DR. AMBEDKAR INSTITUTE OF TECHNOLOGY, BENGALURU

Department of Electronics and Instrumentation Engineering

SEVENTH AND EIGTH SEMESTER

SCHEME AND SYLKLABUS-CBCS-2022-2023 REGULATION

Academic Year 2025-26

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System
B.E. Electronics and Instrumentation Engineering
Tentative Scheme of Teaching and Examination effective from the Academic Year 2025-26 (2022 Scheme)

VII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self Study	Duration hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22EIU701	IOT & Wireless Sensor Networks	EIE	3	0	2		03	50	50	100	4
2	IPCC	22EIU702	VLSI Design	EIE	3	0	2		03	50	50	100	4
3	PCC	22EIT703	Industrial Data Communication and DCS	EIE	4	0	0		03	50	50	100	4
4	PEC	22EIT704x	Professional Elective Course	EIE	3	0	0		03	50	50	100	3
5	OEC	22EIT705x	Open Elective Course - 2	EIE	3	0	0		01	50	50	100	3
6	PROJ	22EIP706	Major Project Phase-II	EIE	0	0	12		03	100	100	200	6
					16	0	16	--		350	350	700	24

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:** Lecture, **T**: Tutorial, **P**: Practical S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Professional Elective Course 22XXT704x			
22EIT704A	Multimedia Communication	**22EIT704C**	Augmented Reality and Virtual Reality
22EIT704B	IoT in healthcare	**22EIT704D**	Artificial Intelligence in Industrial Applications
Open Elective Course 22XXT705x			
22EIT705A	Aircraft Instrumentation	**22EIT705C**	
22EIT705B	Sensors and Actuators	**22EIT705D**	

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI semester**.**

(2)Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether the VII or VIII semesters is completed during the beginning of the IV year or the later part of IV years of the program.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of Engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they canopt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under theguidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

PROJECT WORK (21XXP75): The objective of the Project work is

(i) To encourage independent learning and the innovative attitude of the students.

(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.

(iii) To impart flexibility and adaptability.

(iv) To inspire team working.

(v) To expand intellectual capacity, credibility, judgment and intuition.

(vi) To adhere to punctuality, setting and meeting deadlines. To install responsibilities to oneself and others.

(vii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

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Outcome Based Education(OBE) and Choice Based Credit System
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VIII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	22EIT801x	Professional Elective (Online Courses)	EIE	3	0	0		-	50	50	100	3
2	OEC	22EIT802x	Open Elective (Online Courses) - 3	EIE	3	0	0		-	50	50	100	3
3	INT	22EII803	Internship (Industry/Research) (14 - 20 Weeks)	EIE	0	0	12		03	100	100	200	10
					6	0	12			200	200	400	16

L: Lecture, **T**: Tutorial, **P**: Practical S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work, **INT**: Industry Internship / Research Internship / Rural Internship.

Professional Elective Course (Online courses) 22XXT801x			
22EIT801A	Laser and Optical Instrumentation	**22EIT801C**	Neural Network
22EIT801B	Power Plant Instrumentation	**22EIT801D**	Factory Automation
Open Elective Courses (Online Courses) 22XXT802x			
22EIT802A	Instrumentation and Measurement Techniques	**22EIT802C**	
22EIT802B	Laser and Optical Instrumentation	**22EIT802D**	

Note: VII and VIII semesters of IV years of the program Swapping Facility

- Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate **research internships/ industry internships/Rural Internship** after the VI semester**.**
- Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or

VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester **Research Internship /Industrial Internship / Rural Internship** shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize,appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship.The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship.

- With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their home town (**within or outside the state or abroad**), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide.
  University/Institute shall not bear any cost involved in carrying out the internship by students. However, students can receive any financial assistance extended by the organization

Course Title	**IoT and Wireless Sensor Networks**						
Course Code	**22EIU701**						
Category	Integrated Professional Core Course **(IPCC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	02	00	05	40+12	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

The objective of the course is to:

1. Understanding the need for migrating towards software defined networks andintegrating time series data from wireless sensor networks.
2. Know about communication protocols, Hardware platforms and operating systemscommonly used in IoT systems.
3. Describe different modules in a wireless sensor node and design of wireless sensornetworks for different applications

Module No	Syllabus	No of Teaching hours
1	**Overview of Internet of Things:** Introduction to Internet of Things Introduction-Definition & Characteristics of IoT, IoTConceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Difference between IoT and M2M, Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway.	8
2	**Architecture and Design Principles for IoT:** Internet connectivity, Internet-based communication, IP Addressing in the IoT,Application layer protocols: HTTP, HTTPS, FTP, TELNET and ports. **Data Collection, Storage and Computing using a Cloud Platform:** Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud- based data collection, storage and computing	8
3	**Prototyping and Embedded device for IoT and M2M:** Embedded computing basics, Embedded platforms for prototyping, Things always connected to Internet/cloud. Programming embedded device Arduino platform using IDE, Programming for Arduino controlled traffic-control lights (TLs) at a road junction. **IoT applications:** for Smart homes, cities, environment-monitoring and agriculture.	8

4	**Overview and Architectures of Wireless Sensor Networks:** Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components, Operating systems and execution environments, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts	9
5	**Communication Protocols:** MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols -CSMA, Schedule based protocols -LEACH. **WSN Applications:** Home Control, Building Automation, Industrial Automation, Medical Application.	7

Practical Component

Sl. No	Experiment
1.	Exploring the in-built features of Arduino UNO and ESP32
2.	Introduction to Arduino platform and programming using Arduino UNO and Node MCU. i) Control the ON/OFF of LED using switch ii) Indicate the LED status on serial monitor
3.	Implement a counter on a seven segment display
4.	Precise control of angular position of a servo motor interfaced to Arduino/Node MCU. Study of serial communication and device control using serial communication with Arduino
5.	Interfacing DHT11 temperature sensors to Arduino/Node MCU to measure temperature and humidity and display on the serial monitor.
6.	Interrupt in Arduino
7.	Data transmission between node MCU and remote server
8.	Introduction to Raspberry PI platform and python programming: i) Blinking of LED to GPIO pin ii) Interfacing an LED and switch
9.	Interfacing ultrasonic sensors to Raspberry Pi to measure distance.
10.	Python Program to vary the intensity of the LED By varying the PWM Value
11.	Update the sensor data or control devices using cloud platform for visualization
12.	Write a python program to implement an auto cooling system using Arduino platform

13.	Establish Communication between Arduino and Raspberri Pi
14.	Programming for Arduino controlled traffic-control lights (TLs) at a road junction

Course outcome:
After successful completion of the course the student is able to:

Sl.No	Description	Description Bloom's Taxonomy Level
1.	Understand basic concepts of IoT Infrastructure, principles and challenges in IoT and various network scenarios of wireless sensor networks	Knowledge, Understand (Level 1, Level 2)
2.	Apply network communication aspects and protocols used in IoT and wireless sensor networks	Knowledge, Analyze (Level 1, Level 4)
3.	Examine the functioning of hardware devices and sensors used for IoT.	Knowledge, Understand (Level 1, Level 2)
4.	Evaluate simple applications using Ardunio and Python programming	Knowledge, Analyze (Level 1, Level 4)

CO-PO MAPPING															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	-	1	3	1	1
CO2	3	2	2	1	1	-	-	-	-	-	-	1	3	2	2
CO3	2	2	3	2	2	-	-	-	1	-	-	2	3	2	2
CO4	2	2	2	2	2	-	-	-	1	-	-	1	3	2	3

Text Books:

1. "Internet of Things-Architecture and design principles", Raj Kamal, McGraw HillEducation, 2017 ISBN-13: 978-93-5260-522-4.
2. "Protocols and Architectures for Wireless SensorNetwork", Holger Kerl, Andreas Willig, JohnWiley and Sons, 2005 ISBN-13 978-0-470-09510-2

Reference Books:

1. "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, , 1st Edition, AcademicPress, 2014.
2. "Internet of Things (A Hands-on Approach)", Vijay Madisetti and Arshdeep Bahga, , 1st Edition, VPT, 2014
3. "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",Francis daCosta, 1st Edition, A press Publications, 2013

NPTEL Swayam :
https://onlinecourses.nptel.ac.in/noc19_cs65/preview
https://onlinecourses.swayam2.ac.in/ntr24_ed01/preview

Course Title	**VLSI Design**						
Course Code	**22EIU702**						
Category	Integrated Professional Core Course **(IPCC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	02	00	05	40+12	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course objectives:

1. Explain VLSI design flow and Need, Advantages & Applications of VLSI technology.
2. Familiarize the performance and design CMOS schematic analysis models, including logic components and their interconnect
3. Understand the combinational, sequential logic, functional units and semiconductor memory cells at the transistor level,
4. Understand low power concept, the need for testing and verification of VLSI chip,
5. Understand the VLSI device architecture.

Module No.	**Syllabus**	**No of Teaching hours**
1	**Introduction:** Overview of VLSI design methodologies-VLSI design flow-Design Hierarchy- concepts of regularity, modularity, and locality, Design quality, computer aided design technology. **CMOS transistor fabrication**: CMOS Fabrication, **CMOS Inverter:** DC Characteristics, Beta Ratio Effect, Noise Margin**.**	8
2	**CMOS Gates: N**AND Gate, The NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristate stick diagram and layout-lambda based rules for CMOS (example: CMOS-NOT, NAND and NOR gate). **Delay:** RC Delay Model, Linear Delay Model, Logical Efforts of Paths.	8
3	**Combinational and sequential logic circuits:** Adders-1 bit adder, carry lookahead adder, Manchester carry adder, carry select adder, comparator, Parallel multiplier. Behavior of Bistable Elements, SR Latch Circuit, Clocked Latch and Flipflop Circuits.	8
4	**Semiconductor memories**: equivalent circuits of memory cells, DRAM cells – configurations, three-transistor and one-transistor, flash memory, ferroelectric Random-access memory. **Low power VLSI chips**: charging and discharging capacitance, short circuit current in CMOS leakage current, static current, basic principles of low power design, low power figure of merits.	8
5	**Testing and Verification:** Introduction, Logic Verification, Logic Verification Principles, Manufacturing Test Principles, Design for testability. **VLSI Design Styles**: The concept of programmable Logic Devices, SPLDs, PAL devices, PLA devices, GAL devices, CPLD-Architecture**, FPGAs-FPGA technology**, architecture, vertex CLB and slice, FPGA Programming Technologies, Xilinx XC2000, XC3000, XC4000 Architectures,	8

Practical Component

Sl. No	Experiments
PART A - Digital Circuit Design	
Write Verilog Code for the following circuits and their Test Bench for verification, observe the waveform and synthesize the code using suitable simulation software (Xilinx/Cadence Tool) with FPGA Kit , demonstrate the operation of the following circuits.	
1	Basic/universal gates
2	Transmission Gate
3	Flip flop -SR, D, JK, T
4	Full/half Adder & Subtractor
5	4:1 Multiplexer and Demultiplexer
6	
PART B – Analog Circuit Design Experiments can be conducted using Cadence tool	
Design and draw the schematic of following CMOS Circuits and verify the i) DC Analysis ii) Transient Analysis,	
7	Inverter
8	NAND Gate
9	NOR gate
Draw the Layout and verify the DRC and LVS and verify the Design.	
10	Inverter layout
11	NAND Layout
12	NOR Layout
13	Design the schematic circuit of CMOS-CS amplifier and verify the i) DC Analysis ii) Transient Analysis, implement the Layout and verify the DRC and LVS and verify the Design.

Course outcome:

After successful completion of the course the student is able to:

Sl.No	Description	Description Bloom's Taxonomy Level
1.	Explain the VLSI design flow, and its Methodology.	Knowledge, Understand (Level 1, Level 2)
2.	Illustrate the CMOS transistor characteristics and fabrication process,	Understand (Level 2)
3.	Design and implement the CMOS transistors,Schematic models, layout design.	Understand, Apply, Analyze (Level 2, Level 3, Level 4)
4.	Design and implement combinational, sequential logic, memory cells at the transistor level and verify the functionality.	Understand, Apply, Analyze (Level 2, Level 3, Level 4)
5.	Explain the architecture of VLSI Devices.	Knowledge, Understand (Level 1, Level 2)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	1	1												2
CO2	3	1	1									1			
CO3	2	3	3	2	3	2						2	2	2	3
CO4	2	3	2	2	3							2	2	2	3
CO5	3		3	2	3							`2	2	1	3

Low-1 Medium-2 High-3

TEXT BOOK

1. "CMOS Digital Integrated Circuits: Analysis and Design", Sung Mo Kang &Yosuf Lederabic Law, McGraw-Hill (Third Edition),2003
2. "Principles of CMOS VLSI Design: A System Perspective", Neil Weste and K. Eshragian, 3rd edition, Pearson Education (Asia) Pvt. Ltd., 2005.
3. "CMOS VLSI Design: A Circuits and Systems Perspective", David Money, Weste, Neil H. E Pearson/Addison-Wesley ,3rd Edition,2005.

REFERENCE BOOKS:

1. "Basic VLSI Design: System and circuits", Douglas A Pucknell & Kamran Eshragian PHI 3rd Edition, 2011. (originalEdition – 1994)
2. "Digital Systems Design Using VHDL", Charles H. Roth, The University of Texas at Austin Lizy Kurian John the University of Texas at Austin.
3. "Digital Integrated Circuits: A design perspective" Jan M Rabaey, PHI Pvt.Ltd, 2nd Edition 2009.
4. Charles Roth Jr.H., "Fundamentals of Logic Design", Australia cengage learning,2014,7th edition.
5. Samir Palnitkar, "Verilog HDL-A guide to Digital Design and synthesis second edition Pearson", Education in South Asia 2013.

Course Title	**Industrial Data Communication and DCS**						
Course Code	**22EIU703**						
Category	Professional Core Course **(PCC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	04	00	00	00	04	52	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

The objective of the course is to:

1. Understand the role of standards, protocols and principles of communication standards.
2. Understand the principles of communication systems for industrial applications
3. Provide basic knowledge on architecture and components of DCS
4. Provide knowledge on different algorithms and applications in DCS
5. Provide knowledge on state of arts and future trends in DCS

Module No.	**Syllabus**	**No of Teaching hours**
1	**Introduction:** OSI model, Communication principles Standards – Protocols – Network Models:- OSI Model – TCP/IP Model – Network Types Network Topologies – Network Devices – Ethernet Standards **Serial communication standards**: Balanced and unbalanced transmission lines, RS232 interface standard functional description, RS-485 standard, GPIB: Physical configuration, electrical and mechanical characteristics and bus structure, USB topology: Host hub, connectors, cables, external hubs, USB devices	10
2	**Industrial protocols:** Protocol Definition, CAN bus, Device Net, MODBUS **HART Protocol:** HART, Physical layer, Data link Layer, Application Layer	10
3	**Industrial protocols:** Foundation field bus, Ethernet topology **PROFIBUS:** Architecture, OSI-model, PROFIBUS types – PA, DP & FMS and their comparison, Designing PROFIBUS, Network design, Advantages and Applications of PROFIBUS in industries	10
4	**Distributed Computer Control System Architecture:** DCS Architecture, functional levels, data base organization, system implementation concepts, human interface, computer integrated processing **System Elements**: Field stations, intermediate stations, central computer station, monitoring and command facilities **Software:** Real time operating system, communication software, application	10

	software, software configuration and parameterization.	
5	**Modern DC's systems:** CENTUM Networking, Components, Redundancy and reliability, Instrument Asset management systems,(IAMS), CENTUM VP, Honey well System Architecture in DCS, Process control hardware, Siemens PCS 7 systems, SIMATIC PCS 7 AX RTX with software control systems, Modular Automation systems. **Applications:** Plant automation Hierarchy**,** power plants, chemical plants, DCCS application in cement plants, DCCS application in water industry and water waste treatment, oil and gas fields.	10

Course outcome:

After successful completion of the course the student is able to:

1. Examine the importance of OSI, serial communication standards.
2. Demonstrate different protocols used in industry
3. Apply the different Ethernet topologies in industries.
4. Identify the components of DCS
5. Apply and Analyse the different algorithms used in DCS 6. Implement different applications and the future trends in DCS

CO-PO MAPPING												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	1	-	2	1	-	-	1	3	2	2
CO2	2	1	1	-	2	1	-	-	1	2	2	2
CO3	2	1	1	-	1	1	-	-	1	1	2	2
CO4	3	2	2	2	2	1	-	-	2	1	2	2
CO5	3	2	3	2	2	2	-	-	1	1	2	2

Low-1 Medium-2 High-3

Text Books:

1. **Practical Data Communications for Instrumentation and Control.** John Park, Steve Mackay, Edwin Wright 1st Edition 2003
2. **Distributed computer control for industrial automation** popovic and bhatkar Publication by Marcel Dekker, Inc. New York, NY, USA ©1990

Reference Books:

1. **Process software and digital networks** Bela G Liptak, 3rd edition, 2002.
2. **Computer Networks** Andrew S. Tanenbaum, , 4th Edition, PHI/Pearson Education. 2002.
3. **Data Communications and Networking** Behrouz A. Forouzan, , 2nd update Edition, Tata McGraw Hill Publishing Company, New Delhi, 2000.
4. **Modern Distributed control Systems ,** Dr. Moustafa Elshafei 2nd update Edition 2000
5. **Computer control of processes** - M.Chidambaram, Narosa publishing, Reprint 2010
6. **Data Communications and Networking** Behrouz A. Forouzan, , 2nd update Edition, Tata McGraw Hill Publishing Company, New Delhi, 2000.
7. **Understanding Distributed Processor Systems for Control.** Samuel M. Herb ISA Publication, 1999
8. **Computer control of processes** - M.Chidambaram, Narosa publishing, Reprint 2010

Course Title	Multimedia Communication						
Course Code	**22EIT704A**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

The objective of the course is to:

1. To study the different types of Media and their representation in different forms.
2. To apply the different compression techniques for Text and image with examples.
3. To apply the different compression techniques for Audio and Video.
4. To analyze the various Routing algorithms.
5. To analyze the network architecture and transport protocols

Module No.	Syllabus	No of Teaching hours
1	**multimedia communications:** Introduction, multimedia information representation, multimedia networks, multimedia applications, communication modes, network types, multipoint conferencing, network QoS, Application QoS. Digitization Principles,	8
2	**Text:** unformatted text, formatted text, hyper text**, Image:** Graphics, Digitized documents, **Text and Image Compression:** compression principles, text compression – Arithmetic coding, Lempel-ziv and Welsh coding, Image compression-GIFF, TIFF, Digitized documents and Pictures, JPEG.	8
3	**Audio compression:** Introduction, audio compression, LPC, Code excited LPC, Perceptual coding, MPEG Audio coders, Dolby Audio coders. **Video compression**: Video compression principles, H.261, MPEG, MPEG-1, MPEG-2, and MPEG-4.	8
4	**The Internet**: IP addresses, ARP, RARP, Routing Algorithms -Flooding, Distance vector Routing, Link State &Hierarchical Routing, Broadcast Routing, Multicast Routing.	8
5	**Broadband ATM Networks:** Cell format and Switching principles, Switching architectures, Protocol architectures. **Transport Protocols**: TCP: Protocol operation-Segment format, connection establishment, Data transfer, error control, flow control, connection termination, UDP: User services, protocol operation ,RTP and RTCP.	8

Course outcome:

After successful completion of the course the student is able to:

Sl.No.	Description	Bloom's Taxonomy Level
1.	Understand types of Multimedia networks, applications and QoS.	Knowledge, Understand (Level 1,Level 2)
2.	Illustrate representation of the information of text, images, audio and video.	Knowledge, Understand (Level 1,Level 2)
3.	Apply the different techniques and standards of text, image, Audio and Video compression.	Understand, Apply (Level 2,Level 3)
4.	Analyze the various Routing algorithms.	Analyze (Level 4)
5.	Study the Broadband Architectures and analyze Transport Protocols.	Analyze (Level 4)

CO-PO MAPPING															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3					1						1			1
CO2	3	2				1						1			2
CO3	3	2	2			1						1			2
CO4	3	2	2	2		2						1			2
CO5	3	2	2	2		2						1			2

Low-1 Medium-2 High-3

Text Books:

1. Multimedia Communications: Applications, Networks, Protocols, and Standards – Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

ReferenceBooks:

1. Multimedia Information Networking–, Nalin K. Sharda, PHI, 2003.
2. Multimedia Fundamentals: Vol 1-Media Coding and Content Processing– RalfSteinmetz,KlaraNarstedt,PearsonEducation,2004.

Course Title	IoT in healthcare						
Course Code	**22EIT704B**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

The objective of the course is to:

1. Understand basic concepts, of Internet of Things.
2. Provide exposure to routing protocols used in medical IoT devices
3. To comprehend on applications of IoT Iin the field of healthcare

Module No.	Syllabus	No of Teaching hours
1	IoT definition and applications, IoT System Architectures Basic building blocks of IoT architecture, Introduction Protocols Concepts, IoT-Oriented Protocols IoT - integrated state-of-the-art assistive technology, IoT applications for people who are deaf/hearing impaired, blind/visually impaired, and mobility disability.	8
2	Smart Sensors, Self-Powered sensors, Nano-technology sensors, Issues of the IoT-based assistive technology for people with disabilities. IoT for ambient assisted living: Introduction, system design, general architecture, wearable devices, experimental evaluation, functional list, operation list, and results.	8
3	Hybrid integration system for wearable sensor system- Introduction, State-of-the-art of current health care wearable system (WHCS), a desirable WHCS, customized IC for wearable sensors. Hybrid integration system for wearable sensor system: Printed electrodes and their characteristics, electrode technology, active electrode, passive electrode, dry electrode.	9
4	Hybrid integration of flexible wearable sensors: flexible circuits and interconnection, silicon on flex bio-patch implementation and miniaturization Role of time in IoT: Introduction, Blood flow analysis, circulation diagnosis, flow quantification, synchronization in space, blood pressure, health things-single device, distinct times, multiple device-single time, redundant device, tolerance, data reliability	9

5	Work process of IoT for Healthcare, Advantages of IoT-enabled healthcare system, Challenges in IoT-enabled healthcare application-Infrastructural challenges, security challenges	6

Course outcome:

After successful completion of the course the student is able to:

Sl.No	Description	Description Bloom's Taxonomy Level
5.	Understand the basic architecture and associated protocols with respect to healthcare	Knowledge, Understand (Level 1, Level 2)
6.	Apply different electrical/electronic measurements and instruments in smart healthcare	Knowledge, Apply (Level 1, Level 3)
7.	Analyse the role of an IoT system to assist disabled person	Knowledge, Analyze (Level 1, Level 4)
8.	Examine the assistance of IoT in healthcare with various real world scenarios	Knowledge, Analyze (Level 1, Level 4)

CO-PO MAPPING															
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	1	1	-	1	-	-	-	-	-	-	1	2	-	1
CO2	3	2	2	1	1	-	-	-	-	-	-	1	3	2	1
CO3	2	2	3	2	2	-	-	-	1	-	-	2	2	2	2
CO4	2	2	2	2	2	-	-	-	1	-	-	1	2	1	1

Low-1 Medium-2 High-3

Text Books:

1. IoT and advanced applications in health care, Catarina Reiss, Marisa da silva maximiano, IGI Global
medical information science reference, ISBN: 2237-9354.,2017.

Reference Books:

1. Internet-of-Things (IoT)Systems Architectures, Algorithms, Methodologies, Dimitrios Serpanos, Marilyn Wolf ,ISBN 978-3-319-69714-7 © Springer International Publishing AG 2018.

Course Title	Augmented Reality and Virtual Reality						
Course Code	**22EIT704C**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives

1. To provide foundational knowledge of Augmented Reality and Virtual Reality, including their history, key characteristics, and technological evolution.
2. To understand and evaluate the core components, hardware, and software tools used in the development and deployment of AR and VR applications.
3. To develop competency in integrating AR/VR technologies into practical environments such as education, healthcare, smart cities, and industry.
4. To explore and apply AR/VR development platforms, input/output devices, and design principles for creating immersive experiences.

Module No	Topics	No. of Teaching Hours
1	**Introduction to Augmented Reality**: History of AR - Augmented reality characteristics – Difference between Augmented Reality and Virtual Reality – AR technological components – Technologies used in AR– Feature Extraction – Hardware components – AR devices – Importance of AR - Real world uses of AR – AR types – Software tools available for AR **Need of technologies for Augmented Reality:** Hardware technology – virtual scenes – 3D objects – AR components – Display – HMD – Eyeglasses Contact Lenses	8
2	**Technology Integration and Implementation of AR:** Technology use and integration in industrial settings – Assistive training to faculty members – Planning and administration for implementation – AR implications – Practical data – AR labs – Platforms to form AR content – Coordinated utilization of AR applications.	8
3	**Tools and Applications of Augmented Reality:** Tools available for Augmented Reality and Recognition – Software Tools – Google Poly. **Applications**: AR business applications – weather prediction – market prediction – smart cities - AR application for Education - AR application for healthcare sector.	8
4	**Introduction to Virtual Reality:** What is Virtual Reality? A history of VR, an overview of various realities, The, Early Commercial VR Technology. VR becomes an industry, Five classical Components of VR. Immersion, Presence and Reality Trade-offs, The Basic design guidelines.	8

5	**Input Devices: Trackers, Navigation and Gesture interfaces.** **Output Devices:** Graphics, three-dimensional sound and Haptic Display. Computing Architecture for VR, Modeling. VR Applications	**8**

Course outcome:

At the end of the course, Students can able to

Sl.No.	Description	Bloom's Taxonomy Level
1.	Differentiate between AR and VR systems based on features, components, and user experiences.	Understand (Level 2)
2.	Identify and describe the hardware and software technologies that support AR/VR development including display systems, sensors, and modeling tools.	Remember, Understand (Level 1, Level 2)
3.	Apply AR/VR tools to design, create and test interactive content for real-world applications across various domains.	Apply (Level 3)
4.	Analyze the integration and implementation challenges of AR/VR systems in industrial and educational settings and propose suitable solutions.	Analyze (Level 4)

MAPPING of COs with POs

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**1**
Co2	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
Co3	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**3**	**3**
Co4	**2**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**

Text Book:

1. Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications. https://doi.org/10.1201/9781003175896
2. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press, ISBN: 9780471360896
3. "The VR Book" Human centered design for Virtual Reality by Jason Jerald, First Edition Series ISSN: 2374-6769

Reference Books:

1. Reference Books: 1. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson, ISBN: 9789332578494
2. Craig, A. B., (2013), "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, ISBN: 978024082408
3. Alan B. Craig, "Understanding Augmented Reality", Concepts and Applications, Morgan Kaufmann,1st Edition, 2013 ISBN: 9780240824086

Online sources:

1. NPTEL Course https://onlinecourses.swayam2.ac.in/ntr24_ed76/preview
2. MOOC Courses:
   https://www.coursera.org/learn/ar
   https://www.udemy.com/share/101XPi/

https://www.udemy.com/course/augmented-reality-in-depth-101-by-debayandey-

Course Title	**Artificial Intelligence in Industrial Applications**						
Course Code	**22EIT704D**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

The objective of this course is to make the graduates to:

1. Understand the concepts, logic, and programming techniques of Artificial Intelligence.
2. Apply problem-solving methods using AI search strategies, knowledge representation, and reasoning techniques.
3. Apply AI Learning techniques in industrial automation.

Unit No	Syllabus	No of Teaching hours
1	**Introduction to Artificial Intelligence:** Foundations and history of AI. Intelligent agents: agents and environments, the concept of rationality, nature of the environment, structure of agents.	08 Hours
2	**Problem Solving Agents:** Formulating a problem, Toy problem, 8-puzzle, uninformed search strategies, Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Bidirectional search, Comparing uninformed search strategies.	08 Hours
3	**Knowledge Reasoning and planning**: Logical agents, Propositional logic, Forward and backward chaining, Local search algorithms, ontological engineering, categories and objects, events, reasoning system for categories, default information, the internet shopping world.	08 Hours
4	**Introduction to Industrial AI:** The beginning of Industrial AI, the purpose and value of Industrial AI, Technical elements of industrial AI: Data, Analytics, Platform, Operations, and human machine technology, Difference between Industrial AI and AI, Challenges of AI in Industry: Reproducibility, Data issues, Reliability, Safety/Security.	08 Hours
5	**Industrial AI Algorithms:** Selection and Applications, Categories of Algorithms: Regression Algorithm, Classification Algorithm, Clustering algorithm, Statistical Algorithm. **Industrial AI Applications:** Predictive maintenance of equipment, Virtual metrology and process quality control, Defective detection and material sorting, intelligent monitoring and maintenance platform for CNC machines. Large language models (LLMs) capabilities and potential applications, LLMs in production, Prompt engineering.	08 Hours

Course outcome:

After successful completion of the course the student is able to

Sl.no	Description	Description Bloom's Taxonomy Level
CO1	Understand AI fundamentals, intelligent agents, and basic AI programming.	Knowledge,Understand (Level 1, Level 2)
CO2	Apply AI techniques like heuristic search, logic-based reasoning, and problem solving to industrial use cases.	Knowledge, Apply (Level 1, Level 3)
CO3	Apply AI, ML, and DL concepts in developing industrial automation solutions.	Knowledge, Apply (Level 1, Level 3)

Mapping od Cos with Pos

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	3	2	2	2	2						1	2	2	1	1
Co2	1	2	2	1	3						2	2	2	2	2
Co3	2	2	2	1	3						2	2	2	2	2

Low-1 Medium-2 High-3

Text Books

1. Rich and Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2014.
2. Jay Lee, Industrial AI: Applications with Sustainable Performance, 1st edition, Springer, 2020.
3. Dirafzoon, A., "LLMs System Design and Applications (Draft 1)", Self-published via GitHub, 2024. https://github.com/alirezadir/LLM-book-2024.

Reference Books

1. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning by James V Stone, Sebtel Press, 2019.
2. Artificial Intelligence by Example: Acquire advanced AI, machine learning, and deep learning design skills by Denis Rothman, 2nd Edition, 2020.
3. M.P.Groover, Automation, Production Systems and Computer Integrated Manufacturing, 5th edition, Pearson Education, 2009.

Course Title	Aircraft Instrumentation						
Course Code	**22EIT705A**						
Category	Open Elective Course **(OEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives

Sl.No.	Description
1.	Understand the Instrument display and Cockpit layout
2.	Understand the Operation of Flight instruments
3.	Study the characteristics of Gyroscopic Instruments
4.	Understand the operation of engine instruments and data recording system.

Module No	Syllabus	No. of Teaching Hours
1	**AIRCRAFT INSTRUMENTS**: Introduction-Qualitative and quantitative displays, basic T grouping of instruments, basics of Attitude Director Indicator(ADI) & Horizontal Situation Indicator, glass cockpit. **AIR DATA INSTRUMENTS**: Types of Air Data Instruments:-Pneumatic type and Air data computers, International Standard Atmosphere (ISA). Combined pitot and static probe, separate static ports. Pneumatic -type Air Data Instruments: Air speed indicator, altimeter and Vertical Speed Indicator and Instantaneous vertical speed indicator	**8**
2	**AIR DATA WARNING SYSTEM**: Mach warning system, altitude alerts system, airspeed warning system. Directional Systems: Earth's total magnetic field, horizontal and vertical components of total field, direct reading compass and its limitations, fluxgate detector units .	**8**
3	**GYROSCOPIC AND ADVANCED FLIGHT INSTRUMENTS**: Gyro scope and its properties, gyro system, Types of gyros-Conventional Mechanical, Ring laser gyros, Fiber optic gyros, basic mechanical gyro and its properties, Gyro horizon, Advanced direction indicator, Turn and bank indicator.	**8**
4	**ENGINE INSTRUMENTS**: Introduction, Engine Speed measurement- Electrical Tacho Generator, Optical Tachnometer, Hall Effect sensor, torque measurement- Hydro mechanical Transducer, Electronic Torque Meter, Pressure measurement	**8**
5	**ENGINE FUEL INDICATORS**: Fuel quantity indicator(FQI)- volumetric FQI,Fuel flow rate Indicator- Rotating vane flowmeter, Integrated flow meter. **FLIGHT DATA RECORDING**: Cockpit Voice Recorder, Flight Data Recorder, future developments	**8**

Course outcome:

Sl.No.	Description	Bloom's Taxonomy Level
6.	Develop basic knowledge on the behavior and the characteristics of various indicators in aircraft	Knowledge, Understand (Level 1,Level 2)
7.	Acquire knowledge on the aircraft computer systems	Knowledge, Understand (Level 1,Level 2)
8.	Identify the different types of aircraft instruments and their operation	Knowledge, Understand (Level 1,Level 2)
9.	Illustrate the performance of aircraft instruments in functionality of Aircraft System	Understand, Illustrate(Level 2)

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	**3**	**2**										**1**	**2**	**1**	**1**
Co2	**2**	**3**										**1**	**2**	**1**	**2**
Co3	**2**	**2**										**2**	**2**	**1**	**3**
Co4	**2**	**1**										**1**	**2**	**1**	**2**

Text Book:

1. Aircraft Instrumentation and Systems- S.Nagabhushana, L.K Sudha, I.K.International Publishing House Pvt.Ltd. 2013.

Reference Books:

1. Aircraft digital electronic and computer systems - Michael H. Tooley, second edition, Taylor & Francis Group, 2022
2. Design and development of aircraft systems - Seabridge, Allan G, 3rd edition, Wiley; 3rd edition ,2020
3. Aircraft Instruments and Integrated Systems- EHJ Pallet, Longman Scientific & Technical, McGraw-Hill, 3rd edition,1992.

Course Title	**Sensors and Actuators**						
Course Code	**22EIT705B**						
Category	Open Elective Course **(OEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives: The objective of the course is to:

1. Impart the principles and working modes of various types of Resistive, Inductive, Capacitive, Piezoelectric and Special transducers.
2. Give an idea about the applications of various transducers and selection criteria of a transducer for a particular application.
3. Give an insight into the static and dynamic characteristics of different orders of instruments.
4. Explain the working principles and functions of different actuating systems

Module No	Syllabus	No. of teaching Hours
1	**Introduction to sensors and Application:** its significance and scope in the current scenario. Industrial applications, research and innovations related to sensors. **Transducers**: Definition of a transducer, Block Diagram, Active and Passive Transducers, Advantages of Electrical transducers. Resistive Transducers: Potentiometers: Characteristics, Loading effect, and problems. Strain gauge: Theory, Types, applications and problems. Thermistor, RTD: Theory, Applications and Problems.	8
2	**Sensor Systems:** Measurement of thermocouple output, compensating circuits, lead compensation, advantages and disadvantages of thermocouple. LVDT: Characteristics, Practical applications and problems. Capacitive Transducers: Capacitive transducers using change in area of plates, distance between plates and change of dielectric constants, Applications of Capacitive Transducers and problems.	8
3	**Piezoelectric Sensor Systems:** Principles of operation, expression for output voltage, Piezo-electric materials, equivalent circuit, loading effect, and Problems. **Smart, MEMS, and Nano Sensors:** Thin film sensors, and smart transducers: Principles and applications, Introduction to MEMS Sensors and Nano Sensors, Schematic of the design of sensor, applications.	8
4	**Sensors in Different Application Area:** Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration, Proximity Sensors, Ultrasonic and Infrared Sensors for Distance and Motion Detection, Fluid Level Sensors	8

5	**Actuators:** Pneumatic Hydraulic system: Control valves, cylinder, rotary actuators, Mechanical actuating system: Types of Motion, Kinematics chains, Cams, Gear trains, Belts and chain drives, Electrical actuating systems: Solid-state switches, Solenoids, D.C. motors, AC motors, Stepper motors, Piezoelectric actuator, micro-actuators.	**8**

Course Outcome

At the end of the course, Students can able to

Sl.No.	Description	Bloom's Taxonomy Level
5.	Remember and understand the basic principles of transducers and smart sensors.	Remember, Understand (Level 1, Level 2)
6.	Apply the knowledge of transducers and sensors to comprehend digital instrumentation systems.	Apply (Level 3)
7.	Analyze performance of different sensors for various applications.	Analyze (Level 4)
8.	Identify and analyze different types of actuators and motion systems	Analyze (Level 4)

CO-PO Mapping

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	**3**	**2**	**1**									**1**	**1**	**2**	
Co2	**3**	**2**	**2**	**2**								**1**	**1**	**2**	
Co3	**2**	**2**	**1**	**1**								**1**	**1**	**3**	
Co4	**2**	**1**	**1**	**1**								**1**	**1**	**2**	

Text Books:

1. A.K. Sawhney "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, 18th Edition, 2008, ISBN 81-7700-016-0.
2. Clarence W.de Silva, "Sensor systems: Fundamentals and applications" CRC Press, 2016 Edition, ISBN 9781498716246.
3. D.V.S. Murthy "Transducers and Instrumentation", PHI Publication, 2nd Edition 2008, ISBN 978-81-203-3569-1.
4. Sensors And Actuators: Control System Instrumentation by Clarence W. De Silva Publisher

Reference Books:

1. Arun K. Ghosh, "Introduction to Measurement and Instrumentation", PHI 3rd Edition, 2009, ISBN: 978-81-203-3858-6.

Course Title	Laser and Optical Instrumentation						
Course Code	**22EIT801A**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective: The objective of the course is to:

1. To study the types of lasers and its characteristics.
2. To understand the working of various laser instruments and its applications.
3. To gain knowledge about various types of optical fiber sensors.
4. To understand the working principle of fiber optic instrumentation.

Module No	Syllabus	No of Teaching hours
1	**Laser characteristics & Types**: Properties of Laser Light, Frequency stabilization Q-switching and mode locking, line shape function, Principles, classification. Modes of Lasers: Axial, Transverse, Glass fiber lasers, Semiconductor lasers: Threshold current density for semiconductor lasers, Heterojunction lasers	8
2	**Laser instruments**: laser interferometry, Measurement of distance Interferometric methods, Beam modulation telemetry, pulse echo technique, and holography, application of holography Holographic interferometry , Holographic computer memories , High energy applications of lasers , Industrial applications laser welding, Medical applications , Laser-induced nuclear fusion.	8
3	**INTRODUCTION TO OPTICAL FIBERS:** light Modulation schemes, optical fibers, intermodal dispersion, graded index fiber, low dispersive fibers Fiber losses, fiber materials, integrated optics, optical bistability, laser printing, optical multiplexers	8
4	**OPTICAL FIBER SENSORS**: Multimode passive and active fiber sensors, phase modulated sensors, fiber optic gyroscope, Polarization: polarimetric sensors, polarization and rotation sensors	8
5	**FIBER OPTIC INSTRUMENTATION**: Interferometric method of measurement of length - Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain. Fiber optic gyroscope – polarization maintaining fibers – applications	8

Course outcome:

After successful completion of the course the student is able to:

Sl.No.	Description	Bloom's Taxonomy Level
1	To remember the basic principles, characteristics and construction of various types of Lasers	Knowledge, Understand (Level 1,Level 2)
2	To understand the engineering principles in different type of Laser Instruments.	Knowledge, Understand (Level 1,Level 2)
3	To realize the working of optical fibre sensors and detectors for measurement of various Parameters	Knowledge, Understand (Level 1,Level 2)
4	To illustrate the use of optic fiber Instrumentation for a given applications of optical fibre.	Understand, Illustrate(Level 2)

CO-POMAPPING															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3					1						1			
CO2	3	2				1						1	2		
CO3	3	2				1						1	2		
CO4	3	2				2						1	2		

Low-1 Medium-2 High-3

Text Books:

1. 'Introduction to Opto Electronics' J. Wilson and J.F.B. Hawkes, Prentice Hall of India, 2nd Edition, 2001.
2. "Lasers and optical Instrumentation", S.Nagabhushana and N.Satyanarayana, International publishing house pvt. Ltd., 2010

Reference books:

1. John and Harry, Industrial Lasers and their Applications, McGraw Hill, 1974.
2. Senior J.M., Optical Fiber Communication Principles and Practice, Prentice Hall, 1985.
3. Keiser G., Optical Fiber Communication, McGraw Hill, 1991

Course Title	Power Plant Instrumentation						
Course Code	**22EIT801B**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course objectives:

1. Describe the Operational Principles of Traditional Power Plants
2. Identify and Explain Power Plant Instrumentation and Control Systems
3. Evaluate and Recommend Improvements in Power Plant Control Processes
4. Analyze the Environmental Impacts of Power Generation and the Role of Control Systems in Mitigation

Module No	**Syllabus**	**No of Teaching hours**
1	**Overview Of Power Generation: Survey** of methods of power generation hydro, thermal, nuclear, solar and wind power Importance of instrumentation in power generation Thermal power plant Building blocks Combined Cycle System Combined Heat and Power System	**8**
2	**Measurements In Power Plants:** Measurement of feed water flow, air flow, steam flow and coal flow, Drum level measurement, Steam pressure and temperature measurement Turbine speed and vibration measurement, Flue gas analyzer, Fuel composition analyzer.	**8**
3	**Hydroelectric Power Plant-** Site selection, Hydrology, Estimation electric power to be developed, classification of Hydropower plants, Types of Turbines for hydroelectric power plant, pumped storage plants, storage reservoir plants.	**8**
4	**Boiler Control:** Combustion of fuel and excess air, firing rate demand Steam temperature control, Control of deaerator, Drum level control Single, two and three element control, Furnace draft control, implosion flue gas dew point control, Trimming of combustion air.	**8**
5	**Solar Energy:** solar resource, solar energy conversion systems: Solar PV technology: Block diagram of PV system, advantages and limitations. Solar thermal energy system: Principle, solar collector and its types, solar concentrator and its types, safety. Nuclear Power Plant: Nuclear power generation, control station and reactor control	**8**

Course Outcomes:

After completion of this course the student is able to:

Sl.No.	Description	Bloom's Taxonomy Level
1	Explain the operational principles of traditional power plants, including the process of energy conversion and the role of key components in electricity generation.	Remember, Understand (Level 1, Level 2)
2	Identify and describe the instruments used for measurement and control in power plant systems, highlighting their functions and importance in plant operation.	Remember, Understand (Level 1, Level 2)
3	Analyze the performance and effectiveness of various instrumentation and control systems used in power plants, and recommend improvements to enhance system efficiency and reliability.	Analyze (Level 4)
4	Apply methods to reduce the harmful effects of electricity generation on the environment by using suitable control processes.	Understand, Apply (Level 2, Level 3)

CO-PO Mapping														
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**2**	**2**	**2**									**1**	**1**	**2**	
CO2	**2**	**1**	**1**									**1**	**1**	**2**	
CO3	**2**	**2**	**1**									**1**	**1**	**3**	
CO4	**2**	**2**	**1**									**1**	**1**	**2**	

Text Books:

1. Boiler Control Systems Engineering, by G.F. Gilman, 2005, ISA Publication
2. Power plant engineering, P.K.Nag, 3rd edition, 2010. McGraw Hill.

Reference Books:

1. "Power Plant Engg.", Domkundwar 5th Edition Arora, Domkundwar,1990, Dhanpat Rai & Co.1990
2. "Non-conventional energy resources", by B. H. Khan, McGraw Hill, New Delhi, 2009
3. "Renewable energy Technologyî, Chetan Singh Solanki, Prentice Hall Publication 2011

Course Title	Neural Network						
Course Code	**22EIT801C**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

1. The objective of the course is to:
2. The main objective of Neural Network Techniques to Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities
3. Apply the basic knowledge of neural network architectures and learning algorithms, for Pattern recognition, image processing
4. Explore the use of Pattern and Neural Classifiers for classification applications.

Module No	**Syllabus**	**No of Teaching hours**
1	Fundamentals of Neural Networks: Model of Artificial Neuron, Learning rules and various activation functions. Neural Networks viewed as directed graphs, Feedback, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks. Neural Network Architecture: Single layer Feed-forward networks. Multilayer Feed-forward networks. Recurrent Networks. Linear Separability and Non- linear separable problem,XOR problem	8
2	**LEARNING Algorithms:** Error correction algorithm, Memory based learning, Hebbian Learning, Competitive learning, Boltzmann learning, learning with a teacher, learning without a teacher, Learning tasks, Perceptron learning algorithm, perception convergence theorem, Multilayer perceptron	8
3	Supervised Learning: Perceptron Learning and Non-separable sets, α- least Mean square learning Back propagation Networks: Back Propagation networks, Architecture of Back-propagation (BP) Networks, Back-propagation Learning, Variation of Standard Back propagation algorithms.	8

4	Support Vector Machine and Radial Basis Function: Stastical learning Theory, support vector machines. SVM application to image classification. Radial basis function Regularization theory, Generalized RBF networks Applications. RBF application to Face Recognition Hopfield Networks – Architecture, Capacity of Hopfield models, Energy analysis of Hopfield networks	8
5	Introduction about Fuzzy set theory: Fuzzy versus Crisp, Crisp and fuzzy sets, Crisp and Fuzzy relations. Fuzzy Systems: Crisp Logic, Predicate Logic, Fuzzy logic, Fuzzy rule based system, Defuzzification Methods, Applications.	8

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Sl.No	Description	Description Bloom's Taxonomy Level
CO1	Acquire the fundamental knowledge and types of neural networks. The student will have a broad knowledge in developing the different algorithms for neural networks.	Knowledge, Develop (Level 1, Level 4)
CO2	Understand the concept and techniques of neural networks and neural network models.	Knowledge, Understand , (Level 1, Level 2)
CO3	Apply the basic knowledge of neural network architectures and learning algorithms, for Pattern recognition, image processing	Apply, Analyze (Level 3, Level 4)
CO4	Analyse whether neural networks are appropriate to a particular application.	Apply, Analyze (Level 3, Level 4)
CO5	Apply the broad knowledge in Fuzzy logic principles and will be able to determine different methods of Deffuzification	Apply (Level 3)

CO-PO MAPPING													PSOs		
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3										1	1	1
CO2	3	2	3	2									1	1	1
CO3		2	3		2								1	1	1
CO4	3		2	3		3									

Low-1 Medium-2 High-3

TEXT BOOKS:

1. Simon Haykin, Neural Networks A comprehensive foundation- McMillan College public company, Newyork 1994.
2. Artificial neural networks-B. Yegnanarayana Prentice Hall of India 1999.

REFERENCE BOOKS:

1. Introduction to Artificial Neural Systems- Jacek M. Zurada JaicoPublishing House,1994
2. Neural Network Fundamentals with Graphs, Algorithms, and applications-N.K. Bose, P.Liang,
Tata McGraw Hill Edition.1998
3. Artificial Neural networks-Robert J Schalkoff, McGraw Hill international Edition,1997

Course Title	Factory Automation						
Course Code	**22EIT801D**						
Category	Professional Elective Course **(PEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives

1. **To introduce the fundamentals, principles, and strategies of industrial automation**
2. To develop the ability to analyze and design material handling and automatic identification system.
3. To provide an understanding of various automated manufacturing systems, including their components, classifications, and planning aspects
4. To introduce the key concepts of product design, CAD/CAM, process planning, and production control systems used in modern manufacturing.

Module No	Syllabus	No. of teaching hours
1	**Introduction:** Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations. Flow lines & Transfer Mechanisms, Fundamentals of Transfer Lines.	8
2	**Material handling and Identification Technologies:** Overview of Material Handling Systems, Principles and Design Consideration, Material Transport Systems, Storage Systems: Introduction to Storage Systems, Conventional Storage Methods and Equipment, Automated Storage Systems, Analysis of Storage Systems. Automatic Identification Method: Bar Code Technology, Radio Frequency Identification.	8
3	**Hardware components for automation and Process Control:** Sensors, Actuators, Analog–Digital Conversions, Input/Output Devices for Discrete Data **Control Technologies in Automation:** Industrial Control Systems, Process Industries versus Discrete Manufacturing Industries, Continuous Versus Discrete Control, Computer Process and its Forms.	8
4	**Automated Manufacturing Systems:** Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMS and its Planning and Implementation. **Quality Control Systems:** Traditional and Modern Quality Control Methods, SPC Tools, Inspection Principles and Practices, Inspection Technologies.	8
5	**Manufacturing Support Systems:** **Product design and CAD/CAM in the production system:** Product Design and CAD, CAM, CAD/CAM, and CIM, Quality Function Deployment	8

	Process Planning and Concurrent engineering: Process Planning, Computer-Aided Process Planning, Concurrent Engineering and Design for Manufacturing, Advanced Manufacturing Planning. **Production Planning and Control systems:** Aggregate Production Planning and the Master Production Schedule, Material Requirements Planning, Capacity Planning, Shop Floor Control, Inventory Control, Manufacturing Resource Planning, Enterprise Resource Planning (ERP)	

Course outcome:

At the end of the course, Students can able to

Sl.No.	Description	Bloom's Taxonomy Level
9.	Understand the fundamentals and strategies of automation in production systems, including flow lines and transfer mechanisms.	Remember, Understand (Level 1, Level 2)
10.	Analyze and design appropriate material handling and identification systems for efficient integration in automated manufacturing environments.	Analyze (Level 4)
11.	Analyze different components and types of automated manufacturing systems to determine how they affect system planning and implementation.	Analyze (Level 4)
12.	Understand and apply tools like CAD/CAM, process planning methods, and production control systems such as MRP and ERP.	Understand, Apply (Level 2, Level3)

CO-PO Mapping

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	**3**	**2**	**1**									**1**	**1**	**2**	
Co2	**2**	**3**	**2**	**2**								**1**	**1**	**2**	
Co3	**2**	**2**	**1**	**1**								**2**	**2**	**2**	
Co4	**2**	**1**	**1**	**2**	**1**							**2**	**2**	**3**	

Text Books:

1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover, Pearson Education.
2. Computer Based Industrial Control- Krishna Kant, EEE-PHI,2nd edition,2010

Reference Books

1. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang &Richard A. Wysk

Course Title	Instrumentation and Measurement Techniques						
Course Code	**22EIT802A**						
Category	Open Elective Course **(OEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives

1. To introduce the basic concepts of measurement, types of instruments, and the importance of accuracy, precision, and error analysis.
2. To study the working principles and applications of analog and digital measuring instruments like voltmeters, ammeters, and multimeters.
3. To understand and demonstrate the use of oscilloscopes and signal generators for analyzing and testing electronic signals.
4. To learn how to measure electrical parameters using bridge circuits and understand the function of various display and recording devices.

Module No	**Syllabus**	**No. of teaching Hours**
1	**Measurements:** Introduction, Significance of measurements, methods of measurements, instruments and measurement systems, Functions of instruments and measurement systems, Applications of measurement systems. **Measurement Errors:** Introduction Gross errors and systematic errors, Absolute and relative errors, basic concepts of accuracy, Precision, Resolution and Significant figures, Measurement error combinations.	8
2	**Ammeters, Voltmeter and Multimeters:** Introduction, DC ammeter principle only, DC voltmeter, Multi-range voltmeter, Extending voltmeter ranges, Loading, Peak responding and True RMS voltmeters **Digital Voltmeters:** Introduction, Ramp type, Dual slope integrating type (V–T), integrating type (V–F) and Successive approximation type (relevant problems). **Digital Instruments:** Introduction, Block diagram of a Basic Digital Multimeter. Digital frequency meters: Basic circuit of a Digital frequency meter, Basic circuit for frequency measurement.	8
3	**Oscilloscopes:** Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch **Special Oscilloscopes:** Delayed time-base oscilloscopes: Need for a time delay & delayed-time base system. Analog storage oscilloscopes: Need for trace storage, bistable storage CRT, Variable persistence storage CRT. Digital storage oscilloscopes	8
4	**Signal Generators:** Introduction, Fixed and variable AF oscillator, Standard signal generator, Modern laboratory signal generator, AF sine and square wave	8

	generator, Function generator, Square and Pulse generator. **Bridge Circuits for Measurement of R, L & C**: DC bridges: Introduction, Wheatstone's bridge, Kelvin Bridge AC bridges: Capacitance Comparison Bridge, inductance Comparison Bridge, Maxwell's bridge, Schering Bridge.	
5	**Display Devices and Recorders:** Introduction, electrical indicating instruments, digital instruments, digital display methods, digital display unit. Segmental Displays: Seven segmental display, dot matrices, LED, LCD, decade counting assemblies, display systems. Recorders: Recording requirements, analog recorders- Graphic recorders, strip chart recorders & its types, X-Y recorder, Magnetic & Digital tape recorders.	8

Course outcome:

At the end of the course, Students can able to

Sl.No.	Description	Bloom's Taxonomy Level
1	Understanding Measurement Fundamentals	Remember, Understand (Level 1, Level 2)
2	Analyze Analog and Digital Measuring Instruments	Analyze (Level 4)
3	Demonstrate Operation and Application of Oscilloscopes and Signal Generators	Apply (Level 3)
4	Apply the working principles of bridge circuits, display devices, and recording systems to perform measurements	Apply (Level 3)

	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	Pso1	Pso2	Pso3
Co1	**3**	**2**	**1**									**1**	**2**	**1**	
Co2	**2**	**3**	**2**	**2**								**1**	**2**	**1**	
Co3	**2**	**2**	**1**	**1**								**2**	**3**	**1**	
Co4	**2**	**1**	**1**	**2**	**1**							**2**	**3**	**1**	

Text Books:

1. Electrical and Electronic Measurements and Instrumentation – A. K. Sawhney, 17th Edition DhanpatRai& Co. Pvt. Ltd., 2012
2. "Electronic Instrumentation and Measurements", David A Bell, PHI / Pearson Education2006/ Oxford Higher Education, 2013.

Reference Books

1. "Principles of Measurement Systems", John P. Beately, 3rdEdition, Pearson Education, 2000
2. "Modern Electronic Instrumentation and Measuring Techniques", Cooper D & A D Helfrick, PHI, 2020

Course Title	Laser and Optical Instrumentation						
Course Code	**22EIT802B**						
Category	Open Elective Course **(OEC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	00	00	03	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objective:

The objective of the course is to:

1. To study the characteristics and different types of Lasers.
2. To understand the working of various laser instruments and its applications.
3. To gain knowledge about various types of optical fiber sensors.
4. To apply knowledge of lasers in medical applications

Module No	Syllabus	No of Teaching hours
1	**LASER TYPES & CHARACTERISTICS:** Principles, classification, Modes of Lasers: Axial, Transverse, He-Ne Laser, Molecular lasers - the carbon dioxide laser & its configurations, Properties of Laser Light, Frequency stabilization Q-switching: rotating mirror, electro-optic and passive Q-switching and mode locking, line shape function.	8
2	**LASER INSTRUMENTS**: laser interferometry, Measurement of distance Interferometric methods, Beam modulation telemetry, pulse echo technique, and holography, application of holography Holographic interferometry , Holographic computer memories , High energy applications of lasers , Industrial applications laser welding, Medical applications , Laser-induced nuclear fusion.	8
3	**INTRODUCTION TO OPTICAL FIBERS:** light Modulation schemes, optical fibers, intermodal dispersion, graded index fiber, low dispersive fibers Fiber losses, fiber materials, integrated optics, optical bistability, laser printing, optical multiplexers	8
4	**OPTICAL FIBER SENSORS**: Multimode passive and active fiber sensors, phase modulated sensors, fiber optic gyroscope, Polarization: polarimetric sensors, polarization and rotation sensors	8
5	**MEDICAL APPLICATIONS:** Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology	8

Course outcome:

After successful completion of the course the student is able to:

Sl.No.	Description	Bloom's Taxonomy Level
1	To remember the basic principles, characteristics and construction of various types of Lasers	Knowledge, Understand (Level 1,Level 2)
2	To understand the engineering principles in different type of Laser Instruments.	Knowledge, Understand (Level 1,Level 2)
3	To realize the working of optical fibre sensors and detectors for measurement of various Parameters	Knowledge, Understand (Level 1,Level 2)
4	To demonstrate the applications of lasers in medical domain.	Understand, Apply (Level 2, Level 3)

CO-POMAPPING															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3					1						1			
CO2	3	2				1						1	2		
CO3	3	2				1						1	2		2
CO4	3	2				2						1	2		2

Low-1 Medium-2 High-3

Text Books:

1. 'Introduction to Opto Electronics', J. Wilson and J.F.B. Hawkes, Prentice Hall of India, 2nd Edition, 2001.
2. " Lasers and optical Instrumentation", S.Nagabhushana and N.Satyanarayana, International publishing house pvt. Ltd., 2010.

Reference books:

1. John and Harry, Industrial Lasers and their Applications, McGraw Hill, 1974.
2. Senior J.M., Optical Fiber Communication Principles and Practice, Prentice Hall, 1985.
3. Keiser G., Optical Fiber Communication, McGraw Hill, 1991

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