Academic Council.
Agenda 17/ BoS/7/2024/ICE/UG	
	Any other additional points with the permission of chair.

Minutes of the Meeting

Dr. L. M. Varalakshmi, Chairman, BoS initiated the meeting by welcoming the external members, Industrial Expert, the alumni and the internal members and thanked them for the detailed deliberations on the agenda items that had been approved by the Chairman.

Minutes 1/BoS/7/2024/ ICE/UG	Welcome Address by chairman, Board of Studies (BoS) and introduction of external and internal members. The meeting began with a welcome address by the chairman of the BoS and introductions of members.
Minutes 2/BoS/7/2024 /ICE/UG	To apprise the College Achievements. The highlights and achievements of the college were presented.
Minutes 3/BoS/7/2024 /ICE/UG	To review the Composition of Governing Body, Academic Council and Finance committee as per UGC Regulations 2018 and 2023. The composition of the Governing Body, Academic Council, and Finance Committee was reviewed according to UGC regulations.
Minutes 4/BoS/7/2024 /ICE/UG	To discuss the composition of Previous BoS members as per UGC Regulations 2018, Revised BoS composition as per UGC Regulations 2023, Highlights of R-2020 Regulations, Curriculum, syllabi and the suggestions received from previous meetings of BoS. The composition of previous BoS members, the revised BoS composition based on new regulations, and the highlights of the R-2020 regulations and curriculum were discussed.
Minutes 5/BoS/7/2024/ ICE/UG	To deliberate the suggestions received from Curriculum advisory committee and the stakeholders for the revision of R-2020 Regulations and Curriculum Suggestions from the Curriculum Advisory Committee and stakeholders for revising the R-2020 regulations and curriculum were discussed. (Annexure I)
Minutes 6/BoS/7/2024/ ICE/UG	To confirm the minutes of the sixth Board of Studies Meeting held on 17.07.2023. The minutes of the previous BoS meeting were confirmed.
Minutes 7/BoS/7/2024/ ICE/UG	To consider and approve the B.Tech. Degree Regulation 2023, Curriculum and Syllabi of third and fourth semesters for the B.Tech. – Instrumentation and Control Engineering students admitted from the

academic year 2023-24.

- Credit Distribution
- Course structure
- Professional Core Courses
- Professional Elective Courses
- Open Elective Courses offered to other departments

S. No	Sem	Subject and Code	Type	Unit	Particulars
1	III	Electrical and Electronic Measurement (U23ICT303)	Core	-	Title Change "Electrical and Electronic Instrumentation".

Suggestions by Expert members

- Project Credit can be increased as per the AICTE model curriculum.
- The experts suggested 40 / 60 weightage can be implemented for practicals instead of 50 /50
- Transient can be included in Circuit theory in theory cum practical course.
- Industrial Instrumentation 1 and 2 can be confined into single course.
- Industrial Buses and Network course may be added in the curriculum.
- Research methodology can be considered for PG students.
- Outreach activity for students can be carried out in the government schools of nearby villages.

The B.Tech. Degree Regulation 2023, curriculum, and syllabi for the third and fourth semesters for students admitted from the academic year 2023-24 were considered and approved. **(Annexure II)**

**Minutes
8/BoS/7/2024
/ICE/UG**

To discuss the uniqueness of the Curriculum (R-2023)

The unique features of the new curriculum (R-2023) were discussed including

- Theory cum Practical Courses
- Micro and Mini Projects
- Honours Degree
- Ability Enhancement Courses
 - Skill Enhancement Courses
 - Certification Courses
- Mandatory courses
- Introduction of Universal Human Values II
- Sustainable Development Goals (SDG) - equivalent courses as per NEP 2020.

**Minutes
9/BoS/7/2024
/ICE/UG**

To discuss and approve the Evaluation Systems for regulation R-2023.

The evaluation system for the R-2023 regulation was discussed and approved, including:

	<ul style="list-style-type: none"> • Mark weightage for Continuous Assessment and End Semester Examination • Question paper pattern • Mark requirement to pass the course
Minutes 10/BoS/7/2024 4 /ICE/UG	<p>To discuss and approve the academic calendar for the even semester 2024.</p> <p>The academic calendar for the even semester of 2024 was discussed and approved. (Annexure III)</p>
Minutes 11/BoS/7/2024 4/ICE/UG	<p>To review the B.Tech. Degree Regulations 2020 (R-2020), Curriculum and Syllabi from I to VIII semesters.</p> <p>To consider and approve the professional elective / open elective / employability enhancement courses offered to II/IV, III/VI and IV/VIII semester students under R-2020 regulation during the period Feb 2024 to May 2024.</p> <p>To discuss and approve the online Swayam / MOOC Courses for the students under R-2020 Regulation (Jan 24 – Apr 24).</p> <p>The B.Tech. Degree Regulations 2020 (R-2020), curriculum, and syllabi from semesters 1 to 8 were reviewed.</p> <p>Professional elective, open elective, and employability enhancement courses offered to students under R-2020 during the period February 2024 to May 2024 were considered and approved. (Annexure IV)</p> <p>Professional Elective</p> <ul style="list-style-type: none"> ▪ II / IV - Electric and Hybrid Vehicles (U20ICE402) ▪ III / VI - Virtual Instrumentation (U20ICCM02) ▪ IV / VIII - Industrial Safety (U20ICE821) - Design of Process Control System Components (U20ICE826) <p>Open Elective</p> <ul style="list-style-type: none"> ▪ II / IV - Introduction to Data Science (U20ADO402) ▪ III / VI - Principle of Artificial Intelligence and Machine Learning (U20ADO603) <p>Certification Course</p> <ul style="list-style-type: none"> ▪ II/IV- Cybersecurity ▪ III/VI - Industrial Automation <p>Online Swayam/MOOC courses for students under R-2020 regulation (January 24 to April 24) were discussed. (Annexure V)</p> <ul style="list-style-type: none"> • Introduction to internet of things • Air pollution and control • Introduction To Industry 4.0 And Industrial Internet Of Things • Azure fundamentals(AZ-900) • The Joy of computing using python • Data science with python • Web Developers

	<ul style="list-style-type: none"> • Robotic Process Automation • Cyber security.
Minutes 12/BoS/7/202 4/ICE/UG	<p>To discuss the research activities in the department.</p> <ul style="list-style-type: none"> • Seminar Organized • Paper Publications • Patent Publications • Faculty pursuing Ph.D <p>Research activities in the department, including seminars, publications, patents, ongoing PhDs, were discussed.</p>
Minutes 13/BoS/7/202 4/ICE/UG	<p>To consider the Teaching Pedagogies adopted to handle the courses.</p> <ul style="list-style-type: none"> • Information and Communication Technology (ICT) • Model Based Teaching • Affective and Cognitive Teaching <p>Teaching methodologies adopted in the department, including ICT, model-based teaching, and affective and cognitive teaching, were discussed.</p>
Minutes 14/BoS/7/202 4/ICE/UG	<p>To discuss the Industry Institute Interaction of the department of Instrumentation and Control Engineering.</p> <p>Guest lectures Internship details Placement details MOUs Industrial Visits</p> <p>Industry-institute interaction activities such as guest lectures, internships, placements, MOUs, and industrial visits were reviewed.</p>
Minutes 15/BoS/7/202 4/ICE/UG	<p>To review the student activities.</p> <p>Student Details End Semester Exam Results Participation of Students Club Activities</p> <p>Student activities, including student details, exam results, participation, and club activities, were reviewed.</p>
Minutes 16/BoS/7/202 4/ICE/UG	<p>To discuss and recommend the panel of examiners to the Academic Council.</p>


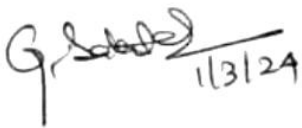

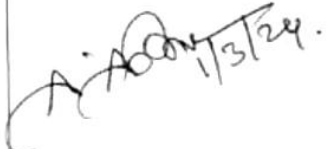



A panel of examiners was discussed and recommended to the Academic Council. **(Annexure VI)**


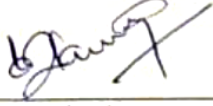

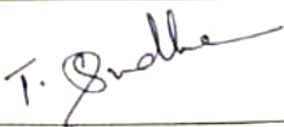
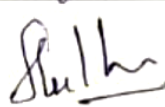
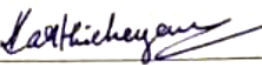


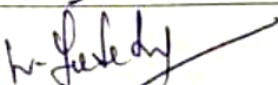
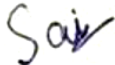
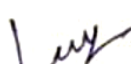
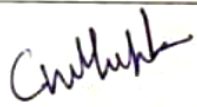

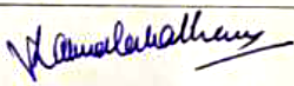

**Minutes
17/BoS/7/202
4/ICE/UG**


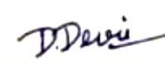
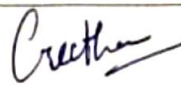
Any other additional points with the permission of chair.

Equivalent courses of R-2020 and R-2023 were discussed. **(Annexure VII)**

The meeting concluded at 1.00 PM with vote of thanks by Dr. L. M. Varalakshmi,
Head of Department, Instrumentation and Control Engineering

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. L.M. Varalakshmi Professor and Head Department of ICE, SMVEC	Chairman	
External Members			
2	Dr. G. Sakthivel, Professor and Director i/c in EMMC (Educational Multimedia Centre Department of Electronics and Instrumentation Engineering, Annamalai University	External Member (University Nominee)	 11/3/24
3	Dr. S. Mourouga Prakash Professor and Head Department of Electronics and Instrumentation Engineering Pondicherry Engineering College	External Member (Academic Expert)	 1.12.24
4	Dr. A. Asokan Professor Dept of Electronics and communication Government college of Engineering Sengipatti –Thanjavur	External Member (Academic Expert)	 1/3/24.
5	Dr. V. Nagarajan Professor Department of Electronics Engineering School of Engineering & Technology Pondicherry University	External Member (Academic Expert - Special Courses)	 1/3/24.
6	Mr. K. Ruba Anand Quality Manager Benlab	Industry Member	
7	Mr. Ankit Shah Instrumentation Engineer Forbes Marshal	Alumni	

Internal Members			
8	Dr. D. Sivanandakumar Associate Professor Department of ICE, SMVEC	Internal Member	
9	Prof. K. Naveenkumar Assistant Professor Department of ICE, SMVEC	Internal Member	
10	Dr. M. Rekha Associate Professor Department of ICE, SMVEC	Internal Member	
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16	Prof. W. Godfrey Daniel Assistant Professor Department of ICE, SMVEC	Internal Member	
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18	Prof. G. Laxminarayanan Department of ICE, SMVEC	Internal Member	
19	Prof. C. Muthupraba Department of ICE, SMVEC	Internal Member	
20	Prof. R. Vijayarajan Department of ICE, SMVEC	Internal Member	
21	Prof. V. Kamalanathan Department of ICE, SMVEC	Internal Member	
22	Dr. K. Karthikeyan Associate Professor, Department of Chemistry, SMVEC	Internal Member	

23	Dr. S. Rajakumar Professor, Dept. of Mathematics, SMVEC	Internal Member	
24	Dr. D. Devi Professor, Department of English, SMVEC	Internal Member	
25	Prof. S. Geetha Department of Physics, SMVEC	Internal Member	



Chairman-BoS /Dept. of ICE
(Dr.L. M. Varalakshmi)



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Department of Instrumentation and Control Engineering

Annexure I

(Suggestions from Curriculum Advisory Committee)

**Consolidated feedback received from various stakeholders (Academic experts,
Employers, Parents, Students and Alumni)**

Sl. No.	Category of Stakeholder	Number of feedbacks collected	Collective feedback
1	Academic experts	20	For NPTEL course completion, exchange of credits can be considered with the final semester elective subjects.
			One credit courses may be included.
			Skill development courses can be implemented on credit basis.
			Foreign exchange programs can be encouraged to provide better exposure to the students.
			Foreign languages can be added in the skill development course as optional.
2	Employers	20	Case studies to be included in fifth unit wherever possible.
			Digital Transducer can be included in Transducer Engineering.
			Last two units can be modified as real time embedded system and its applications.
			In Fuzzy Logic and Neural Network, Virtual modeling in fuzzy can be included.
			In Embedded system Design Lab, RP2040 dual arm cortex can be used for laboratory experiments instead of LPC2148.
			In Process Automation, Awareness regarding stuxnet malware can be included.
			In Analog and Digital Circuits lab can be splitted separately
In Signals and System, FFT and DFT can be minimized.			

3	Parents	10	More real time (Practical) knowledge can be fed to the students.
			Students can be given more aptitude training classes.
			Competitive exam training can be given to the students.
4	Students	20	Syllabus for signals and systems has to be updated
			Digital logic circuits syllabus is very vast.
			Robotics and automation lab can be added.
5	Alumni	20	More courses can be added related to Automobile.
			PLC can be added as separate course.
			More Practical courses can be included.
			Embedded software can be added. More weightage can be given to embedded designing.
			Number of soft skill courses can be increased.
			Simulation lab -MATLAB software can be explored in depth.



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Department of Instrumentation and Control Engineering

Annexure II

(R-2023 – Curriculum and Syllabi (I - IV semester))



SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.
INSTRUMENTATION AND CONTROL ENGINEERING

ACADEMIC REGULATIONS 2023
(R-2023)

CURRICULUM AND SYLLABI
VOLUME 2



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*)	-
Total		170

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

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

* 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 Instrumentation	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	Linear Control Systems	PC	2	1	0	3	25	75	100
4	U23ICT405	Microcontroller Based System Design	PC	3	0	0	3	25	75	100
5	U23ICE4XX	Professional Elective I #	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ICB402	Solid and Fluid Mechanics	ES	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	Microcontroller Based System Design Laboratory	PC	0	0	2	1	50	50	100
10	U23ICP405	Simulation Laboratory	PC	0	0	2	1	50	50	100
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	PC	3	0	0	3	25	75	100
4	U23ICT507	Embedded System Design	PC	3	0	0	3	25	75	100
5	U23ICE5XX	Professional Elective II #	PE	3	0	0	3	25	75	100
6	U23XXO5XX	Open Elective I §	OE	3	0	0	3	25	75	100
Practical										
7	U23ITPC03	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U23ICP506	Embedded System Design Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP507	Industrial Instrumentation Laboratory	PC	0	0	2	1	50	50	100
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	U23ICT608	Analytical Instrumentation	PC	3	0	0	3	25	75	100
2	U23ICT609	Power Plant Instrumentation	PC	3	0	0	3	25	75	100
3	U23ICT610	Process Control	PC	3	0	0	3	25	75	100
4	U23ICE6XX	Professional Elective III #	PE	3	0	0	3	25	75	100
5	U23XXO6XX	Open Elective II §	OE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ICB603	Internet of Things for Automation	PC	2	0	2	3	50	50	100
Practical										
7	U23ICP608	Instrumentation System Design Laboratory	PC	0	0	2	1	50	50	100
8	U23ICP609	Process Control Laboratory	PC	0	0	2	1	50	50	100
9	U23ICP610	Virtual Instrumentation Laboratory	PC	0	0	2	1	50	50	100
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	U23ICT711	Computer Control of Processes	PC	3	0	0	3	25	75	100
2	U23ICT712	Instrumentation in Biomedical Applications	PC	3	0	0	3	25	75	100
3	U23ICT713	Process Automation	PC	3	0	0	3	25	75	100
4	U23ICE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective III §	OE	3	0	0	3	25	75	100
Practical										
6	U23ICP711	Computer Control of Processes Laboratory	PC	0	0	2	1	50	50	100
7	U23ICP712	Process Automation Laboratory	PC	0	0	2	1	50	50	100
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
5	U23ICE404	Signal Processing for Instrumentation
Professional Elective – II (Offered in Semester V)		
Sl. No.	Course Code	Course Title
1	U23ICE505	Energy Harvesting Techniques
2	U23ICE506	Industrial Unit Operations
3	U23ICE507	Micro Electromechanical Systems
4	U23ICE508	Instrumentation Buses and Data Networks
5	U23ICE509	Wireless Instrumentation
Professional Elective – III (Offered in Semester VI)		
Sl. No.	Course Code	Course Title
1	U23ICEC01	Virtual Instrumentation
2	U23ICEC02	Soft Computing Techniques
3	U23ICE610	Calibration Systems
4	U23ICE611	Non-Linear control systems
5	U23ICE612	Fiber Optics and Laser Instrumentation
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	Course Code	Course Title
1	U23ICEC03	Intelligent Robotic Systems
2	U23ICE713	Advanced Process Control
3	U23ICE714	Automotive Instrumentation and Control
4	U23ICE715	Instrumentation symbols and Standards
5	U23ICE716	Field instruments for process control
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1	U23BMEC02	Wearable Technology
2	U23ICE817	Artificial Intelligence for Process Control
3	U23ICE818	Design of Process Control System Components
4	U23ICE819	Instrumentation in Agriculture and Food Processing Industries

5	U23ICE820	System Identification and Adaptive Control
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
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

Open Elective- I (Offered in Semester V/ VI)				
S. No	Course Code	Course Title	Offering Department	Offered Department
Open Elective – I/ Open Elective – II (Offered in Semester V for CSE, IT, MECH, Mechatronics, AI&DS) (Offered in Semester VI for EEE, ECE, ICE, CIVIL, BME, CCE, FT)				
1	U23ICOC01	Sensors and Transducers	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS
2	U23ICOC02	Basics of LabVIEW	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS, Mechatronics
Open Elective- II (Offered in Semester VII)				
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 Equinity	NISM
90	U23ICCX90	Research Analyst	NISM
91	U23ICCX91	Portfolio Management Services	NISM
92	U23ICCX92	Cyber Security	Palo alto

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

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

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

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

Annexure – V

HONOURS PROGRAMME - SENSORS TECHNOLOGY

COURSE DETAILS											
Sl. No.	Semester	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
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										
<ol style="list-style-type: none"> 1. M.K. Venkataraman, "Engineering Mathematics", The National Publishing Company, 2nd Edition, 2016. 2. N. P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018. 3. S.Narayanan and T.K. Manickavasagam Pillay, "Differential Equations and its Applications", Viswanathan. S, Printers & Publishers Pvt Ltd, 2009. 										
Reference Books										
<ol style="list-style-type: none"> 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, 10th Edition, 2019. 4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition, 2018. 5. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019. 										
Web References										
<ol style="list-style-type: none"> 1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra-slides-systems-of-equation-handout.pdf 2. http://www.math.cum.edu/~wn0g/2ch6a.pdf 3. https://nptel.ac.in/courses/122/104/122104017/ 4. https://nptel.ac.in/courses/111/106/111106051/ 5. https://nptel.ac.in/courses/111/108/111108081/ 										

* 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	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	ESE	TM
Course Name	Physical Science for Engineers		3	0	0	3	25	75	100
(Common to all Branches)									
Prerequisite	Physics of 12 th standard or equivalent / Chemistry of 12 th 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 ₂ 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 ₂ -O ₂ 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 nd Edition ,2011.									
2. S.S Dara – "A text book of Engineering Chemistry" -. S.Chand Publications, 15 th Edition, 2021									
3. C.Jain, Monica Jain "Engineering Chemistry", Dhanpat Rai Pub. Co., New Delhi, 17 th 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 th Edition, 2009.									

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

Web References

1. https://www.sciencedaily.com/terms/materials_science.htm.
2. <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

* 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	Basic Science						
Course Outcomes	On completion of the course, the students will be able to						BT Mapping (Highest Level)
	CO1	Understand the types of buildings and materials.					K2
	CO2	Summarize on the various components of buildings and surveying concepts					K2
	CO3	Identify the various infrastructure facilities					K2
	CO4	To familiarize the working principles of IC engines and automobile systems					K2
	CO5	To understand about the power generation systems and its components					K1
	CO6	To acquire knowledge about the various machining process.					K2

SECTION A - CIVIL ENGINEERING

UNIT - I	Buildings And Buildings Materials	Periods: 08
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		CO1
UNIT - II	Buildings Components and Surveying	Periods: 08
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		CO2
UNIT - III	Basic Infrastructure	Periods: 07
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.		CO3

SECTION B – MECHANICAL ENGINEERING

UNIT- IV	Internal And External Combustion Systems	Periods: 08
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.		CO4
UNIT- V	Power Generation Systems, Refrigeration and Air Conditioning System	Periods: 07
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.		CO5
UNIT- VI	Manufacturing Process	Periods: 07
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).		CO6
Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -
		Total Periods: 45

Text Books

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

Reference Books

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

Web References

1. <https://nptel.ac.in/courses/112107291/>
2. <https://nptel.ac.in/courses/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										
<ol style="list-style-type: none"> David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman & Hall/CRC Textbooks in Computing, 2014. R.G.Dromey, "How to solve it by Computer", PHI, 2008. Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA, 2008. 										
Reference Books										
<ol style="list-style-type: none"> Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education, 2018. Don McAdam, Roger Winn, "A Problem-solving Approach", Prentice Hall Canada; 2nd Edition, 2017. V Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012. Sham Tickoo "A Problem-solving Approach", Delmar/Cengage Learning, 2009. Harold Abelson & Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997. 										
Web References										
<ol style="list-style-type: none"> https://www.edx.org/learn/problem-solving https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html https://www.classcentral.com/course/problem-solving-skills-6687 										
* 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	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. DC Motor - Torque Equation- Speed - Torque Characteristics of Series and Shunt Motors – Speed Control methods and Applications. Need for starter – types.									CO3
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. https://www.electricaltechnology.org/									
2. https://nptel.ac.in/courses/108105053/									
3. https://www.youtube.com/watch?v=FAjM4C7dssM									

* 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.Tech.						
Semester	First		Course Category : HS			End Semester Exam Type:TE			
Course Code	U23ENBC01		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Communicative English - I		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	Understand the communication flow in organization and its objectives						K2	
	CO2	Write the technical contents with grammatically precise sentences						K2	
	CO3	Articulate with correct pronunciation and overcome vernacular impact in speaking						K3	
	CO4	Express opinions confidently in formal and informal communicative contexts						K2	
	CO5	Attend interview with assertiveness						K3	
UNIT- I	Workstead Communication					Periods:10			
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									CO1
UNIT- II	Common Errors In Writing And Comprehension Strategies					Periods:10			
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									CO2
UNIT- III	Phonetics					Periods:10			
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									CO3
UNIT- IV	Communication Practice-I					Periods:15			
List of Exercises									CO4
Listening: Self Introduction videos									
Speaking: Self-Introduction, Extempore, and Role Play									
Reading: Non-Technical Comprehension Passage									
Writing: Common Errors in Writing									
UNIT-V	Interpersonal Communication-I					Periods:15			
List of Exercises									CO5
Listening: Speech Sounds, Interview Videos									
Speaking: Debate, Structured Group Discussion, and Conversation									
Reading: Commonly Confused Words									
Writing: Transcription									
Lecture Periods:30			Tutorial Periods:-			Practical Periods:30		Total Periods:60	
Text Books									
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.									
Reference Books									
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.									
Web References									
1. https://lemongrad.com/subject-verb-agreement-rules/									
2. https://opentextbc.ca/advancedenglish/chapter/misplaced-and-dangling-modifiers/									
3. https://www.hitbullseye.com/Reading-Comprehension-Tricks.php									

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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	Mechanical Engineering			Programme: B.Tech.							
Semester	I / II			Course Category : ES		End Semester Exam Type: LE					
Course Code	U23ESPC02			Periods/Week			Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM	
Course Name	Design Thinking and IDEA Lab			0	0	2	1	50	50	100	
(Common to ALL Branches)											
Prerequisite	Basic Knowledge of Science										
Course Outcomes	On completion of the course, the students will be able to										BT Mapping (Highest Level)
	CO1	Demonstrate a comprehensive understanding of the tools and inventory associated with the IDEA Lab.								K2	
	CO2	Develop proficiency in ideation techniques to generate creative and innovative solutions for various design challenges and problems								K3	
	CO3	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.								K3	
	CO4	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.								K4	
	CO5	Apply iterative design methodologies to refine and improve solutions based on feedback, user testing, and evaluation of functional, aesthetic, and usability aspects								K4	
<p>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</p> <p>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.</p> <p>Sustainable product design, Ergonomics, Semantics, Entrepreneurship/business ideas, Product Data Specification, establishing target specifications, Setting the final specifications. Design projects for teams.</p>											
<p>List of Lab Activities and Experiments</p> <ol style="list-style-type: none"> Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit. Machining of 3D geometry on soft material such as softwood or modelling wax. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs. Familiarity and use of welding equipment. Familiarity and use of normal and wood lathe. Embedded programming using Arduino and/or Raspberry Pi. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure. Discussion and implementation of a mini project. Documentation of the mini project (Report and video). 											
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 30			Total Periods: 30		
Text Books											
<ol style="list-style-type: none"> Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing. 											
Reference Books											
<ol style="list-style-type: none"> Ulrich and Eppinger, Product Design and Development, McGraw Hill, 3rd Edition, 2004 The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan, Weldon Owen; 2017. 											

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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

* 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									
<ol style="list-style-type: none"> Write an algorithm, Flowchart, pseudo code and program to find the sum of two numbers Write an algorithm, Flowchart, pseudo code and program to find the average of three numbers Write an algorithm, Flowchart, pseudo code and program to find an odd number between 1 to 50. Write an algorithm, Flowchart, pseudo code and program to find even numbers between 1 to 50. Write an algorithm, Flowchart, pseudo code and program to swap two numbers with and without a temporary variable. Write an algorithm, Flowchart, pseudo code and a program to convert temperature from Celsius to Fahrenheit and vice versa. Write an algorithm, Flowchart, pseudo code and program to find the Area and Perimeter of a Square and Circle. Write an algorithm, Flowchart, pseudo code and program to find Simple Interest and compound interest. Write an algorithm, Flowchart, pseudo code and program to find the roots of a quadratic equation. Write an algorithm, Flowchart, pseudo code and program to check if the given year is leap year or not Write an algorithm, Flowchart, pseudo code and program to check if the given number is Armstrong or not. 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									
<ol style="list-style-type: none"> David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman & Hall/CRC Textbooks in Computing, 2014. R.G. Dromey, "How to solve it by Computer", PHI, 2008. Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA, 2008. 									
Reference Books									
<ol style="list-style-type: none"> Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education, 2018. Don Mc Adam, Roger Winn, "A Problem-solving Approach", Prentive Hall Canada; 2nd Edition, 2017. V Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012. Sham Tickoo "A Problem-solving Approach", Delmar/Cengage Learning, 2009. Harold Abelson & Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997. 									
Web References									
<ol style="list-style-type: none"> Geeks for Geeks (www.geeksforgeeks.org) Stack Overflow (stackoverflow.com) W3Schools (www.w3schools.com) 									
* 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	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									
<ol style="list-style-type: none"> Wiring circuits for <ol style="list-style-type: none"> Go Down wiring Staircase Ceiling fan and fluorescent lamp wiring Load test on single phase transformer Open circuit and short circuit test on single phase transformer Load characteristics of dc shunt motor Speed control of dc shunt motor. Load characteristics of dc series motor Open circuit characteristics of separately excited dc shunt generator Load test on single phase Induction motor Load test on single phase Alternator Study of DC and AC starters 									
Lecture Periods:			Tutorial Periods:-			Practical Periods: 45		Total Periods: 45	
Text Books									
<ol style="list-style-type: none"> J.B. Gupta, "Theory and Performance of Electrical Machines", S.K. Kataria & Sons, 4th Edition, 2013. B.L. Theraja and A.K. Theraja, "A Text Book of Electrical Technology, Vol.II", S. Chand & Company Ltd., 2010. R.K. Rajput, "Electrical Engineering" Lakshmi Publications Pvt Limited, 4th Edition, 2018. 									
Reference Books									
<ol style="list-style-type: none"> Umesh Agarwal, "Laboratory Manual Basic Electrical Engineering, 2019", Notion Press, 1st Edition, 2019. P. Tiwari & S. Sairola S.K. Kataria & Sons, "Electrical Engineering Laboratory Practice ", Reprint 2010 Edition 2010. Kothari, D. P., Umre, B. S. Laboratory Manual for Electrical Machines. India: I.K. International Publishing House Pvt. Limited, 2016 Chaturvedi, D. K. (2010). Electrical Machines Lab Manual with MATLAB Programs. India: Laxmi Publications Pvt Limited. Janardanan, E. Special Electrical Machines. India: PHI Learning, 2014. 									
Web References									
<ol style="list-style-type: none"> https://nptel.ac.in/courses/108/108/108108076/ https://nptel.ac.in/courses/108/105/108105017/ http://www.cittumkur.org/eee/em.pdf 									

* 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	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.							CO3
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.							
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 nd 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 th 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 th 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 st Edition 2019							
9. - , , , , : , 2002.							
10. - , , , , ,							
11. - , , , , ,							
Web References							

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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 rd Edition, 2011.										
2. C. P. Gupta, Shree Ram Singh. M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2 nd Edition, 2016.										
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand, New Delhi, 22 nd Edition 2019.										
Reference Books										
1. N.P. Bali and Dr. Manish Goyal, "A TEXTBOOK OF ENGINEERING MATHEMATICS", UNIVERSITY SCIENCE PRESS, India, 8 th Edition, 2016.										
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearson India Education services Pvt. Ltd, India 1 st 2017.										
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10 th Edition, 2019.										
4. G. Balaji, "Engineering Mathematics - Transforms and Partial Differential Equations", G. Balaji Publishers, 18 th Edition, 2022.										
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2017.										
Web References										
1. https://nptel.ac.in/courses/111105121/										
2. https://nptel.ac.in/courses/111105035/										
3. https://nptel.ac.in/courses/11110711										
4. https://swayam.gov.in/nd1_noc20_ma17/preview										
5. https://nptel.ac.in/courses/111/103/111103021/										

* 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 nd Impression,2012.										
3. VikasVerma, "A Workbook on C ", Cengage Learning, 2 nd Edition,2012.										
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Sri Krishna Publications, 4 th Edition, 2012.										
5. PradipDev, ManasGhoush, "Programming in C", Oxford University Press, 2 nd Edition, 2011.										
Web References										
1. https://www.programiz.com/c-programming										
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/										
3. https://www.tutorialspoint.com/cprogramming										
4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c										
5. https://nptel.ac.in/courses/106/104/106104128/										
* 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	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	U23BMT01			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 th 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 th 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. https://nptel.ac.in/courses/117/103/117103063/										
2. https://nptel.ac.in/courses/108108122/										
3. https://www.electronics-tutorials.ws/										

Academic Curriculum 2023 (R-2023)

* 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
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 nd Edition, Prentice Hall of India, 2016. 2. Patranabis, D., "Sensors and Transducers", 2 nd Edition, Prentice Hall India Pvt. Ltd, 2010. 3. Murthy D.V.S., "Transducer and Instrumentation", PHI, 2 nd Edition, 2012.									
Reference Books									
1. Jacob Fraden , "Handbook of modern sensors physics, designs and applications", 5 th edition, Springer, 2015. 2. PavelRipka, "Modern sensors handbook", ISTE Ltd, 1 st edition, 2007. 3. Renganathan S., "Transducer Engineering" -Allied Publishers Limited, 2003 4. Doebelin E.A., "Measurement Systems: Applications and Design", 5 th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2008.									

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

Web References

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	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: HS		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										
<ol style="list-style-type: none"> Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book). The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi Small is Beautiful - E. F Schumacher Slow is Beautiful - Cecile Andrews Economy of Permanence - J C Kumarappa Bharat Mein Angreji Raj – Pandit Sunderlal Rediscovering India - by Dharampal Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland (English) 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.Tech.						
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										
UNIT-V	Interpersonal Communication-II						Periods:15			
List of Exercises										CO5
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										
Lecture Periods: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 rd 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. https://www.indeed.com/career-advice/finding-a-job/how-to-write-an-application-letter										
2. https://owlcation.com/humanities/Four-Types-of-Writing										
3. https://targetstudy.com/languages/english/paragraph-writing.html										
4. https://www.businessnewsdaily.com/8262-email-etiquette-tips.html										

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

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

Department	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									
<ol style="list-style-type: none"> 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. Drawing a Title Block with necessary text and projection symbol. Drawing 2D sketch by applying modify tools like fillet, mirror, array, etc., Drawing front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning. Drawing front view, top view and side view of objects from the given pictorial views (eg. Simple stool, V-block, Mixie Base). Drawing a plan of residential building (Two bed rooms, kitchen, hall, etc.) Drawing sectional views of prism, pyramid, cylinder, cone, etc, Drawing lateral surface development of prism, pyramid, cylinder, cone, etc, Drawing isometric projection of simple objects. Creating 3D model of simple object and obtaining 2D multi-view drawings. 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									
<ol style="list-style-type: none"> James D. Bethune, Engineering Graphics with AutoCAD A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020. NS Parthasarathy and Vela Murali, Engineering Drawing, Oxford university press, 2015. M.B Shah, Engineering Graphics, ITL Education Solutions Limited, Pearson Education Publication, 2011. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017. Jeyapooan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd., 7th Edition, New Delhi, 2016. C M Agrawal, Basant Agrawal, Engineering Graphics, McGraw Hill, 2012. Dhananjay A. Jolhe, Engineering Drawing: With An Introduction To CAD McGraw Hill, 2016. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016. 									
Web References									
<ol style="list-style-type: none"> http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php http://www.nptelvideos.in/2012/12/computer-aided-design.html https://mech.iitm.ac.in/meitm/course/cad-in-manufacturing/ https://autocadtutorials.com https://dwgmodels.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	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

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

Evaluation Method

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

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

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			
<ol style="list-style-type: none"> 1. Create a C program to find the Area of the triangle. 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. 3. Write a C program to check whether a given character is vowel or not using Switch – Case statement. 4. Print the numbers from 1 to 10 along with their squares using C program. 5. Demonstrate do—While loop in C to find the sum of 'n' numbers. 6. Find the factorial of a given number using Functions in C. 7. Write a C program to check whether a given string is palindrome or not? 8. Write a C program to check whether a value is prime or not? 9. Develop a C program to swap two numbers using call by value and call by reference. 10. Construct a C program to find the smallest and largest element in an array. 11. Implement matrix multiplication using C program. 12. Create a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp. 13. Develop a C program to remove all characters in a string except alphabets. 14. Create a C program to find the sum of an integer array using pointers. 15. Write a C program to find the Maximum element in an integer array using pointers. 16. Construct a C program to display Employee details using Structures 17. Write a C program to display the contents of a file on the monitor screen. 18. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands. 19. Write a C program to create two files with a set of values. Merge the two file contents to form a single file 20. Create a C program to pass the parameter using command line arguments. 										
Lecture Periods:			Tutorial Periods:			Practical Periods:30		Total Periods:30		
Reference Books										
<ol style="list-style-type: none"> 1. Zed A Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016. 2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", Pearson Education, First edition, 2011. 3. Maureen Sprinkle Hubbard, "Problem Solving and Programming Concepts," Pearson, 9th Edition, 2011. 4. Yashwanth Kanethkar, "Let us C", BPB Publications, 13th Edition, 2008. 5. B.W.Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2nd Edition, 2006. 										
Web References										
<ol style="list-style-type: none"> 1. https://alison.com/course/introduction-to-c-programming 2. https://www.geeksforgeeks.org/c-programming-language/ 3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf 4. https://www.tenouk.com/clabworksheet/clabworksheet.html 5. https://fresh2refresh.com/c-programming/ 										

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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:										
<ol style="list-style-type: none"> 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										
<ol style="list-style-type: none"> 1. Srinivasa Murthy, "Electronic Devices and Circuits Laboratory Manual", 4th 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, 11th 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, 3rd Edition , 2004. 										
Web References										
<ol style="list-style-type: none"> 1. www.allaboutcircuits.com 2. www.circuitstoday.com 3. www.tutorialspoint.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	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.Tech.						
Semester	II		Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	U23ICP203		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Transducer Engineering Laboratory		0	0	2	1	50	50	100
Prerequisite	Basics in Electronics								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Acquaint knowledge on strain gauge, potentiometer and load cell							K2
	CO2	Analyze and understand the static and dynamic characteristics of thermocouple, thermistor and RTD.							K3
	CO3	Demonstrate the performance characteristics of capacitive and inductive type of transducers.							K3
	CO4	Acquire knowledge on energy harvesting transducers.							K3
	CO5	Select suitable sensors and transducers for various applications.							K3
List of Experiments:									
<ol style="list-style-type: none"> Characteristics of Strain gauge and load cell. Characteristics of potentiometer. Characteristics of temperature transducer using RTD, Thermistor and Thermocouple. Characteristics of Filled in system thermometer Characteristics of LVDT. Angular displacement Measurement using capacitive transducers. Speed measurement using photoelectric tachometer. Pressure measurement using piezoelectric transducers. Measurement of Voltage, Current and Power using Hall Effect Sensor. Characteristics of I/P Converters. Characteristics of Optical Transducers. Measurement of position and error detector using synchro transmitter and Receiver 									
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 30		Total Periods: 30	
Reference Books									
<ol style="list-style-type: none"> Handbook of Laboratory Measurements and Instrumentation IFSA Publishing (2011) Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18thEdition, Dhanpat Rai & Company Private Limited, 2017. Renganathan. S, "Transducer Engineering", 4thedition Allied Publishers, Chennai, 2003. Sensors and transducers by Patranabis, 2nd Edition, 2003. John G. Webster, Sensors and Signal Conditioning, Wiley Inter Science, 2ndEdition, 2008 									
Web References									
<ol style="list-style-type: none"> https://lecturenotes.in/subject/30/sensors-and-transducers-st https://lecturenotes.in/notes/2143-notes-for-sensors-and-transducers-st-by-anita-mohanty https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod2.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	-	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**

L	T	P	C	Hrs
0	0	4	-	50

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									
<ol style="list-style-type: none"> 1. Brar Ajmer Singh, Gill Jagtar Singh, Bains Jagdish, "Modern Textbook of Physical Education Health and Sports- I", Kalyani Publishers , 6th 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									
<ol style="list-style-type: none"> 1. http://www.thebetterindia.com/140/national-service-scheme-nss 2. http://en.wikipedia.org/wiki/national-service-scheme 19=http://nss.nic.in/adminstruct 									

Academic Curriculum 2023 (R-2023)

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

Evaluation methods

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

Department	Artificial Intelligence and Data Science		Programme: B.Tech						
Semester	III		Course Category Code: ES			End Semester Exam Type: TE			
Course Code	U23ADTC01		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Programming in Python		3	0	0	3	25	75	100
(Common to All Branches)									
Prerequisite	NIL								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Interpret the basic concepts of Python programs.							K2
	CO2	Articulate the concepts of Sets, Dictionaries and Object-Oriented concepts.							K2
	CO3	Experiment with Numpy package.							K3
	CO4	Apply and analyze Data Manipulation with Pandas.							K3
	CO5	Illustrate programming concept for Visualization with Matplotlib.							K3
UNIT-I	Introduction To Python					Periods: 09			
Structure of Python Program – Underlying mechanism of Module Execution – Branching and Looping – Problem Solving Using Branches and Loops – Functions – Lambda Functions – Lists and Mutability – Problem Solving Using Lists and Functions.									CO1
UNIT-II	Sequence Datatypes and Object-Oriented Programming					Periods: 09			
Sequences – Mapping and Sets – Dictionaries. Classes: Classes and Instances – Inheritance – Exception Handling – Introduction to Regular Expressions using “re” module.									CO2
UNIT-III	Using Numpy					Periods: 09			
Basics of NumPy – Computation on NumPy – Aggregations – Computation on Arrays – Comparisons – Masks and Boolean Arrays – Fancy Indexing – Sorting Arrays – Structured Data: NumPy’s Structured Array.									CO3
UNIT-IV	Data Manipulation with Pandas					Periods: 09			
Introduction to Pandas Objects – Data indexing and Selection – Operating on Data in Pandas – Handling Missing Data – Hierarchical Indexing – Combining Data Sets. Aggregation and Grouping – Pivot Tables –Vectorized String Operations – Working with Time Series – High Performance Pandas – eval() and query().									CO4
UNIT-V	Visualization With Matplotlib					Periods: 09			
Basic functions of Matplotlib – Simple Line Plot – Scatter Plot – Density and Contour Plots – Histograms – Binnings and Density – Customizing Plot Legends – Colour Bars – Three-Dimensional Plotting in Matplotlib.									CO5
Lecture Periods: 45			Tutorial Periods:			Practical Periods: -		Total Periods: 45	
Text Books									
<ol style="list-style-type: none"> 1. Jake VanderPlas, “Python Data Science Handbook - Essential Tools for Working with Data”, O’Reilly Media Inc, 2016. 2. Zhang.Y, “An Introduction to Python and Computer Programming”, Springer Publications, 2016. 3. Wesley J Chun, “Core Python Programming”, Pearson Education, 2nd Edition, 2006. 									
Reference Books									
<ol style="list-style-type: none"> 1. John Paul Mueller, Luca Massaron, “Python for Data Science for Dummies”, 2nd Edition, John Wiley& Sons, 2019. 2. Jesus Rogel-Salazar, “Data Science and Analytics with Python”, CRC Press Taylor and Francis Group, 2017. 3. Brian Draper, “Python Programming A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language”, CreateSpace Independent Publishing Platform, 2016. 4. Mark Lutz, Laura Lewin, Frank Willison, “Programming Python”, O’Reilly Media, 3rd Edition, 2006. 5. Gowrishankar S, Veena A, “Introduction to Python Programming”, CRC Press, 2018. 									
Web References									
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106/106/106106212/ 2. https://www.geeksforgeeks.org/data-analysis-visualization-python/ 3. https://www.coursera.org/learn/python-data-analysis 4. https://www.python.org/ 5. https://www.programiz.com/python-programming 									

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	III		Course Category: PC			End Semester Exam Type: TE			
Course Code	U23ICTC02		Periods/Week			Credit	Maximum Marks		
Course Name	Digital Logic Circuits		L	T	P	C	CAM	ESE	TM
			2	1	0	3	25	75	100
(Common to ICE & BME Branches)									
Prerequisite	-								
Course Outcomes	On completion of the course, the students will be able to							BT Mapping (Highest Level)	
	CO1	Interpret the concepts of number systems and binary codes.						K2	
	CO2	Analyze the operations of boolean algebra and logic gates.						K3	
	CO3	Design and implement combinational logic circuits						K3	
	CO4	Design and implement sequential logic circuits						K3	
CO5	Acquaint with memory devices, Programmable Logic Devices and Logic families						K3		
UNIT – I	Number Systems and Binary Codes					Periods:12			
Number Systems -Binary, Octal, Decimal, Hexadecimal. Number system conversions, Binary Arithmetic, Representation of signed binary numbers, 1s and 2s Complements.									
Binary Codes - Classification, Binary coded decimal (BCD), Weighted, and Non weighted, Reflective, sequential, Alphanumeric codes. Error detection codes. Error correction codes.									
UNIT – II	Boolean Algebra and Logic Gates					Periods:12			
Boolean Algebra: Basic Theorems and Properties, Standard Forms of Boolean Expression-Sum of Product(SOP), Product of Sum(POS), Canonical and Standard forms, Simplification of Boolean expressions - Algebraic simplification, Karnaugh-Map simplification, Quine McClusky simplification.									
Logic gates: Basic logic gates ; Universal gates ;Implementation of Boolean function using gates									
UNIT – III	Combinational Logic Circuits					Periods:12			
Binary adders- Half adder, Full adder, Parallel Adder, Look ahead carry adder, Binary Subtractors - Half subtractor, Full subtractor, 1bit and 2bit Magnitude comparators, Code converters, Decoders and encoders, Multiplexers and Demultiplexers, Parity bit generator and checker.									
UNIT – IV	Sequential Logic Circuits					Periods:12			
Types of sequential circuits, Comparison between combinational and sequential circuits, Latches-RS latch; Flip flops(FF) – RS,D, JK, and T, JK Master/Slave FF, triggering of flip flops, Excitation tables, Flip flop conversions. Design of Counters- Asynchronous(Ripple) Counters, synchronous counters, Shift registers, Classification of shift registers, Universal Shift Register, Ring Counter, Johnson counter.									
UNIT – V	Memory, Programmable Logic Circuits and Logic Families					Periods:12			
Memory Classification- Random Access Memory (RAM), Static RAM, Dynamic RAM, Read Only Memory (ROM); PROM, EPROM, EEPROM.									
Programmable Logic Devices: Programmable ROM (PROM), Programmable Array Logic (PAL), Programmable Logic Array (PLA), Implementation of combinational circuits using PROM, PAL, PLA.									
Logic families: Characteristics - propagation delay, power dissipation, fan-in, fan-out, noise margin, TTL, ECL, CMOS.									
Lecture Periods: 60			Tutorial Periods: -			Practical Periods: -		Total Periods: 60	
Text Books									
1. M. Morris Mano, Digital Design, Fourth Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.									
2. Anand Kumar, Fundamentals of Digital Circuits Prentice Hall of India, Pvt Ltd, New Delhi, Second Edition, 2014.									
3. R.P. Jain, Modern Digital Electronics, Fourth edition, Tata McGraw Hill, 2010.									
Reference Books									
1. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.									
2. Charles H. Roth, Larry L. Kinney, Raghunandan G.H. Fundamentals of Logic Design, Cengage Learning India Pvt. Ltd.; 1 st edition, 1 September 2019									
3. William H. Gothmann, Digital Electronics Prentice Hall, 2001									
4. John M. Yarbrough, Digital logic: Applications and Design Thomas Vikas Publishing House, 2002.									
5. Ananda Natarajan R, Digital Design, Second edition, Eastern Economy Editions, PHI Learning Pvt. Ltd., 2015.									
Web References									
1. https://nptel.ac.in/courses/117106086/									
2. https://learn.ni.com/teach/resources/1104/digital-electronics									
3. http://nptel.ac.in/courses/117/106/117106086/									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Department	INSTRUMENTATION AND CONTROL ENGINEERING			Programme: B.Tech.						
Semester	III			Course Category: PC		End Semester Exam Type: TE				
Course Code	U23ICT303			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Electrical and Electronic Instrumentation			3	0	0	3	25	75	100
Prerequisite	Basic Electronics									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Understand the principle and operation of electrical instruments and measurement							K2	
	CO2	Develop skills in power and energy measurement techniques.							K3	
	CO3	Understand the measurement of resistance, inductance, and capacitance in circuits.							K3	
	CO4	Evaluate the performance of instruments under various operating conditions							K3	
CO5	Develop the ability to select appropriate instruments for specific applications.							K3		
UNIT – I	Electrical Measurements						Periods:9			
Basics of Measurements, General features and Classification of electro mechanical instruments. Principles of Moving coil, moving iron, dynamometer type, rectifier type, thermal instruments. Errors and compensation, Extension of instrument range: shunt and multipliers, calibration of voltmeter and ammeters, CT and PT.									CO1	
UNIT – II	Measurement of Power and Energy						Periods:9			
Electro-dynamic wattmeter, Low Power Factor (LPF) wattmeter, errors, Single and three phase power measurement, Hall Effect wattmeter, thermal type wattmeter. Energy measurement - Single phase and polyphase induction type energy meter - theory and adjustments - Principle of operation of single-phase energy meter, Creep in energy meter and its compensation, testing of energy meter, Phantom loading- Calibration of wattmeter and energy meter									CO2	
UNIT – III	Measurement of Resistance, Inductance and Capacitance						Periods:9			
Measurement of Resistance: Wheatstone's bridge, Sensitivity, Limitations. Kelvin's double bridge. Earth resistance measurement by fall of potential method and by using Megger. Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance and capacitance bridge, Hay's bridge, Anderson's bridge, Schering bridge. Application of AC bridges. Introduction to cable fault and eddy current measurement.									CO3	
UNIT – IV	Electronic and Digital Measurements						Periods:9			
Introduction essentials of electronic instruments, Advantages of electronic instruments. True RMS reading voltmeter. Electronic multimeters. Digital voltmeters (DVM) - Ramp type DVM, Integrating type DVM, Continuous – balance DVM and Successive - approximation DVM. Q meter. Principle of working of electronic energy meter (block diagram treatment), Extra features offered by present day meters and their significance in billing.									CO4	
UNIT – V	Display Devices, Waveform Generators and Analyzers						Periods:9			
DSO, DPO, MSO, Analog Recorders – Strip Chart and X-Y recorders, Digital Recorders Function generators, Signal generators, Waveform analyzers, Spectrum analyzers, Distortion analyzers.									CO5	
Lecture Periods:			Tutorial Periods:			Practical Periods: -		Total Periods: 45		
Text Books										
1. Golding, E.W. and Widdis, F.C., "Electrical Measurements and Measuring Instruments", A.H. Wheeler and Co, 5 th Edition, 2011. 2. David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press, 2013. 3. Shawney A K, "A course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons.19 th revised edition, 2014.										
Reference Books										
1. Kalsi.H.S, "Electronic Instrumentation", Tata McGraw Hill Education Private Limited, 3 rd Edition, 2012. 2. Doebelin, E.O., Measurement systems, McGraw Hill, Sixth edition, 2017. 3. K. Ghanimatha Prasad, Electronic Measurements and Instrumentation McGraw Hill Education, 2017. 4. John G. Webster, Measurement, Instrumentation, and Sensor Handbook CRC Press, 2017. 5. J.B. Gupta, Electrical and Electronic Measurements and Instrumentation S. Chand & Company Ltd, 2018.										
Web References										
1. https://lecturenotes.in/subject/265/electrical-measurement-and-instrumentation-emi 2. http://www.brainkart.com/subject/Measurements-and-Instrumentation_204/ 3. https://onlinecourses.nptel.ac.in/noc19_ee44/preview 4. https://www.careerride.com/mcq/electrical-and-electronic-measurements-instrumentation-electrical-engineering-mcq-questions-and-answers-272.aspx										

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Department	Academic Curriculum and Syllabi (R-2023)			Instrumentation and Control Engineering					Programme: B.Tech.	
Semester	III			Course Category : PC			End Semester Exam Type: TE			
Course Code	U23ICB301			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Circuit Theory			2	0	2	3	50	50	100
Prerequisite	Basics of Maths									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Gain knowledge on the basic concepts of electrical circuits							K2	
	CO2	Apply the Network Theorems.							K3	
	CO3	Explore the steady state analysis of circuits							K4	
	CO4	Simulate the network reduction laws and theorems on DC circuits							K3	
	CO5	Simulate the frequency response of resonant circuits with AC supply.							K3	
UNIT- I	DC Fundamental						Periods:10			
Electrical Quantities- Types of Network: Linear and nonlinear, unilateral, bilateral, lumped, distributed. Ohm's Law, Resistors in Series and parallel Combinations - voltage and current division, Source: Voltage and Current Source - Ideal and Practical source - Dependent and Independent Source. Kirchhoff's Laws. Mesh and node Analysis.										CO1
UNIT- II	Network Reduction and Theorems (DC Circuits)						Periods:10			
Source Transformation: Current to Voltage, Voltage to Current. Network reduction – star delta conversion. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer Theorem, Reciprocity Theorem.										CO2
UNIT- III	Steady State Analysis and Transient Analysis						Periods:10			
Steady state analysis of RL, RC and RLC Series Circuits. Transient response of RL, RC & RLC Networks with DC Input - Solution using Laplace transforms. RL and RC Decaying Transient										CO3
UNIT- IV	List of Exercises : Both DC and AC Input						Periods:15			
<ol style="list-style-type: none"> Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem. Simulation and experimental verification of electrical circuit problems using Norton's theorem. Simulation and experimental verification of electrical circuit problems using Superposition theorem. Simulation and experimental verification of Maximum Power transfer Theorem. 										CO4
UNIT-V	List of Exercises						Periods:15			
<ol style="list-style-type: none"> Simulation and Experimental validation of RL and RC electric circuit transients. Simulation and Experimental validation of frequency response of RLC electric circuit. Design and Simulation of series and parallel resonance circuit. Determination of self, mutual inductance and coefficient of coupling Study of Analog and digital oscilloscopes and measurement of average value, RMS value, form factor and peak factor of sinusoidal waveform. 										CO5
Lecture Periods:30			Tutorial Periods:-			Practical Periods:30			Total Periods:60	
Text Books										
<ol style="list-style-type: none"> Sudhakar and Shyam Mohan Palli, "Circuits and Networks; Analysis and Synthesis", 5th Edition, Tata McGraw Hill Education, 2017 William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 9th Edition, 2020. M.E.VanValkenburg "Network Analysis", Third Edition, Prentice Education, 2019 										
Reference Books										
<ol style="list-style-type: none"> Joseph Edminister and MahmoodNahvi, "Electric Circuits", Schaum's Outline Series, Seventh Edition, Tata McGraw Hill, 2017. P. Ramesh Babu, "Circuit theory" Second Edition, Scitech Publications Pvt. Ltd, 2014. N.C. Jagan&C.Lakshminarayana, 'Network Theory' B.S Publications, 2006. Kuriakose, "Circuit Theory", PHI Learning, 2005. Allan.H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013. 										

Web References

1. <http://bookboon.com/en/textbooks/electrical-electronics-engineering>
2. <http://www.freebookcentre.net/electronics-ebooks-download/Circuit-Theory-Lecture-Handouts.html>
3. <https://nptel.ac.in/courses/108/102/108102042/>

COs/POs/PSOs Mapping

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

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

Assessment method for theory cum practical course

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

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

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	Mathematics		Programme: B.Tech.						
Semester	III		Course Category Code: BS		*End Semester Exam Type: LE				
Course Code	U23MAPC01		Periods/Week		Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM
Course Name	Engineering Mathematics Laboratory		0	0	2	1	50	50	100
(Common to all Branches Except CSBS)									
Prerequisite	Matrices, Fourier Transforms, Laplace Transforms								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Perform and evaluate Matrix Operations							K3
	CO2	Solve Differential and Integral Equations							K3
	CO3	Construct Fourier series and Fourier Transforms of the given function							K3
	CO4	Find the Measures of Central tendency							K3
	CO5	Analyze Correlation and Regression lines							K3
List of Experiments:									
<ol style="list-style-type: none"> Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix. Solve the first order differential equation. Find the integration of $\int_a^b f(x)dx$. Find the Fourier series of f(x). Find the Fourier Transform of f(x). Find the Laplace Transform of f(x). Find the Mean, Median and Mode. Construct the Pie and Bar Diagram. Find the Correlation coefficient. Find the Regression lines. 									
Lecture Periods:- Nil			Tutorial Periods:- Nil			Practical Periods: 3 0		Total Periods :30	
Reference Books									
<ol style="list-style-type: none"> T. Veerarajan, "Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019. 									
Web References									
<ol style="list-style-type: none"> https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410 									

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

U23ICC3XX

CERTIFICATION COURSE III

L	T	P	C	Hrs
0	0	4	-	50

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

U23ICS301

Skill Enhancement Course I

(Choose anyone of the below three courses)

L	T	P	C	Hrs
0	0	2	-	30

1. TROUBLESHOOTING OF ELECTRONIC EQUIPMENTS

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

(OR)**2. CALIBRATION OF MEASURING INSTRUMENTS**

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

(OR)**3. APPLICATION OF ARDUINO****1. Introduction to IOT**

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

2. Arduino Simulation Environment

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

3. Sensor and Actuators with Arduino

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

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

Evaluation Method

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

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.							
Semester	IV		Course Category : PC		End Semester Exam Type: TE					
Course Code	U23ICT405		Periods/Week		Credit	Maximum Marks				
Course Name	Microcontroller Based System Design		L	T	P	C	CAM	ESE	TM	
			3	0	0	3	25	75	100	
Prerequisite	Digital Logic Circuits									
Course Outcomes	On completion of the course, the students will be able to						BT Mapping (Highest Level)			
	CO1	Elucidate the architecture and addressing modes of 8-bit microprocessor						K2		
	CO2	Illustrate the architecture of PIC18F4550 microcontroller						K2		
	CO3	Ability to write embedded C program for PIC18F4550 microcontroller.						K3		
	CO4	Gain knowledge about timer and interrupts						K3		
CO5	Learn about design of different peripheral using PIC18F4550						K3			
UNIT- I	REVIEW OF 8085 MICROPROCESSOR					Periods:09				
Evolution of microprocessor, Types of various architectures; Harvard and Von-Neumann, RISC and CISC, 8085 microprocessor- Pin Functions, Architecture, Addressing modes Interrupts, Direct Memory Access, I/O Mapping. CO1										
UNIT- II	ARCHITECTURE OF PIC18F4550 MICROCONTROLLER					Periods:09				
PIC microcontrollers overview and features- PIC18F4550 architecture, status register, Special function registers, memory organization, PIC16F877A pin configuration. CO2										
UNIT- III	PIC18F4550 With Embedded C					Periods:09				
MPLAB IDE with compiler, Data Types and Time Delays in C, I/O Programming, Logic Operations, Data Serialization, Program ROM Allocation, Data RAM Allocation, MACROS — Intel HEX file. CO3										
UNIT- IV	TIMER AND INTERRUPTS					Periods:09				
GPIO programming, Timers Programming, Counter programming, PWM programming, Serial Communication, Interrupts. CO4										
UNIT-V	PERIPHERAL AND INTERFACING					Periods:09				
LCD Interfacing, Keyboard Interfacing, ADC Programming in the PIC18F4550, DAC Interfacing, Relay interfacing, Sensor Interfacing, Stepper Motor Interfacing. CO5										
Lecture Periods:45			Tutorial Periods:-			Practical Periods:-			Total Periods:45	
Text Books										
<ol style="list-style-type: none"> 1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Application', Penram International (P) Ltd., Mumbai, 6th edition, 2013. 2. Mazidi M.A., PIC Microcontroller and Embedded Systems: Using assembly and C for PIC, Pearson publishing, 2016. 3. Andrew N. Sloss Dominic Symes and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaughmann/Elsevier Publishers, 2016. 										
Reference Books										
<ol style="list-style-type: none"> 1. Sunil Mathur, Jeebananda Panda, "Microprocessor and microcontroller", PHI Learning Private Limited, New Delhi, 1st Edition, 2016. 2. Saurabh Chandrakar Nilesh Bhaskarrao Bahadure."Microcontrollers and Embedded System Design, Dreamtech Press, 2019. 3. Peatman J., Design with PIC microcontrollers, Pearson Education, 2017. 4. Martin P. Bates, Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation, Newnes, 2nd Edition, 2013. 5. Lucio Di Jasio, Tim Wilmshurst, Dogan Ibrahim, John Morton, PIC Microcontrollers: Know It All, Newnes 2007. 										
Web References										
<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=rSFIUkQYLrk 2. https://www.youtube.com/watch?v=S1QCZW92fU4 3. https://www.youtube.com/watch?v=iecMfsMxCHI 4. https://www.microchip.com/promo/explorer-8-development-board 5. https://pic-microcontroller.com/pic18f4550-programming-and-tutorial-hardware-c/#PIC18F_Microcontroller_Programming_Tutorial 										

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	IV		Course Category : ES			End Semester Exam Type: TE			
Course Code	U23ICB402		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Solid and Fluid Mechanics		2	0	2	3	50	50	100
Prerequisite	-								
Course Outcomes	On completion of the course, the students will be able to							BT Mapping (Highest Level)	
	CO1	Analyze the state of stress and strain at any point in a member. (K2)						K2	
	CO2	Evaluate the properties of material Deformation. (K2)						K2	
	CO3	Apply Hagen Poiseuille's equation to solve numerical Problems. (K3)						K3	
	CO4	Understand the concepts of stress and strain in mechanics of solids and structures and material Properties. (K3)						K2	
CO5	Conduct experiments on hydraulic turbines and pumps to draw characteristics.						K3		
UNIT- I	Deformation of Solids					Periods:10			
Concept of stress and strain– stress strain curve – Simple and compound Stresses - Elasticity and elastic moduli – Poisson's ratio – Thin Cylinder.									CO1
UNIT- II	Shafts and Springs					Periods:10			
Torsion – Shear stresses in circular solid and hollow shafts -Torque and power – Helical and leaf springs – Load, deflection, stress and stiffness relationships.									CO2
UNIT- III	Fluid Property and Flow Characteristics					Periods:10			
Fluid Property - Newton's law of Viscosity – Types of Flow– Reynolds number –Continuity equation - Euler's Equation of Motion. Bernoulli's Equations –Venturi meter and orifice meter - Pressure losses along the flow –Major and minor losses									CO3
UNIT- IV	Part – A: Fluid Mechanics Laboratory					Periods:15			
List of Exercises									CO4
<ol style="list-style-type: none"> Determination of Coefficient of discharge of given Venturimeter. Determination of Coefficient of discharge of given Orifice meter. Characteristics study on Centrifugal Pump. Characteristics study on Submergible Pump. Characteristic study on turbines. 									
UNIT-V	Part – B: Strength of Materials Laboratory					Periods:15			
List of Exercises									CO5
<ol style="list-style-type: none"> Tension test and Young's modulus of steel. Hardness test: Rockwell and Brinell. Torsion test: Rods and Flats. Impact test: Charpy and Izod on metals. Ductility test: Sheet metals (Al and MS) 									
Lecture Periods:30			Tutorial Periods:-			Practical Periods:30		Total Periods:60	
Text Books									
<ol style="list-style-type: none"> R. K. Rajput, Strength of Materials, S. Chand & Company Ltd., 2018. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Machinery, - M/s. Lakshmi Publications (P) Ltd, 2018. Junarkar S. B, "Mechanics of Structures", Vol. 2, 24th edition, Charotar Publising House, Anand, India, 2015. 									
Reference Books									
<ol style="list-style-type: none"> WilliamA.Nash, "Theory and problems of strength of materials", Schaum's Outline Series, McGraw-Hill International Editions, Sixth Edition(Paperback), 2013 Streeter, V.L., and Wylie, E.B."Fluid Mechanics", McGraw-Hill, Ninth Edition (Paperback), 2017 White, F.M.,"Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003. Som, S.K., and Biswas, G. "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2nd Edition (Paperback), 2010 Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (Reprint edition), 2010. R.S.Khurmi, Strength of Materials, S.Chand& company, 24thEdition, 2006 									

Web References

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

COs/POs/PSOs Mapping

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

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

Assessment method for theory cum practical course

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

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

Department	English		Programme: B.Tech.						
Semester	IV		Course Category Code: HS			*End Semester Exam Type: LE			
Course Code	U23ENPC02		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	General Proficiency- II		0	0	2	1	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	Infer ideas to attend international standardized test by broadening receptive and productive skills							K2
	CO2	Interpret the types of writing in different state of affairs							K3
	CO3	Acquire meticulous exposure in speaking and get rid of performance anxiety							K2
	CO4	Articulate the ideas and opinions effectively and coherently							K2
	CO5	Progress the skills to compete in various competitive exams like GATE, GRE, UPSC, etc.							K4
UNIT- I	CAREER SKILLS					Periods:6			
Listening: Listening at specific contexts - Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps) - CO1 Reading: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) - Writing: Integrated Writing Task (TOEFL) - Vocabulary: Synonyms and Antonyms (IELTS)									
UNIT- II	CORPORATE SKILLS					Periods:6			
Listening: Listening English news and reproducing in own words - Speaking: Team Presentation - Reading: Short texts and Longer Passages (cloze reading) - Writing: Analytical Writing: Analyzing an issue and Argument task (GRE based) - Vocabulary: Prefix and Suffix CO2									
UNIT- III	FUNCTIONAL SKILLS					Periods:6			
Listening: Listening TED Talks - Speaking: Brainstorming & Individual Presentation - Reading: Text Completion (GRE Based) - CO3 Writing: Picture Inference - Vocabulary: Word Formation									
UNIT- IV	TRANSFERRABLE SKILLS					Periods:6			
Listening: Listening Documentaries and making notes - Speaking: Mock Interview - Reading: Read texts on emerging trends - CO4 Writing: Agreeing & Disagreeing Essay (IELTS) - Vocabulary: Euphemism, Redundancy, Clichés and Intensifiers									
UNIT-V	VERBAL APTITUDE - II					Periods:6			
Transformational Grammar: Tenses, Change of Voice, Concord Verbal Ability Enhancement: Letter Series, Coding &Decoding, Sentence Equivalence (GRE)Analytical Reasoning and Logical Reasoning (GATE), Syllogism, One-word Substitution, Jumbled Sentences CO5									
Lecture Periods: -			Tutorial Periods: -			Practical Periods:30		Total Periods:30	
Reference Books									
<ol style="list-style-type: none"> 1. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training". Cambridge, 2014. 2. Prasad, Hari Mohan, Sinha, Uma Rani, "Objective English for Competitive Examinations", Tata Mc Graw Hill: Noida,2010. 3. Loughheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008. 4. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford, 2007. 5. Murphy, Raymond English Grammar in Use with answers: Reference and Practice for Intermediate students, Cambridge: CUP,2004. 									
Web References									
<ol style="list-style-type: none"> 1. https://www.englishclub.com/grammar/nouns-compound.htm 2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1 3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html 4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/ 5. http://www.englishvocabularyexercises.com/general-vocabulary/ 									

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	Instrumentation and Control Engineering			Programme: B. Tech.						
Semester	IV			Course Category: PC	*End Semester Exam Type: LE					
Course Code	U23ICP404			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Microcontroller Based System Design Laboratory			0	0	2	1	50	50	100
Prerequisite	Digital Laboratory									
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Gain conceptual understanding of using 8085 microprocessor							K2	
	CO2	Learn about interfacing of various peripheral devices with PIC18F4550 Microcontrollers							K2	
	CO3	Design and generate pulses for real time applications.							K3	
	CO4	Analyze the programming aspects of PIC microcontroller							K3	
	CO5	Design and simulate microcontroller based systems used for control and monitoring							K3	
List of Experiments										
<ol style="list-style-type: none"> Study of 8085 microprocessor Programming Implementation of GPIO of PIC18F4550. Implementation of UART features of PIC microcontroller. Implementation of ADC of PIC microcontroller. Generation of square waveform of given duty cycle using PIC microcontroller. LCD interfacing using PIC microcontroller. Relay interfacing using PIC microcontroller Interfacing of 7 Segment display with PIC microcontroller. Stepper motor interfacing using PIC microcontroller. DC motor speed control using PIC microcontroller. 										
Lecture Periods:			Tutorial Periods:-			Practical Periods: 45		Total Periods: 45		
Reference Books										
<ol style="list-style-type: none"> Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw-Hill, 2017. Andrew N. Sloss Dominic Symes and Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaughmann/Elsevier Publishers, 2004. Mazidi M.A., PIC Microcontroller and Embedded Systems: Using assembly and C for PIC, 2008 Saurabh Chandrakar Nilesh Bhaskarrao Bahadure."Microcontrollers and Embedded System Design, Dream tech Press, 2019 Peatman J., Design with PIC microcontrollers, Pearson Education, 2017. 										
Web References										
<ol style="list-style-type: none"> https://www.mikroe.com/easymx-pro-stm32 https://ww1.microchip.com/downloads/aemDocuments/documents/OTH/ProductDocuments/DataSheets/39632e.pdf https://microcontrollerslab.com/introduction-pic18f4550-microcontroller/ https://www.youtube.com/watch?v=MtxKP81Dy1E https://www.microchip.com https://www.youtube.com/watch?v=S1QCZW92fU4 										

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	Instrumentation and Control Engineering			Programme: B. Tech.							
Semester	IV			Course Category: PC			*End Semester Exam Type: LE				
Course Code	U23ICP405			Periods/Week			Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM	
Course Name	Simulation Laboratory			0	0	2	1	50	50	100	
Prerequisite	Basics of Mathematics										
Course Outcomes	On completion of the course, the students will be able to									BT Mapping (Highest Level)	
	CO1	Gain adequate knowledge on the basics of control system tools.								K2	
	CO2	Obtain the model of the system and investigate its performance in open and closed loop.								K3	
	CO3	Determine the time response analysis of first and second order systems.								K4	
	CO4	Obtain the system stability in time domain and frequency domain.								K4	
	CO5	Understand the effect of PI and PD controller.								K3	
List of Experiments											
<ol style="list-style-type: none"> Determination of (i) Transfer Functions and (ii) Poles and Zeros of the system. Determination of Step, Impulse and Ramp Response for a First Order Unity Feedback System Determination of Step, Impulse and Ramp Response for a Second Order Unity Feedback System. Determination of transfer functions of a DC servo motor and its speed control. Determination of transfer function of AC servo motor and its speed control. Stability analysis of Linear Systems. Compensation of Closed Loop System. Frequency Response analysis using Bode Plot. Frequency Response analysis using Polar Plot. Frequency Response analysis using Nyquist Plot. Time domain Analysis using Simulink blocks. Study the Effect of Addition of Poles to the Forward Path Transfer Function of a Closed Loop System. 											
Lecture Periods:			Tutorial Periods:-			Practical Periods: 45			Total Periods: 45		
Reference Books											
<ol style="list-style-type: none"> Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017. DingyüXue, YangQuan Chen, Modeling, Analysis and Design of Control Systems in MATLAB and Simulink, World Scientific Publishing, 2014 Liuping Wang, PID Control System Design and Automatic Tuning Using MATLAB/Simulink, Wiley, 2020 Norman S Nise, Control System Engineering, John Wiley and sons, inc., Seventh Edition, 2015 Smarajith Ghosh, —Control Systems Theory and Applications II, Pearson Education, Singapore, Sixth Edition, 2015. 											
Web References											
<ol style="list-style-type: none"> https://in.mathworks.com/products/matlab.html https://nptel.ac.in/courses/108108122/ https://www.smarzworld.com/notes/control-systems-pdf-notes-cs/ 											

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

U23ICC4XX

CERTIFICATION COURSE IV

L	T	P	C	Hrs
0	0	4	-	50

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

U23ICS402

Skill Enhancement Course II
(Choose anyone of the below three courses)

L	T	P	C	Hrs
0	0	2	-	30

1. APPLICATIONS USING RASPBERRY PI

1. Blink an LED to learn GPIO basics.
2. Respond to button presses for input-output practice.
3. Read temperature with a sensor and display the value.
4. Measure distance using an ultrasonic sensor.
5. Control a servo motor for precise movement.
6. Drive a stepper motor in specific steps.
7. Display messages and graphics on an LCD screen.
8. Create simple sounds or alarms with a buzzer.
9. Set up a web server using Python to build web apps.
10. Log sensor data over time for data collection and analysis.
11. Monitor network traffic to troubleshoot potential issues.
12. Control your Raspberry Pi remotely with SSH or VNC.
13. Build a simple home automation system to control devices.
14. Create your own games using libraries like Pygame.
15. Connect your Pi to the internet and explore the world of IoT.

(OR)**2. PLC PROGRAMMING**

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

(OR)**3. AutoCAD for Instrumentation**

1. Introduction to I&C Engineering:
 - Basic concepts of process control loops
 - Different types of instrumentation (pressure, temperature, flow, etc.)
 - Introduction to Piping and Instrumentation Diagrams (P&IDs)
2. AutoCAD Basics for I&C:
 - Introduction to AutoCAD interface and core drawing tools
 - Setting up drawing templates and layers specific to I&C drawings
 - Using AutoCAD for basic drafting of piping and equipment layouts

3. Introduction to AutoCAD Plant 3D (or equivalent software):
 - User interface and functionalities of AutoCAD Plant 3D (or alternative)
 - Creating and managing project databases for I&C projects
4. I&C Symbol Libraries:
 - Exploring the standard symbol libraries for instruments, equipment, and control systems
 - Placing and customizing symbols according to project specifications
5. P&ID Development with AutoCAD Plant 3D:
 - Creating intelligent P&IDs using automated tools for symbol placement and connection
 - Adding annotations, tags, and instrument details
 - Working with data tables to link instrument information with the P&ID

Professional Elective Courses Semester – IV

Department	Biomedical Engineering			Programme: B.Tech.						
Semester	IV			Course Category: PE		End Semester Exam Type: TE				
Course Code	U23BMECO1			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Communication Systems			3	0	0	3	25	75	100
Prerequisite										
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Understand the various Analog modulation techniques							K2	
	CO2	Gain knowledge in Digital modulation techniques							K3	
	CO3	Knowledge about fiber optic and satellite communication systems							K2	
	CO4	Analyse spread spectrum and multiple access techniques							K3	
	CO5	Realize the concepts of wireless communication							K3	
UNIT – I	Analog modulation					Periods:9				
Need for modulation - Amplitude modulation – Frequency spectrum of AM wave – Representation of AM – Power relation – Frequency modulation – Frequency spectrum of FM wave –AM transmitter – FM transmitter – Super heterodyne AM receiver –FM receivers.										CO1
UNIT – II	Digital modulation					Periods:9				
Principles of pulse modulation – sampling theorem, PAM, PWM, PPM, Conversion of PWM wave to PPM wave – Generation of PAM, PPM and PWM waves – Demodulation of PAM, PWM, PPM – An introduction todigital modulation systems – PCM, DPCM, Delta Modulation, ADM, ASK, FSK and PSK.										CO2
UNIT – III	Fiber optic and satellite communication					Periods:9				
Need for fiber optics- principle of light transmission through a fiber- fiber classification-fiber losses- Light sources and photo detectors- Block diagram of a fiber optic system - Power budget analysis for an optical link- Recent medical application of fiber optics. Block diagram of a satellite communication system, Satellite Orbits, satellite parameters, satellite link model, GPS services.										CO3
UNIT – IV	Spread spectrum and multiple access techniques					Periods:9				
Pseudo-noise sequence, DS spread spectrum, FH spread spectrum, multiple access techniques –TDMA and FDMA, source coding of speech for wireless communication.										CO4
UNIT – V	Wireless communication					Periods:9				
Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand off- Introduction to 4G & 5G technologies										CO5
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -		Total Periods: 45		
Text Books										
1. Wayne Tomasi, "Advanced Electronic Communication Systems", Sixth Edition, Pearson Education, 2010.										
2. Kennedy Davis, "Electronic Communication Systems", Fifth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.										
3. Rappaport T.S, "Wireless Communications: Principles and Practice", Second Edition, Pearson Education, 2010										
Reference Books										
1. Simon Haykin, "Communication Systems", Fourth Edition, John Wiley and Sons, 2009.										
2. William C.Y. Lee, "Mobile Cellular Telecommunication Systems", McGraw Hill International Edition, Third edition, 2008.										
3. H.Taub, D L Schilling and G Saha, "Principles of Communication", Third Edition, Pearson Education, 2010										
4. B. P.Lathi, "Modern Analog and Digital Communication Systems", Third Edition, Oxford University Press, 2009										
5. Martin S.Roden, "Analog and Digital Communication System", Fifth Edition, Prentice Hall of India, 2012.										
Web References										

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

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Methods

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	IV		Course Category: PE			End Semester Exam Type: TE			
Course Code	U23ICE401		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Fundamentals of Pneumatics and Hydraulics		3	0	0	3	25	75	100
Prerequisite	Basics in fluid mechanics								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Acquire knowledge about the working of Pneumatic systems.							K2
	CO2	Identify the controlling components of Pneumatic systems							K3
	CO3	Understand the working of hydraulic systems							K2
	CO4	Identify the controlling components of hydraulic systems							K3
	CO5	Trouble shoots malfunctioning of the hydraulic and pneumatic systems and identifies the various application of the system.							K3
UNIT – I	Introduction to Pneumatic Control					Periods:09			
Structure of pneumatic control system.- Choice of working medium - characteristics of compressed air - Production of compressed air - Driers, filters, regulators, lubricators, distribution of compressed air. - Pneumatic Actuators: Linear cylinders – types, conventional type of cylinder working, mounting arrangements applications.									CO1
UNIT – II	Directional Control Valves					Periods:09			
Simple Pneumatic Control - Direct and indirect actuation pneumatic cylinders, use of memory valve. Flow control valves - speed control of cylinders supply air throttling - Exhaust air throttling and use of quick exhaust valve. Use of Logic gates – OR and AND gates pneumatic applications - Practical examples involving the use of logic gates.									CO2
UNIT – III	Introduction to Hydraulic Systems					Periods:09			
Structure of Hydraulic Control System - The Source of Hydraulic Power - Pumps Pumping theory, pump classification, gear pumps, vane pumps, piston pumps, pump performance, pump selection. Variable displacement pumps, Hydraulic Actuators - Linear Hydraulic Actuators [cylinders], Mechanics of Hydraulic Cylinder loading.									CO3
UNIT – IV	Hydraulic Motors					Periods:09			
Hydraulic Rotary Actuators, Gear motors, vane motors, piston motors, Hydraulic motor theoretical torque, power and flow rate, hydraulic motor performance, Control Components in Hydraulic Systems - Constructional features, pressure control valves – direct and pilot operated types, flow control valves.									CO4
UNIT – V	Trouble Shooting and Applications					Periods:09			
Trouble shooting and Remedies in Hydraulic and Pneumatic systems - Electrical and electronic components in fluid power systems (sensors, controllers). Applications of Hydraulic and Pneumatic Systems - Press and Forklift –Low Cost Automation - Hydraulic and pneumatic power packs.									CO5
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -		Total Periods: 45	
Text Books									
1. Anthony Esposito, Fluid Power with applications, Pearson education, Inc., 5th Edition, 2000. 2. Andrew Parr, Pneumatics and Hydraulics, Jaico Publishing Co. 2000. 3. Dr. Niranjan Murthy and Dr.R.K. Hegde, Hydraulics and Pneumatics, Sa8\pna Publications, 2013.									
Reference Books									
1. Srinivasan. R, Hydraulic and Pneumatic Control, Tata McGraw - Hill Education, 2 nd Edition, 2012. 2. Shanmugasundaram.K, Hydraulic and Pneumatic controls, Chand&Co, 2006. 3. Jagadeesha. T., “Pneumatics Concepts, Design and Applications “, Universities Press, 2011 4. Majumdar S.R., Oil Hydraulics Systems - Principles and Maintenance, Tata McGraw-Hill, 2001. 5. Majumdar, S.R., Pneumatic Systems – Principles and Maintenance, Tata McGraw Hill, 2007.									
Web References									
1. https://archive.nptel.ac.in/courses/112/106/112106300/# 2. https://www.youtube.com/watch?v=Dim0fLFIFOG 3. https://www.youtube.com/watch?v=lqgDDS7x1Gc									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	IV		Course Category: PE			End Semester Exam Type: TE			
Course Code	U23ICE402		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Hybrid Electric Vehicles		3	0	0	3	25	75	100
Prerequisite	Fundamentals of Machines								
Course Outcomes	On completion of the course, the students will be able to							BT Mapping (Highest Level)	
	CO1	Understand the need for alternative system						K2	
	CO2	Impart knowledge on hybridization for a conventional system.						K2	
	CO3	Acquaint the Performance and characteristics of the electric propulsion systems						K2	
	CO4	Gain knowledge on energy storage devices						K2	
	CO5	Familiarize the concept of hybrid solar vehicles						K2	
UNIT – I	NEED FOR ALTERNATIVE SYSTEM					Periods:09			
Need for hybrid and electric vehicles – main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. Case study on specification of electric and hybrid vehicles.									
UNIT – II	HYBRID TRACTION					Periods:09			
Hybrid electric drive trains – Basic concepts of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, fuel efficiency analysis, Merits and Demerits.									
UNIT – III	ELECTRIC PROPULSION SYSTEMS					Periods:09			
DC motor drives, induction motor drives, permanent magnet motor drives and switched reluctance motor drives. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis									
UNIT – IV	ENERGY STORAGE DEVICES					Periods:09			
Battery Parameters- Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium-ion Sodium based- Metal Air. Battery Modelling- Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types Half reactions of fuel cell, Ultra-capacitors, Battery Management System.									
UNIT – V	HYBRID SOLAR VEHICLES					Periods:09			
Impact on hybrid Solar vehicles, Photovoltaic cell, maximum power point tracking, solar powered accessories, hybrid solar vehicles.									
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -		Total Periods: 45	
Text Books									
1. MehrdadEhsani, Yimin Gao, sebastien E. Gay and Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, Third edition,2018.									
2. Iqbal Husain, —Electric and Hybrid Vehicles: Design Fundamentals, Third Edition CRC Press, 2021.									
3. Chris Mi, M. AbulMasrur, David WenzhongGao, Hybrid Electric Vehicles Principles and Applications With Practical Perspectives, Second Edition, Wiley Publication, 2017.									
Reference Books									
1. Seref Soylu —Electric Vehicles - The Benefits and Barriers II, InTech Publishers, Croatia, 2011.									
2. Aulice Scibioh M. and Viswanathan B., —Fuel Cells – Principles and ApplicationsII, University Press, India, 2007.									
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.									
4. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005.									
5. Denton, Tom. Electric and Hybrid Vehicles. United Kingdom: Routledge, 2020.									
Web References									
1. https://nptel.ac.in/courses/108103009/									
2. http://ceb.ac.in/knowledge-center/E-BOOKS/Modern%20Electric%2C%20Hybrid%20Electric%20%26%20Fuel%20Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf									
3. https://www.youtube.com/watch?v=uoBuOQn9XAAQ									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

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

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	IV		Course Category: PE		End Semester Exam Type: TE				
Course Code	U23ICE404		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Signal Processing for Instrumentation		3	0	0	3	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 continuous and discrete time signals and systems.							K3
	CO2	Acquire knowledge on continuous time signal using fourier transform and laplace transform							K3
	CO3	Analyze the frequency spectrum of discrete-time signals.							K3
	CO4	Familiarize the concept of DFT and FFT							K3
	CO5	Acquaint knowledge on digital signal processor for various applications.							K3
UNIT – I	Classification of Signals and Systems					Periods:12			
Continuous time signals , Discrete time signals , Representation of signals: Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Classification of continuous time and discrete time signals: Periodic, aperiodic and Random signals, Energy and power signals, Continuous time and discrete time systems: Classification of systems, Properties of systems.									CO1
UNIT – II	Analysis of Continuous Time Signals					Periods:12			
Fourier Series : Properties - Trigonometric and Exponential Fourier Series -Parsavel's relation for periodic signals - Fourier Transform: Properties - Laplace Transformation : Properties, R.O.C - Inverse Laplace transform.									CO2
UNIT – III	Analysis of Discrete Time Signals					Periods:12			
Discrete Time Fourier Series: Properties, Discrete Time Fourier Transform: Properties, Z Transformation: Properties, Inverse Z-Transformation.									CO3
UNIT – IV	Computation of DFT and FFT					Periods:12			
Discrete Fourier Transform (DFT), Relationship of the DFT to other transforms, Properties of DFT, circular convolution, filtering long duration sequences, parameter selection to calculate DFT. Computation of DFT using Fast Fourier Transforms (FFT) algorithm, DIT & DIF - FFT using radix 2 – Butterfly structure- FFT applications									CO4
UNIT – V	Digital Signal Processors					Periods:12			
Introduction – Architecture of one DSP processor for motor control – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors.									CO5
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -		Total Periods: 60	
Text Books									
<ol style="list-style-type: none"> Allan V.Oppenheim, Allan S.Willsky and S.Hamid Nawab, "Signals and Systems", Pearson, Second Edition, NewDelhi, 2015. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010. Proakis, J.G. and Manolakis, D.G., Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 2007. Rabiner, C.R. and Gold, B., Theory and Applications of Digital Signal Processing, Prentice Hall of India Private Limited, 2000. 									
Reference Books									
<ol style="list-style-type: none"> J Simon Haykins and Barry Van Veen, "Signals and Systems", Second Edition, Wiley, 2021. H.P.Hsu and R.Ranjan, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, third Edition, 2013 Johny R. Johnson : Introduction to Digital Signal Processing, Prentice Hall, 2015. J.GProakis and D.G.Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Pearson Education/ PHI, New Delhi, 2014. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2015. 									
Web References									
<ol style="list-style-type: none"> http://eeweb.poly.edu/~onur/lectures/lectures.html. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html https://nptel.ac.in/courses/117/105/117105079/ https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/ https://nptel.ac.in/courses/117101055 									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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

Honours Course Semester - IV

Department	Instrumentation and Control Engineering		Programme: B.Tech.						
Semester	IV		Course Category: PC			End Semester Exam Type: TE			
Course Code	U23ICH401		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Design of Sensors and Transducers		3	1	0	4	25	75	100
Prerequisite	Transducer Engineering								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Select and design diaphragm for different practical applications.							K3
	CO2	Design strain gauge based torque, force, load and pressure measurement systems.							K3
	CO3	Design capacitance/ inductance transducers for the measurement of displacement, pressure and level.							K3
	CO4	Acquire knowledge in design of accelerometer and hall effect.							K3
CO5	Design chemical Sensors and its characteristic							K3	
UNIT – I	Introduction to diaphragm					Periods:12			
Introduction to diaphragm; Diaphragm performance and materials, Design of flat diaphragms, flat diaphragms with rigid Centre convex diaphragms, rectangular diaphragms corrugated diaphragms and semiconductor diaphragms.									CO1
UNIT – II	Design of strain gauge					Periods:12			
Design of strain gauge-based load cells, Wheatstone bridge circuit for signal amplification and compensation , torque sensors- Types of torque sensors: rotary, reaction, and non-contact, force sensors- General principles for designing force sensors and pressure sensors - Types of pressure sensors: diaphragm, capsule, and piezo resistive.									CO2
UNIT – III	Design of capacitance and inductance sensors					Periods:12			
Design of capacitance-based displacement, pressure and level sensors; Design of mutual inductance transducers for measurement of displacement- Linear Variable Differential Transformer (LVDT),Rotary Variable Differential Transformer (RVDT). Design of proximity sensors and practical demonstration.									CO3
UNIT – IV	Accelerometer and Hall Effect Sensor Design					Periods:12			
Design of Accelerometer- cantilever and seismic mass, applications. Design of Hall Effect sensors- sensitivity, magnetic field range, operating temperature, and power consumption, Electromagnetic sensors, Magneto-elastic sensors.									CO4
UNIT – V	Introduction to chemical Sensors					Periods:12			
Introduction to chemical Sensors, electrochemical, optical, enzymatic, characteristics. Design of DO2 sensor- membrane selection, electrode material, and signal processing techniques. Working principles of ChemFETs, working principles of PEMFCs.									CO5
Lecture Periods: 45		Tutorial Periods: 15		Practical Periods: -		Total Periods: 60			
Text Books									
<ol style="list-style-type: none"> Doebelin E.O. and Manik D.N., "Measurement Systems", 7th Edition, McGraw-Hill Education Pvt. Ltd., 2019. Karl Hoffmann, An introduction to stress analysis and transducer design using strain gauges, HBM, 2012. James W. Dally, William F. Riley, Kenneth G. McConnell, Instrumentation for Engineering Measurements, Wiley, 1993. Di Giovanni, Flat and Corrugated Diaphragm Design Handbook, CRC Press, 1982. 									
Reference Books									
<ol style="list-style-type: none"> BelaG. Liptak, Instrument Engineers&#39; Handbook, Process Measurement and Analysis,5th edition, Vol.2 ASME PTC, 2018. Richard S. Figliola, Donald E. Beasley, Theory and Design for Mechanical Measurements, John Wiley & Sons, Inc, 6th Edition, 1991. Fraden, Jacob, Handbook of Modern Sensors: Physics, Designs, and Applications, Springe, 3rd Editions, 2010. Alexander D. Khazan, Transducers and Their Elements: Design and Application, PTR Prentice Hall, 1994. Fraden, Jacob, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer, 3rd Editions, 1993. 									
Web References									
<ol style="list-style-type: none"> https://srinix.org/itc/SENSOR%20AND%20TRANSDUCER.pdf https://web.itu.edu.tr/yalcinme/files/courses/MMG/ch2_1%20Sensors%20and%20transducers.pdf https://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf https://research.iaun.ac.ir/pd/abbas.chatraei/pdfs/UploadFile_8643.pdf 									

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

Evaluation Method

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

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



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Department of Instrumentation and Control Engineering

Annexure III

(Academic Calendar - Even 2024)



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

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Madagadipet, Puducherry - 605 107

I year / II sem

February 2024				March 2024				April 2024				May 2024				June 2024			
Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day
1	Thu			1	Fri		9	1	Mon	CAT - I	32	1	Wed	May Day	Holiday	1	Sat		Holiday
2	Fri			2	Sat		Holiday	2	Tue		33	2	Thu	Assignment - 2	55	2	Sun		Holiday
3	Sat		Holiday	3	Sun		Holiday	3	Wed		34	3	Fri	QCM-2/Syllabus Coverage	56	3	Mon	Submission of Model Result Analysis, Attendance and Assessment Record	79
4	Sun		Holiday	4	Mon	National Safety Day	10	4	Thu		35	4	Sat		Holiday	4	Tue		80
5	Mon			5	Tue		11	5	Fri		36	5	Sun		Holiday	5	Wed	World Environment Day	81
6	Tue			6	Wed		12	6	Sat		Holiday	6	Mon	CAT - II	57	6	Thu		82
7	Wed			7	Thu		13	7	Sun		Holiday	7	Tue		58	7	Fri		83
8	Thu			8	Fri	International Women's Day	14	8	Mon		37	8	Wed		59	8	Sat	Seminar/Workshop/GL/Club activity	84
9	Fri			9	Sat	Seminar/Workshop/GL/Club activity	15	9	Tue		38	9	Thu		60	9	Sun		Holiday
10	Sat			10	Sun		Holiday	10	Wed		39	10	Fri		61	10	Mon	Tentative ESE Practicals	85
11	Sun		Holiday	11	Mon		16	11	Thu	Ramzan	Holiday	11	Sat	National Technology Day Seminar/Workshop/GL/Club activity	62	11	Tue		86
12	Mon			12	Tue		17	12	Fri		40	12	Sun		Holiday	12	Wed		87
13	Tue			13	Wed		18	13	Sat	Submission of CAT I Result Analysis, Attendance and Assessment Record Seminar/Workshop/GL/Club activity	41	13	Mon		63	13	Thu		88
14	Wed			14	Thu	Pi Day	19	14	Tue			14	Tue		64	14	Fri		89
15	Thu			15	Fri		20	15	Wed			15	Wed		65	15	Sat		Holiday
16	Fri			16	Sat		Holiday	16	Thu			16	Thu	Submission of CAT II Result Analysis, Attendance and Assessment Record	66	16	Sun		Holiday
17	Sat		Holiday	17	Sun		Holiday	17	Mon	Tamil New Year	Holiday	17	Fri	Online feedback-3	67	17	Mon		90
18	Sun		Holiday	18	Mon		21	18	Tue		42	18	Sat		Holiday	18	Tue		
19	Mon			19	Tue		22	19	Wed		43	19	Sun		Holiday	19	Wed		
20	Tue			20	Wed		23	20	Thu		44	20	Mon	Assignment - 3	68	20	Thu		
21	Wed	Commencement of Classes	1	21	Thu		24	21	Fri		45	21	Tue	QCM-3/Syllabus Coverage	69	21	Fri		
22	Thu		2	22	Fri	World Water Day	25	22	Sat		46	22	Wed	Model Exam	70	22	Sat		
23	Fri		3	23	Sat	Seminar/Workshop/GL/Club activity	26	23	Mon	World Earth Day	47	23	Thu		71	23	Sun		Holiday
24	Sat	Seminar/Workshop/GL/Club activity	4	24	Sun		Holiday	24	Tue		48	24	Fri		72	24	Mon		
25	Sun		Holiday	25	Mon		27	25	Wed		49	25	Sat	Seminar/Workshop/GL/Club activity	73	25	Tue		
26	Mon		5	26	Tue	Online feedback-1	28	26	Thu		50	26	Sun		Holiday	26	Wed	Tentative ESE Theory	
27	Tue	World Sustainable Energy Day	6	27	Wed	Assignment - 1	29	27	Fri	World Intellectual Property Day	51	27	Mon		74	27	Thu		
28	Wed	National Science Day	7	28	Thu	Submission of QCM-1/Syllabus Coverage	30	28	Sat	Seminar/Workshop/GL/Club activity	52	28	Tue	Last working day	75	28	Fri		
29	Thu		8	29	Fri	Good Friday	Holiday	29	Mon		53	29	Wed	Model Practicals	76	29	Sat		
				30	Sat	Seminar/Workshop/GL/Club activity	31	30	Tue		54	30	Thu		77	30	Sun		Holiday
				31	Sun		Holiday	31	Wed	Online feedback-2	55	31	Fri		78				
Total number of working days : 8 Total number of holiday : 01				Total number of working days :23 Total number of holiday : 08				Total number of working days : 23 Total number of holiday : 07				Total number of working days :24 Total number of holiday : 07				Total number of working days : 12 Total number of holiday : 05			

Ethnotech course to be completed before CAT I



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II year / IV sem

-ebruary 2024				March 2024				April 2024				May 2024				June 2024			
Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day
1	Thu			1	Fri		9	1	Mon		32	1	Wed	May Day	Holiday	1	Sat		Holiday
2	Fri			2	Sat		Holiday	2	Tue		33	2	Thu		55	2	Sun		Holiday
3	Sat		Holiday	3	Sun		Holiday	3	Wed		34	3	Fri	Submission of CAT II Result Analysis, Attendance and Assessment Record	56	3	Mon	Submission of Model Result Analysis, Attendance and Assessment Record	79
4	Sun		Holiday	4	Mon	National Safety Day	10	4	Thu		35	4	Sat		Holiday	4	Tue		80
5	Mon			5	Tue		11	5	Fri		36	5	Sun		Holiday	5	Wed	World Environment Day	81
6	Tue			6	Wed		12	6	Sat		Holiday	6	Mon		57	6	Thu		82
7	Wed			7	Thu	Online feedback-1	13	7	Sun		Holiday	7	Tue		58	7	Fri		83
8	Thu			8	Fri	Assignment - 1 International Women's Day	14	8	Mon		37	8	Wed		59	8	Sat	Seminar/Workshop/GL/Club activity	84
9	Fri			9	Sat	QCM-1/Syllabus Coverage	15	9	Tue		38	9	Thu		60	9	Sun		Holiday
10	Sat			10	Sun		Holiday	10	Wed		39	10	Fri		61	10	Mon	Tentative ESE Practicals	85
11	Sun		Holiday	11	Mon		16	11	Thu	Ramzan	Holiday	11	Sat	National Technology Day/ Seminar/Workshop/GL/Club activity	62	11	Tue		86
12	Mon			12	Tue		17	12	Fri		40	12	Sun		Holiday	12	Wed		87
13	Tue			13	Wed	CAT - I	18	13	Sat		41	13	Mon		63	13	Thu		88
14	Wed			14	Thu	Pi Day	19	14	Sun	Tamil New Year	Holiday	14	Tue		64	14	Fri		89
15	Thu			15	Fri		20	15	Mon	Online feedback-2	42	15	Wed		65	15	Sat		Holiday
16	Fri			16	Sat		Holiday	16	Tue	Assignment - 2	43	16	Thu		66	16	Sun		Holiday
17	Sat		Holiday	17	Sun		Holiday	17	Wed	QCM-2/Syllabus Coverage	44	17	Fri	Online feedback-3	67	17	Mon		90
18	Sun		Holiday	18	Mon		21	18	Thu		45	18	Sat		Holiday	18	Tue		
19	Mon			19	Tue		22	19	Fri		46	19	Sun		Holiday	19	Wed		
20	Tue			20	Wed		23	20	Sat		Holiday	20	Mon	Assignment - 3	68	20	Thu		
21	Wed	Commencement of Classes	1	21	Thu	World Water Day	24	21	Sun		Holiday	21	Tue	QCM-3/Syllabus Coverage	69	21	Fri		
22	Thu		2	22	Fri	Seminar/Workshop/GL/Club activity	25	22	Mon	CAT - II World Earth Day	47	22	Wed	Model Exam	70	22	Sat		
23	Fri		3	23	Sat		26	23	Tue		48	23	Thu		71	23	Sun		Holiday
24	Sat	Seminar/Workshop/GL/Club activity	4	24	Mon	Submission of CAT I Result Analysis, Attendance and Assessment Record	27	24	Wed		49	24	Fri		72	24	Mon		
25	Sun		Holiday	25	Tue		28	25	Thu		50	25	Sat	Seminar/Workshop/GL/Club activity	73	25	Tue		
26	Mon		5	26	Wed		29	26	Fri		51	26	Sun		Holiday	26	Wed	Tentative ESE Theory	
27	Tue	World Sustainable Energy Day	6	27	Thu		30	27	Sat		52	27	Mon		74	27	Thu		
28	Wed	National Science Day	7	28	Fri	Good Friday	Holiday	28	Sun		Holiday	28	Tue	Last working day	75	28	Fri		
29	Thu		8	29	Sat	Seminar/Workshop/GL/Club activity	31	29	Mon		53	29	Wed	Model Practicals	76	29	Sat		
				30	Sun		Holiday	30	Tue		54	30	Thu		77	30	Sun		Holiday
												31	Fri		78				
Total number of working days : 8 Total number of holiday : 01				Total number of working days : 23 Total number of holiday : 08				Total number of working days : 23 Total number of holiday : 07				Total number of working days : 24 Total number of holiday : 07				Total number of working days : 12 Total number of holiday : 05			

Ebnotech course to be completed before CAT I and CAT 2



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

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III year / VI sem

February 2024			March 2024			April 2024			May 2024			June 2024							
Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day				
1	Thu			1	Fri		20	1	Mon	CAT - II	43	1	Sat		Holiday				
2	Fri			2	Sat		Holiday	2	Tue		44	2	Thu	May Day	Holiday				
3	Sat		Holiday	3	Sun		Holiday	3	Wed		45	3	Fri		67				
4	Sun		Holiday	4	Mon	National Safety Day	21	4	Thu		46	4	Sat		Holiday				
5	Mon			5	Tue		22	5	Fri		47	5	Sun		Holiday				
6	Tue			6	Wed		23	6	Sat		Holiday	6	Mon		68				
7	Wed	Commencement of Classes	1	7	Thu		24	7	Sun		Holiday	7	Tue		69				
8	Thu		2	8	Fri	International Women's Day	25	8	Mon		48	8	Wed		70				
9	Fri		3	9	Sat	Submission of CAT I Result Analysis, Attendance and Assessment Record/ Club Activity	26	9	Tue		49	9	Thu	Online feedback-3	71				
10	Sat	GL /Seminar/ Workshop /Club Activity	4	10	Sun		Holiday	10	Wed		50	10	Fri	Assignment - 3	72				
11	Sun		Holiday	11	Mon		27	11	Thu	Ramzan	Holiday	11	Sat	OCM-3/Syllabus Coverage / National Technology Day/ Club Activity	73				
12	Mon		5	12	Tue		28	12	Fri		51	12	Sun		Holiday				
13	Tue		6	13	Wed		29	13	Sat	Submission of CAT II Result Analysis, Attendance and Assessment Record/ Club Activity	52	13	Mon	Model Exam	74				
14	Wed		7	14	Thu		30	14	Sun	Tamil New Year	Holiday	14	Tue		75				
15	Thu		8	15	Fri		31	15	Mon		53	15	Wed		76				
16	Fri		9	16	Sat		Holiday	16	Tue		54	16	Thu		77				
17	Sat		Holiday	17	Sun		Holiday	17	Wed		55	17	Fri		78				
18	Sun		Holiday	18	Mon		32	18	Thu		56	18	Sat		Holiday				
19	Mon		10	19	Tue		33	19	Fri		57	19	Sun		Holiday				
20	Tue		11	20	Wed		34	20	Sat		Holiday	20	Mon	Last working day	79				
21	Wed	International Mother's Language Day.	12	21	Thu	Carrer Development Training	35	21	Sun		Holiday	21	Tue		80				
22	Thu		13	22	Fri		36	22	Mon	World Earth Day	58	22	Wed	Model Practical	81				
23	Fri	Online feedback-1	14	23	Sat		37	23	Tue		59	23	Thu		82				
24	Sat	Assignment - 1/ GL/ Club Activity	15	24	Sun		Holiday	24	Wed		60	24	Fri	Submission of Model Result Analysis, Attendance and Assessment Record	83				
25	Sun		Holiday	25	Mon		38	25	Thu		61	25	Sat	GL / Seminar/ Workshop / Club Activity	84				
26	Mon	Submission of OCM-1/Syllabus Coverage	16	26	Tue	Online feedback-2	39	26	Fri	World Intellectual Property Day	62	26	Sun		Holiday				
27	Tue	World Sustainable Energy Day	17	27	Wed	Assignment - 2	40	27	Sat	GL / Seminar/ Workshop / Club Activity	63	27	Mon		85				
28	Wed	National Science Day	18	28	Thu	OCM-1/Syllabus Coverage	41	28	Sun		Holiday	28	Tue		86				
29	Thu	CAT-I	19	29	Fri	Good Friday	Holiday	29	Mon		64	29	Wed		87				
				30	Sat	GL / Seminar/ Workshop / Club Activity	42	30	Tue		65	30	Thu		88				
				31	Sun		Holiday	31	Fri		89	31	Fri		89				
Total number of working days : 19 Total number of holiday : 04				Total number of working days :23 Total number of holiday : 08				Total number of working days : 23 Total number of holiday : 07				Total number of working days :24 Total number of holiday : 07				Total number of working days :01 Total number of holiday :02			

Ethnotech course to be completed between CAT 2 and Model exam



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

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IV year / VIII sem

February 2024				March 2024				April 2024				May 2024				June 2024			
Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day	Date	Day	Schedule	Working Day
1	Thu			1	Fri		20	1	Mon	Model Exam	43	1	Wed	May Day	Holiday	1	Sat		Holiday
2	Fri			2	Sat		Holiday	2	Tue		44	2	Thu	Tentative ES Practical	66	2	Sun		Holiday
3	Sat		Holiday	3	Sun		Holiday	3	Wed		45	3	Fri		67	3	Mon		
4	Sun		Holiday	4	Mon	National Safety Day	21	4	Thu		46	4	Sat		Holiday	4	Tue		
5	Mon			5	Tue	Phase II Review 1	22	5	Fri		47	5	Sun		Holiday	5	Wed	World Environment Day	
6	Tue			6	Wed	Online feedback-2	23	6	Sat		Holiday	6	Mon		68	6	Thu		
7	Wed	Commencement of Classes	1	7	Thu	Assignment - 2	24	7	Sun		Holiday	7	Tue		69	7	Fri		
8	Thu		2	8	Fri	QCM-3Syllabus Coverage	25	8	Mon		48	8	Wed		70	8	Sat		
9	Fri		3	9	Sat	International Women's Day	26	9	Tue		49	9	Thu		71	9	Sun		Holiday
10	Sat	GL / Seminar / Workshop / Club Activity	4	10	Sun	Submission of CAT I Result Analysis, Attendance and Assessment Record / Seminar / Workshop / Club Activity	26	10	Wed		50	10	Fri		72	10	Mon		
11	Sun		Holiday	11	Mon		27	11	Thu	Ramzan	Holiday	11	Sat	National Technology Day	73	11	Tue		
12	Mon		5	12	Tue		28	12	Fri		51	12	Sun		Holiday	12	Wed		
13	Tue		6	13	Wed	CAT - II	29	13	Sat	Submission of Model Result Analysis, Attendance and Assessment Record / Club Activity	52	13	Mon		74	13	Thu		
14	Wed		7	14	Thu		30	14	Sun	Tamil New Year	Holiday	14	Tue		75	14	Fri		
15	Thu		8	15	Fri		31	15	Mon		53	15	Wed		76	15	Sat		Holiday
16	Fri		9	16	Sat		Holiday	16	Tue		54	16	Thu		77	16	Sun		Holiday
17	Sat		Holiday	17	Sun		Holiday	17	Wed		55	17	Fri		78	17	Mon		
18	Sun		Holiday	18	Mon		32	18	Thu	Phase II Review 3	56	18	Sat		Holiday	18	Tue		
19	Mon		10	19	Tue		33	19	Fri		57	19	Sun		Holiday	19	Wed		
20	Tue		11	20	Wed		34	20	Sat		Holiday	20	Mon	Tentative ES Theory Exam		20	Thu		
21	Wed		12	21	Thu		35	21	Sun		Holiday	21	Tue			21	Fri		
22	Thu		13	22	Fri	Phase II Review 2 World Water Day	36	22	Mon	World Earth Day	58	22	Wed			22	Sat		
23	Fri	Online feedback-1	14	23	Sat	Submission of CAT II Result Analysis, Attendance and Assessment Record / Seminar / Workshop	37	23	Tue		59	23	Thu			23	Sun		Holiday
24	Sat	Assignment - 3 / GL / Seminar / Workshop / Club Activity	15	24	Sun		Holiday	24	Wed	Model practical	60	24	Fri			24	Mon		
25	Sun		Holiday	25	Mon	Online feedback-3	38	25	Thu		61	25	Sat		Holiday	25	Tue		
26	Mon	Submission of QCM-1 Syllabus Coverage	16	26	Tue	Assignment - 3	39	26	Fri	World Intellectual Property Day	62	26	Sun		Holiday	26	Wed		
27	Tue	World Sustainable Energy Day	17	27	Wed	QCM-3Syllabus Coverage	40	27	Sat	GL / Seminar / Workshop / Club Activity	63	27	Mon			27	Thu		
28	Wed	CAT-1/National Science Day	18	28	Thu		41	28	Sun		Holiday	28	Tue			28	Fri		
29	Thu		19	29	Fri	Good Friday	Holiday	29	Mon		64	29	Wed			29	Sat		
				30	Sat	GL / Seminar /	42	30	Tue	Last working day	65	30	Thu			30	Sun		Holiday
				31	Sun		Holiday					31	Fri						
Total number of working days : 19 Total number of holiday : 04				Total number of working days : 23 Total number of holiday : 08				Total number of working days : 23 Total number of holiday : 07				Total number of working days : 13 Total number of holiday : 04				Total number of working days : Total number of holiday :			

ETAtech course to be completed before CAT I



SRI MANAKULA VINAYAGAR
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Department of Instrumentation and Control Engineering

Annexure IV

(Professional Elective and Open Elective Courses for R-2020)

Professional Elective Courses

U20ICE402	ELECTRIC AND HYBRID VEHICLES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To expose the working of different configurations of electric vehicles
- To incorporate different energy storage technologies used for hybrid electric vehicles and their control
- To provide a comprehensive overview of a electric and hybrid electric vehicle
- To impart knowledge on the sources utilized for hybrid electric vehicle.
- To impart knowledge on the electric propulsion system

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the architecture of electric vehicles. **(K2)**

CO2 - Understand the basic concept of Hybrid electric vehicles **(K2)**

CO3 - Critically evaluate the strength and limitations of electric propulsion systems.**(K3)**

CO4 - Examine various storage technologies and sizing of storage for independent systems. **(K2)**

CO5 - Design and develop a solar based vehicle with suitable techniques and ability to acknowledge the society about the need of hybrid vehicle system. **(K3)**

UNIT I ELECTRIC VEHICLES (9 Hrs)

Architecture of an electric vehicle, impact of modern drive, essentials and performance of electric vehicles – Traction motor characteristics, attractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations.

UNIT II HYBRID VEHICLES

(9 Hrs)

Hybrid electric drive trains – Basic concepts of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, fuel efficiency analysis, Merits and Demerits.

UNIT III ELECTRIC PROPULSION SYSTEMS (9 Hrs)

DC motor drives, induction motor drives, permanent magnet motor drives and switched reluctance motor drives. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT IV ENERGY STORAGE DEVICES (9 Hrs)

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles -Electrochemical batteries – Reactions, thermodynamic voltage, lead-acid batteries, nickel-based batteries, lithium-based batteries, flywheel and ultra-capacitors, Battery management systems.

UNIT V HYBRID SOLAR VEHICLES (9 Hrs)

Impact on hybrid Solar vehicles, Fuel cell thermodynamics, operating principle, fuel cell technologies, fuel reforming, hydrogen production and storage. Photovoltaic cell, maximum power point tracking, solar powered accessories, hybrid solar vehicles.

Text Books

1. MehrdadEhsani, Yimin Gao, sebastien E. Gay and Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and DesignII, CRC Press, second edition,2010.
2. Iqbal Husain, —Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2011.
3. Chris Mi, M. AbulMasrur, David WenzhongGao, Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Wiley Publication, 2011.

Reference Books

1. Seref Soylu —Electric Vehicles - The Benefits and Barriers II, InTech Publishers, Croatia, 2011.
2. Aulice Scibioh M. and Viswanathan B., —Fuel Cells – Principles and ApplicationsII, University Press, India, 2007
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
4. Mehrdad Ehsani, Yimi Gao, Senastian E. Gay, Ali Emandi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
5. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005

Web References

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

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	-	1	-	1	1	2	-	1
2	3	1	3	-	-	2	2	-	1	-	1	1	2	-	1
3	3	1	3	-	-	2	2	-	1	-	1	1	2	-	1
4	3	1	3	-	-	2	2	-	1	-	1	1	2	-	1
5	3	1	3	-	-	2	2	-	1	-	1	1	2	-	1

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

U20ICCM02	VIRTUAL INSTRUMENTATION	L	T	P	C	Hrs
	(Common to EEE and ICE)	3	0	0	3	45

Course Objectives

- To acquaint the students with the basics of virtual instrumentation.
- To acquire knowledge on basic Programming
- To provide knowledge in Hardware Interfacing by VI tools.
- To study the various graphical programming environment in virtual instrumentation.
- To illustrate few applications in virtual instrumentation.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Explain the concepts of virtual instruments. **(K2)**

CO2 - Apply the Programming concepts in VI. **(K2)**

CO3 - Familiarize in the concepts of instrument interfacing by VI tools. **(K2)**

CO4 - Acquaint the various instrument control interfaces. **(K2)**

CO5 - Elucidate the concepts of VI in real time applications. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Evolution of LabVIEW - Block diagram and architecture of a virtual instrument - Graphical programming and comparison with conventional programming - Controls and indicators- Labels and Text –Shape, size and color – Data type, Format, Precision and representation – Data types – Data flow programming-Editing – Debugging and Running a Virtual Instrument.

UNIT II PROGRAMMING STRUCTURE (9 Hrs)

Front panel - Block diagram - VIS and sub-VIS, Loops: For Loops, While Loops, arrays, clusters, Charts and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT III DATA ACQUISITION (9 Hrs)

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

UNIT IV INSTRUMENT CONTROL (9 Hrs)

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office and Industrial applications, VISA and IVI.

UNIT V APPLICATIONS (9 Hrs)

Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

Text Books

1. Gupta , Virtual Instrumentation Using Lab view 2nd Edition, Tata McGraw-Hill Education, 2010
2. Jovitha Jerome, Virtual Instrumentation using LabVIEW, PHI Learning Pvt. Ltd., 2010

Reference Books

1. Gary Jonson, "Labview Graphical Programming", Fourth Edition, McGraw Hill, New York, 2012
2. Gupta.S., Gupta.J.P., "PC interfacing for Data Acquisition and Process Control", Second Edition, Instrument Society of America, 2012.
3. Sokoloff; "Basic concepts of Labview 4", Prentice Hall Inc., New Jersey 2013.

Web References

1. <https://www.ni.com/>
2. <https://www.youtube.com/user/Labview/playlists>

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	1	2	2	-	-	-	2	2	3	2	1	2
2	3	3	3	2	3	2	-	-	-	2	3	3	1	1	2
3	3	2	3	2	3	2	-	-	-	3	2	3	1	1	3
4	2	3	2	2	2	2	-	-	-	3	2	3	2	1	3
5	3	2	3	3	2	2	-	-	-	2	2	2	2	1	3

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

U20ICE821

INDUSTRIAL SAFETY

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To provide the concept of Industrial Safety and provide knowledge for workplace safety.
- To acquire knowledge in identification, evaluation and control of all the hazards.
- To prevent wear, corrosion and the prevention methods.
- To conduct the fault tracing in machineries.
- To conduct periodic and preventive maintenance.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Identify hazard and potential hazard areas. **(K1)**

CO2 - Develop safety programs to prevent or mitigate damage or losses. **(K2)**

CO3 - Acquire knowledge on wear, corrosion and its preventive methods. **(K2)**

CO4 - Understand the fault tracing in machineries. **(K2)**

CO5 - Develop knowledge on periodic and preventive maintenance. **(K2)**

UNIT I INDUSTRIAL SAFETY

(9 Hrs)

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, 103 cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING

(9 Hrs)

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost and its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION

(9 Hrs)

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV FAULT TRACING

(9 Hrs)

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE

(9 Hrs)

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books

1. Keith Mobley, "Maintenance Engineering Handbook", McGraw-hill education, eighth edition, 2014.
2. Sushil Kumar Srivastava, Maintenance Engineering and Management, S. Chand and Company Ltd, 2006.

Reference Books

1. M.P.Poonia, S.C.Sharma, "Industrial Safety Maintenance Management", Khanna Publication, 2018.
2. C.Ray Asfahl, David W.Rieske, "Industrial Safety and health Management", 5th Edition, Prentice Hall, London,2010.

Web References

1. <https://www.safeopedia.com/definition/1052/industrial-safety>
2. <https://www.nistinstitute.com/blog/industrial-safety-scope-significance/>
3. <https://labour.gov.in/industrial-safety-health>

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	2	-	1	-	-	1	1	-	-	-	-	-	1	-	-
5	3	-	1	-	-	1	1	-	-	-	-	-	1	-	-

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

Open Elective Courses

U20ADO402	INTRODUCTION TO DATA SCIENCE	L	T	P	C	Hrs
		3	0	0	3	45

(Common to EEE, ECE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science. **(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

UNIT I INTRODUCTION TO DATA SCIENCE (9 Hrs)

Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES (9 Hrs)

Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS (9 Hrs)

Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)

Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting

Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS

(9 Hrs)

Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, “A Hands on Introduction to Data Science“, Cambridge University Press, 2020.
3. SinanOzdemir, “Principles of Data Science”, Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, “Ethics and Data Science”, O’ Reilly, 1st edition, 2018.

Reference Books

1. Hector Guerrero, “Excel Data Analysis: Modeling and Simulation”, Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. McOwan, “The Power of Computational Thinking”, World Scientific Publishing, 2017.
3. Steven S. Skiena, “Data Science Design Manual”, Spring International Publication, 2017.
4. RajendraAkerkar, PritiSrinivasSajja, “Intelligence Techniques for Data Science”, Spring International Publication, 2016.
5. Longbing Cao “Data Science Thinking: The Next Scientific, Technological and Economic Revolution”, Spring International Publication, 2018.

Web References

1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. <https://www.javatpoint.com/data-science>
3. [https://www.coursera.org/browse/data-science /](https://www.coursera.org/browse/data-science/)

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	2	3	2	2	-	-	-	-	-	-	-	-	-	-
2	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
3	2	1	3	2	3	-	-	-	-	-	-	-	-	2	-
4	1	2	2	1	1	-	-	-	-	-	-	-	-	-	1
5	2	1	1	2	1	-	-	1	-	-	-	-	-	-	-

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

U20ADO603	PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE)	3	0	0	3	45

Course Objectives

- To understand basic principles of Artificial Intelligence
- To learn and design Knowledge representation
- To understand the concept of reasoning
- To master the fundamentals of machine learning, mathematical framework and learning algorithms
- To understand the reinforcement and statistical learning.

Course Outcomes

After completion of the course, the students will be able to

CO1- Understand foundational principles of artificial intelligence. **(K2)**

CO2- Understand formal methods of knowledge representation. **(K2)**

CO3- Understand the fundamental issues and challenges of Reasoning. **(K2)**

CO4- Analyze the underlying mathematical relationships with Machine Learning algorithms. **(K3)**

CO5- Apply various models for Artificial Intelligence programming techniques. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to Artificial Intelligence- Artificial Intelligence Problems-Timelines of Artificial Intelligence-Production Systems-State Space Representation- Branches of Artificial Intelligence-Application of Artificial Intelligence.

UNIT II KNOWLEDGE REPRESENTATION (9 Hrs)

Knowledge Management-Types of Knowledge-Knowledge representation-Approaches to Knowledge representation-Issues in Knowledge representation-Knowledge base.First order Logic – Frames — Conceptual Dependency.

UNIT III REASONING (9 Hrs)

Types of reasoning-reasoning with Fuzzy Logic- Rule based Reasoning-Diagnosis Reasoning.

UNIT IV LEARNING (9 Hrs)

Types of Learning-Machine Learning-Intelligent agents- Association Learning: Apriori Algorithm- Case Study: Customer Sequence and SCADA Application – k-Means Clustering-Fuzzy Clustering-Cluster Similarity

UNIT V REINFORCEMENT AND STATISTICAL LEARNING (9 Hrs)

Markov Decision Problem- Hidden Markov Model-Linear Classifier-decision Trees: Random forest - Bayesian Network – ANN- ANN Learning process-Types of Network – Perceptron-RBF Network-Case studies: Character recognition.

Text Books

1. Anand Hareendran S., Anand Hareendran, And Vinod Chandra S.S. "Artificial Intelligence and Machine Learning" PHI Publication, 2014.

2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Science, 1997.
3. Peter Harrington, "Machine Learning in action", Manning Publication, 2012.

Reference Books

1. Charu C. Aggarwal "Data Classification Algorithms and Applications", Chapman & Hall/CRC Data Mining and Knowledge Discovery Series.
2. Andreas C. Mueller and Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, Inc. First Edition, 2016.
3. Eremy Watt, Reza Borhani, and Aggelos K. Katsaggelos "Machine Learning Refined Foundations, Algorithms, and Applications", Cambridge University Press, 2016.
4. ShaiShalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

Web References

1. <https://www.coursera.org/learn/machine-learning>
2. https://ml-cheatsheet.readthedocs.io/en/latest/regression_algos.html
3. <https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms>

COs/POs/PSOs Mapping

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

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



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Department of Instrumentation and Control Engineering

Annexure V

(NPTEL Courses)



Department of Instrumentation and Control Engineering

NPTEL Course Completion details by faculty

January – April 2024

S. No	Name	Course Name	Duration	Certificate Type
1	Dr. K. Naveenkumar	Industry 4.0 and industrial IoT	12 Weeks	Successfully completed
2	Dr. M. Rekha	Joy of computing using python	12 Weeks	Successfully completed
3	Ms. P. Kiruthika	Problem Solving Approach through C Programming	12 Weeks	Successfully completed
4	Mr. W. Godfrey Danial	Industry 4.0 and industrial IoT	12 Weeks	Successfully completed

NPTEL Course Completion details by Student

S. No	Course Name	Number of students	Duration	Certificate Type
1	Internet of Things	14	12 Weeks	Successfully completed
2	Joy of computing using python	5	12 Weeks	Successfully completed
3	Industry 4.0 and industrial IoT	13	12 Weeks	Successfully completed
4	Air Pollution and Control	12	12 Weeks	Successfully completed



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Annexure VI

(Panel of Examiners)

Annexure -VI



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DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING

DETAILS OF EXAMINERS FOR QUESTION PAPER SETTER AND EVALUATORS

<u>Sl.No</u>	<u>Name of the Examiner</u>	<u>Specialization</u>	<u>Designation, Department and Institution in which currently working</u>	<u>Contact number and mail id</u>
1	<u>Dr.G.Sakthivel</u>	Embedded System, Process Control	Professor, Department of EIE, <u>Annamalai</u> university. Chidambaram - 608 401	9443270714 gsauei@gmail.com
2	<u>Dr.S.MourougaPrakash</u>	Process Control	Asst prof / EIE Pondicherry Engineering College	9894463366 smpragash@pec.edu
3	<u>Dr. M.Manivannan</u>	Process Control and Instrumentation	Department of EIE, <u>Annamalai</u> university. Chidambaram - 608 401	9442646555 Manivannan1978@gmail.com
4	<u>Dr.P.A.Sridhar</u>	Biomedical Instrumentation	Assistant Professor, Department of Electronics & Instrumentation Engineering, <u>Kattankulathur</u> Campus, SRM Institute of Science and Technology	7598227170 sridhara1@srmist.edu.in
5	<u>Dr.Palanivel</u>	Process Control, Transducer and Measurements	Associate Professor – Dept of E & I <u>Annamalai</u> university, <u>Annamalai</u> Nagar, Chidambaram	9842565026 S_palanivel@yahoo.com
6	<u>Dr.M.Jagannath</u>	Biomedical Instrumentation	Assoc. Prof, School of Electronic <u>Engineering,VIT</u> , Chennai - 600127	9884386262 jagan.faiath@gmail.com

7	Dr.A.Saraswathi	Drives and Control	Assistant Professor / HOD University college of engineering, Villupuram -605103	9994549910 saraswathiask@gmail.com
8	Dr. P. Shanmugaraja	Medical Electronics Embedded Systems	Department of EIE Annamalaiuniversity , Chidambaram - 608 401.	9443275120 psraja70@gmail.com
9	Dr.S. Yazhinian	VLSI	Assoc. Prof / ECE / Sri Venkateshwara Engineering College and Technology	9751112057 yazhinian.s@gmail.com
10	Dr. P. Vijayakumar	Wireless Networks and Communications	Associate Professor, School of Electronics Engineering, Vellore Institute of Technology, Melakottaivur , Chennai – 600127	9894727271 vijayrcet@gmail.com
11	Dr.D.Palani	Image Processing	Assistant professor / dept of ECE. University college of engineering, Villupuram -605103	8667377226 palani.dinesh@gmail.com
12	Dr. M.PheminaSelvi	Electronics and Communications	Assistant professor / dept of ECE. University college of engineering, Villupuram -605103	9994267707 vm.femina@gmail.com
13	Dr.V.Devarajan	Wireless Communication	Professor & Head Department of ECE Dhanalakshmi Srinivasan College of Engineering and Technology, Mamallapuram.	9894040479 devarajan@live.fr
14	Dr.B.Karthik	Embedded System	Associate Professor, Department of ECE, Bharath Institute of Higher Education and Research. Chennai.	9842580740 karthikguru33@gmail.com
15	Dr.V.Ganesan	Electronics Circuits	Associate Professor, Department of ECE, Bharath University. Chennai.	9443723032 vganesh1711@gmail.com
16	Dr. A. Ashokan	Process Control, Transducer and Measurements	Department of ECE Government College of Engineering, Thanjavur.	9150376648
17	Dr M. Florence Mary	Wireless Communication and Network Security, Cryptography, IoT, Embedded System, Blockchain, Cyber security, VLSI	Pondicherry Engineering College	6380597811 florancemary@pec.edu

18	Dr.D. Manamalli	Process Control	MIT Campus, Anna University, Chennai	9445405689 manamalli_m@yahoo.com
19	Dr. P. S. Mayurappriyan	Control Systems / Renewable Energy Systems / Power Electronics	Kumaraguru College of Technology, Chinnavedampatti (PO),Coimbatore – 641 049.	0422-2661100 mayurappriyan.ps.eie@kct.ac.in
20	Dr. N. Sivakumaran	Process Control and Instrumentation	National Institute of Technology, Tiruchirappalli 620015	9443745705 nsk@nitt.edu
21	Dr.B.Hemakumar	1.Transducers and Measurements 2. Electric Circuit Analysis 3. Process Instrumentation 4. Analytical	Department of EIE, Pondicherry Engineering College, Pillaichavady , Puducherry.	9994196804 hemakumarb@pec.edu
22	Dr.M.PonniBala	Biomedical Image Processing, Softcomputing Techniques	Kongu Engineering College Thoppupalayam, Perundurai, Tamil Nadu 638060	9843999554 ponnibala@kongu.ac.in
23	Dr. Anima Nanda	Composites Multi Objective Optimization Machining Material Characterizations	Sathyabama University, Chennai	9443786840 animananda72@gmail.com
24	Dr. M. Kowsalya	Energy and Power Electronics	VIT ,Vellore	7418077407 mkowsalya@vit.ac.in
25	Dr. Gnanou Florence Sudha	Electronics and Communication Engineering,	Department of ECE, Pondicherry Engineering College, Pillaichavady , Puducherry.	9944337963 gfsudha@pec.edu

B.Tech. Instrumentation and Control Engineering



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Annexure VII

(Equivalent Courses of R-2020 and R-2023)



**DETAILS OF EQUIVALENT COURSES IN R 2023 CURRICULUM FOR THE COURSES IN R 2020
DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING**

Sl. No.	Year / Sem	Name of the Course with code under R-2020 Regulations (All the Courses in a semester to be mentioned with course code)	For Question Paper Setting with respect to R-2020 Regulations		
			Equivalent Course Name with Code in R-2023 Regulations (Courses which are not modified / content reduced)	Course is retained with modification in the content / Course content increased)	If Course is Removed (Yes)
1.	I / I	Theory:			
		1. Engineering Mathematics - I (Calculus and Linear Algebra) U20BST101		Engineering Mathematics – I / U23MATC01	
		2. Material Science U20BST105			Yes
		3. Basic Electronics U20EST113			Yes
		4. Electrical Technology U20EST115		Fundamentals of Electrical Machines U23ICT101	
2.	I / II	5. Fundamentals of Civil and Mechanical Engineering U20EST103		Basics of Civil and Mechanical Engineering U23ESTC01	
		Theory:			
		1. Engineering Mathematics - II (Multiple Integrals and Transforms) U20BST215		Engineering Mathematics - II U23MATC02	
		2. Programming in C U20EST201		Programming in C U23CSTC01	
		3. Circuit Theory U20ICT201		Circuit Theory U23ICB301	
		4. Electronic Circuits U20ICT202		Electron Devices and Circuits U23BMT01	
3.	II/III	5. Signals and Systems U20ICT203		Signal Processing for Instrumentation U23ICE404	
		6. Transducer Engineering U20ICT204		Transducer Engineering U23ICT202	
		Theory:			
		1. Complex Analysis and Applications of Partial Differential Equations U20BST320			Yes
		2. Data Structures U20EST356		Data Structures U23CSTC03	
		3. Solid and Fluid Mechanics U20EST361		Solid and Fluid Mechanics U23ICT404	
		4. Analog Integrated circuits U20ICT305		Linear Control Systems U23ICT405	
		5. Digital Logic Circuits U20ICT306		Digital Logic Circuits U23ICTC02	
		6. Electrical and Electronic Measurements U20ICT307		Electrical and Electronic Measurements U23ICT303	
		Theory:			
		1. Probability and Statistics U20BST430		Probability and Statistics U23MATC03	
		2. Programming in JAVA U20EST467		Programming in Java U23ITTC03	
		3. Linear Control Systems U20ICT408		Linear Control Systems U23ICT405	
		4. Microcontroller Based System Design U20ICT409		Microcontroller Based System Design U23ICB402	
		Professional Elective:			
		1. Digital Signal Processing U20ICE401			Yes
2. Electric and Hybrid Vehicles U20ICE402		Hybrid Electric Vehicles U23ICE402			
3. Communication Systems U20ICE403		Communication Systems U23BMEC01			
4. Electric Drives and Control U20ICE404		Industrial Electronics and Drives U23ICE403			
5. Mechatronics and Instrumentation U20ICE405			Yes		
Open Elective:					
1. Sensors and Transducers U20ICO401		Sensors and Transducers U23ICOC01			
2. Industrial safety and management U20ICO402			Yes		

5	III/V	Theory:			
		1. Numerical Methods U20BST547			Yes
		2. Analytical Instrumentation U20ICT510		Analytical Instrumentation U23ICT607	
		3. Embedded System Design U20ICT511		Embedded Systems Design U23ECTC02	
		4. Industrial Instrumentation - I U20ICT512		Industrial Instrumentation - I U23ICT506	
		Professional Elective:			
1. Telemetry and Telecontrol U20ICE506		Wireless Instrumentation U23ICE509			
2. Non-Linear control system		Non-Linear control systems U23ICE611			

		U20ICE507			
		3. Industrial Electronics U20ICE508			Yes
		4. MEMS and NEMS U20ICE509		MEMS and Nano Technology U23ICE507	
6	III/VI	5. Industrial Unit Operations U20ICE510		Industrial Unit Operations U23ICE506	
		Theory:			
		1. Medical Instrumentation U20ICT613		Instrumentation in Biomedical Applications U23ICT711	
		2. Industrial Instrumentation - II U20ICT614		Industrial Instrumentation - II U23ICT608	
		3. Internet of Things U20ECCM04		Internet of Things for Automation U23ICB603	
		4. Process Control U20ICT616		Process Control U23ICT609	
		Professional Elective:			
		1. Soft Computing U20BMCM01		Soft Computing Techniques U23ICEC02	
		2. Virtual Instrumentation U20ICCM02		Virtual Instrumentation U23ICEC01	
		3. Robotics and Automation U20ECCM02		Intelligent Robotic Systems U23ICEC03	
		4. Renewable Energy Sources U20EECM01		Energy Harvesting Techniques U23ICE505	
		5. Digital Control System U20ICE615			Yes
		Open Elective:			
		1. Fuzzy logic and neural networks U20ICCM01		Fuzzy Logic and Neural Networks U23ICOC03	
2. Measurement and Instrumentation U20ICO504			Yes		
7	IV/VII	Theory:			
		1. Computer Control of Processes U20ICT717		Computer Control of Processes U23ICT710	
		2. Process Automation U20ICT718		Process Automation U23ICT712	
		Professional Elective:			
		1. Power Plant Instrumentation U20ICE716		Power Plant Instrumentation U23ICE612	
		2. Automotive Instrumentation System U20ICE717		Automotive Instrumentation and Control U23ICE714	
		3. Industry 4.0 U20ICE718		Instrumentation for Industry 4.0 U23ICOC02	
		4. Modern Electronic Instrumentation U20ICE719			Yes
5. Fiber Optics and Laser		Fiber Optics and Laser			

		Instrumentation U20ICE720		Instrumentation U23ICE715		
		Open Elective:				
		1. Industrial Automation U20ICO705		Industrial Automation U23ICOC04		
		2. Ultrasonic Instrumentation U20ICO706			Yes	
8	IV / VIII	Theory:				
		1. Instrumentation in Process Industries U20ICT819		Instrumentation in Process Industries U23ICE823		
		Professional Elective:				
		1. Industrial Safety U20ICE821		Safety in Process Industries U23ICE825		
		2. System Identification and Adaptive Control U20ICE822				
		3. Advanced Instrumentation System U20ICE823				Yes
		4. Industrial Data Networks U20ICE824		Industrial Data Networks U23ICE610		
		5. Field Instrumentation and Cabling U20ICE825				Yes
		6. Design of Process Control System Components U20ICE826		Design of Process Control System Components U23ICE818		
		7. Web Based Instrumentation U20ICE827				Yes
		8. Instrumentation for Agricultural and Food Processing Industries U20ICE828		Instrumentation in Agriculture and Food Processing Industries U23ICE819		
		9. Cyber Security in Industrial Automation U20ICE829				Yes
10. Safety Instrumented System U20ICE830				Yes		