III Semester

Sr No	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Continual Assessment	End Sem Examination	Total
1	II301T	Analog & Digital Electronics	3	1	-	4	30	70	100
2	II301P	Analog & Digital Electronics Lab	-	-	2	1	25	25	50
3	II302T	Measurements & Instrumentation	3	-	-	3	30	70	100
4	II303T	Object Oriented Programming & Data Structures	3	1	-	4	30	70	100
5	II303P	Object Oriented Programming & Data Structures Lab	-	-	2	1	25	25	50
6	II304T	Analog & Digital Communication	4	-	-	4	30	70	100
7	II304P	Analog & Digital Communication Lab	-	-	2	1	25	25	50
8	II305T	Mechatronics	3	-	-	3	30	70	100
9	II305P	Mechatronics Lab	-	-	2	1	25	25	50
10	H103	Constitution of India	2	-	-	0	Audit		
11	II306T	Career Development- I	2	-	-	0	Audit		
Total			**20**	**2**	**8**	**22**	**250**	**450**	**700**

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II301T	Analog and Digital Electronics	3	1	---	4	30	70	100

Course Objectives	Course Outcomes
This course is intended	**Students will be able to**
- To explain the importance of Electronics and electronic circuits - To analyse and explain the importance of feedback circuits, oscillators and operational amplifier circuits and their applications - To describe, illustrate and analyse the use of combinational and sequential logic circuits - To understand and explain the basics of memory unit and different memory types	- To understand BJT and FET circuits - Analyse and explain feedback amplifiers, oscillators and Operational Amplifier circuits - Understand number systems, learn the postulates of Boolean algebra and explain the logic gates - Explain the use Boolean algebra to minimize and design combinational logic circuits - Design and analyse sequential logic circuits and understand the memory unit

UNIT I

Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET)   **[10 hours]**

Review of pn diode, Bipolar Junction Transistor (BJT) construction and operation, operating regions of a transistor, current components of a transistor, configuration, comparison between CB, CC and CE configuration, Transistor as an Amplifier and Switch, BJT biasing types, comparison of various biasing techniques, DC load line and operating point, construction, working and features of JFET, characteristics of JFET, comparison between JFET and BJT, MOSFET, types of MOSFET, comparison between MOSFETs, CMOS Devices

UNIT II

Feedback Amplifiers, Oscillators and Operational Amplifiers   **[10 hours]**

Feedback, principles of negative voltage feedback in amplifiers, gain of negative feedback amplifier, advantages of negative voltage feedback, feedback circuit, principles of negative current feedback, current gain with negative current feedback, effects of negative current feedback, Sinusoidal Oscillator, Types of sinusoidal oscillations, oscillatory circuit, undamped oscillations from tank circuit, positive feedback amplifier—oscillator, explanation of Barkhausen criterion, different types of transistor oscillators, operational amplifiers (op-amp) stages, op-amp symbols, ideal operational amplifier, properties, parameter values, saturable property of op-amp, concept of virtual ground, applications of op-amp, differential amplifier circuit, A/D and D/A converters

UNIT III

Binary Systems, Boolean Algebra and Logic Gates   **[8 hours]**

Digital Computers and Digital Systems, Binary Numbers, Base Conversions, Complements, Binary Code, Storage and Registers, Binary Logic, Integrated Circuits, Basic and Axiomatic definitions of Boolean Algebra, Theorems and Properties, Boolean Functions, Standard & Canonical Forms, Other Logic Operations, Digital Logic Gates, IC Digital Logic Families

			1.1	
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UNIT IV

Simplification of Boolean Functions and Combinational Logic [10 Hours]

The Map Method, Two-and Three-variable Maps, Four-variable Map, Product of Sums and Sum of Product Simplification, NAND and NOR Implementation, Other Two-level Implementations, Don't Care Conditions, The Tabulation Method, Determination of Prime Implicants, Selection of Prime Implicants, Adders, Subtractors, Code Conversion, Binary Parallel Adder, Magnitude Comparator, Decoders, Multiplexers, Priority Encoders, Parity Generators/Checkers, ROM and PLA

UNIT V

Sequential Logic and the Memory Unit [10 Hours]

Flip-Flops, Triggering of Flip-Flops, Design of one Flip Flop from another, Flip Flop Excitation Tables, Design of Counters, Registers, Shift Registers, Ripple Counters, Timing Sequences, The Memory Unit

Text Books

1. Analog and Digital Electronics: Charles H. Roth, Larry L. Kinney, Raghunandan G.H., Cengage Publication

(Units 1 and 2)

2. Principles of Electronics: V.K. Mehta, S. Chand Publications (Unit 2)

3. Digital Logic and Computer Design: M. Morris Mano, Second Edition, Pearson Education (Units 3, 4 and 5)

Reference Books:

1. Electronic Devices and Circuit Theory: Robert L. Boylestad, Louis Nashelsky, Pearson Education, Ninth Edition

2. Electronic Devices and Circuits: S Salivahanan, N Suresh Kumar, Tata Mc Graw Hill Education Private Limited, Second Edition

3. Integrated Electronics, J. Millman and Halkias, TMH Publications

4. Electronics Principles: Albert Malvino TMH Publications.

5. Fundamentals of Digital Circuits: A. Anand Kumar, PHI Publication

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II301P	Analog and Digital Electronics Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. 2. To prepare students to perform the analysis and design of various digital electronic circuits.	After studying this course, the students would gain enough knowledge ● To explain the fundamental concepts and techniques used in digital electronics. ● To understand and examine the structure of various number systems and its application in digital design. ● The ability to understand, analyze and design various combinational and sequential circuits. ● To develop skill to build, and troubleshoot digital circuits.

- **All eight experiments to be performed from the list**

Expt. No.	Title of the experiment
1	To study and verify truth table of basic logic gates
2	To study and demonstrate the working of combination logic circuit
3	To study and demonstrate the working of flip-flop circuits
4	To study and demonstrate the working of sequential logic circuits
5	Study and verify the operation of shift register
6	To verify the operation of Multiplexer and Demultiplexer circuit
7	To study and demonstrate Half Adder
8	To study the memory unit and different types of memory

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Analog and Digital Electronics	Charles H. Roth, Larry L. Kinney, Raghunandan G.H., Cengage Publication		Cengage Learning
2.	Principles of Electronics	V.K. Mehta		S.Chand Publications

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II302T	Measurement & Instrumentation	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
1. To develop in students the knowledge of basics of Measurements and measuring devices. 2. To develop competence in sensors, transducers and terminating devices with associated parameters	1) To explain basic concepts and definitions in measurement 2) To explain the operation and apply it for designing electronic instruments for parameter measurement 3) To analyze different bridges for measurement of unknown impedances 4) To study and explain the working of different transducers 5) To apply the knowledge gained by from transducers and different elements to demonstrate signal conditioning and analyzers

Unit I – Fundamental of Electronic Measurement and Instrumentation	[06 Hrs]

Necessity of electronic Measurement, Block diagram of electronic measurement system, Types of Measurements, Function of instruments and measurement systems, Applications of measurement system, Elements of measurement system, Types of instruments, Theory of errors, Accuracy and Precision, Types of errors, Statistical analysis, probability of errors, Limiting errors, Standards of measurement.

Unit II – Electromechanical Instruments	[08 Hrs]

Classification of Analog Instruments, Principle of operation, Operating Torques, Different types of damping and control system, Types of Instruments: Extension of range of PMMC Instruments, Moving Iron, Electro-dynamometer, Hot wire instruments, Electrostatic instruments.

Unit III – AC & DC Bridges	[08 Hrs]

DC Bridges: Wheatstone Bridge, Kelvin Bridge AC Bridges and their applications: Maxwell's Bridge, Hay's Bridge, Schering Bridge, Desauty's Bridge, Wein Bridge, Detectors for AC bridges.

Unit IV -Transducers	[06 Hrs]

Static and Dynamic characteristics, Classification of transducers, Capacitive transducer, Inductive transducer, Resistive transducer, RVDT, Stain Gauge, RTD, Optical Transducers, Hall effect transducer, Piezoelectric transducer, transducers for measurement of Pressure, Temperature, level, displacement, study of basic sensors.

Unit V-Signal Analyzer and Data Acquisition System	[8Hrs]

Data Acquisition Techniques: Analog and digital data acquisition, Sensor/Transducer interfacing, unipolar and bipolar, transducers, Sample and hold circuits. Data Acquisition with Op-Amps: Operational Amplifiers, CMRR, Slew Rate, Gain, Bandwidth. Zero crossing detector, Peak detector, Window detector. Difference Amplifier, Instrumentation Amplifier AD 620, Interfacing of IA with sensors and transducer. Data Transfer Techniques: Serial data transmission methods and standards RS 232-C: specifications connection and timing, 4-20 mA current loop, GPIB/IEEE-488, LAN, Universal serial bus, HART protocol, Foundation- Fieldbus, ModBus, Zigbee and Bluetooth. Data Acquisition System (DAS): Single channel and multichannel, Graphical Interface (GUI) Software for DAS, PC-Based data acquisition system.

Text Books

S. N	Title	Authors	Edition	Publisher
1.	Electrical and Electronic Measurement and Instrumentation	A.K. Sawnhey	-	Dhanpat Rai & Sons
2.	Modern Electronic Instrumentation and Measurement	A.D.Helltrick and W.D.Cooper	-	PHI Publications
3.	Electronics Measurements	TS.S. Kaisi	-	Mc Graw Hill Publications

Reference Books

S. N	Title	Authors	Edition	Publisher
1.	Mechanical measurements	Beckwith Marangoni and Lienhard	-	Pearson Education

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II303T	**Object Oriented Programming and Data Structures**	3	1	---	4	30	70	100

Course Objectives	Course Outcomes
1. Understand the concept of object-oriented programming and develop skills in C++ Language. Access how the choice of data structures and algorithm design methods impacts the performance of programs 2. Choose the appropriate data structure and algorithm design method for a specified application. Write programs using C++ Language.	1) Implement the concept of Object-Oriented Programming and describe the concept of function overloading, operator overloading & polymorphism using C++ programming language. 2) Illustrate Inheritance with example. 3) Describe linked list, stack and queue operations. 4) Design program using non-linear data structure

UNIT- I: Introduction of Object-Oriented Programming and Overloading [14Hrs]

Basic concepts of object-oriented programming-Benefits of OOPs-Application OOP-, Class Members, Access Control, Constructor and Destructor, parameter passing method, inline function, static class members, friend function, Function Overloading, Generic Programming. Function and class templates, defining operator overloading-overloading unary operator, overloading binary operator-rules for operator overloading.

Unit -II Inheritance [8Hrs]

Inheritance- Inheritance basics, base and derived classes, inheritance types:-single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, and virtual base class –run time polymorphism using virtual function, pure virtual function, and abstract classes.

Unit -III Introduction to Data structure [8Hrs]

Arrays-Introduction-Linear arrays-representation of linear arrays in memory, Sorting- selection sort, Insertion Sort, Bubble Sorting, Quick Sort, Merge Sort, radix sort, linear Search-Binary Search, Complexity analysis of linear Search-Binary Search, and Multidimensional arrays-Sparse matrices.

UNIT- IV: Introduction of Stack and Queue [9Hrs]

Introduction of Stack and Queue, Dynamic memory allocation, Linked list-Introduction- Representation of singly Linked List in memory, Traversing a linked list, insertion and deletion in linked list, implementation of stack using linked representation, implementation of queue using linked representation

Unit -V: Trees and Terminology [9Hrs]

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Binary search Tree Implementation ,Operations – Searching, Insertion and deletion in binary search trees., Threaded Binary trees, Traversing Threaded Binary trees. Generalization of trees to graphs – their representation & traversals. Dijkstra's shortest path algorithm.

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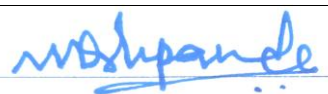
Text Books

S.N	Title	Authors	Edition	Publisher
1	Object Oriented Programming with C++	E.Balagurusamy	--	Tata McGraw Hill Publications.
2	Data Strcture using C and C++	Y.Langsam	--	Pearson Education Publications
3	Fundamentals of Data Structures	Horowitz and Sahani	--	Galgotia Publications Pvt. Ltd
4	Data Structures using C & C++	A. M. Tanenbaum	--	PHI Publications.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Mastering C++	K.R.Venugopal,B. RajKumar, T.RaviShankar	--	Tata McGraw Hill publication.
2	Problem solving with C++ The OOP	W. Savitch	--	Pearson education.
3	C++, the Complete Reference	Herbert Scheldt	--	Tata McGraw Hill Publications.
4	Data Structures and Program Design in C++	Robert L. Kruse, Alexander J. Ryba	--	PHI Publications
5	Object Oriented Programming in Microsoft C++	Robert Lafore	--	Galgotia Publications Pvt. Ltd

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
Il303P	Object Oriented Programming and Data Structures Lab.	---	---	2	1	25	25	50

Course Objectives	Course Outcomes
1) Understand the concept of object-oriented programming and develop skills in C++ Language. 2) To choose the appropriate data structure and algorithm design method for a specified application. Write programs using C++ Language.	1) Describe & Illustrate concept of object-Oriented Programming, function overloading, operator overloading 2) Classify Inheritance and develop program using c++. 3) Implement searching and sorting techniques using c++. 4) Implement operation like Searching, Insertion and Deletion, traversing mechanism on various data structure. 5) Design programs using data structures such as Binary tree and graph.

Expt. No.	Title of the experiment
1	Write a C++ program to find area of circle.
2	Write a C++ program to implement the concept of Class and objects.
3	Write a C++ program to calculate area of a circle and rectangle using default and parameterized constructor
4	Write a C++ program to overload the function.
5	Write a program to implement operator overloading.
6	Unary operator overload
7	Binary Operator Overload
8	Write a program to implement inheritance
9	Write a C++ program to implement linear search technique.
10	Write a program to implement selection sort or Bubble sort technique.
11	Write a program to implement stack operation.
	Write a C++ program to insert and delete a node using single linked list.
12	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order
13	Write a C++ program to find area of circle.

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Text Books

S.N	Title	Authors	Edition	Publisher
1	Object Oriented Programming with C++	E.Balagurusamy	--	Tata McGraw Hill Publications.
2	Data Strcture using C and C++	Y.Langsam	--	Pearson Education Publications
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4	Data Structures using C & C++	A. M. Tenenbaum	--	PHI Publications.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Mastering C++	K.R.Venugopal,B.RajKumar,T. RaviShankar	--	Tata McGraw Hill publication.
2	Problem solving with C++ The OOP	W.Savitch	--	Pearson education.
3	C++, the Complete Reference	Herbert Scheldt	--	Tata McGraw Hill Publications.
4	Data Structures and Program Design in C++	Robert L. Kruse, Alexander J. Ryba	--	PHI Publications
5	Object Oriented Programming in Microsoft C++	Robert Lafore	--	Galgotia

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II303P	**Object Oriented Programming and Data Structures Lab**	---	---	2	1	25	25	50

Course Objectives	Course Outcomes
1) Understand the concept of object-oriented programming and develop skills in C++ Language. **2)** To choose the appropriate data structure and algorithm design method for a specified application. Write programs using C++ Language.	1) Describe & Illustrate concept of object-Oriented Programming, function overloading, operator overloading 2) Classify Inheritance and develop program using c++. 3) Implement searching and sorting techniques using c++. 4) Implement operation like Searching, Insertion and Deletion, traversing mechanism on various data structure. 5) Design programs using data structures such as Binary tree and graph.

Expt. No.	Title of the experiment
1	Write a C++ program to find area of circle.
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5	Write a program to implement operator overloading.
6	Unary operator overload
7	Binary Operator Overload
8	Write a program to implement inheritance
9	Write a C++ program to implement linear search technique.
10	Write a program to implement selection sort or Bubble sort technique.
11	Write a program to implement stack operation.
	Write a C++ program to insert and delete a node using single linked list.
12	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in In order, Preorder and Post Order
13	Write a C++ program to find area of circle.

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2	Data Strcture using C and C++	Y.Langsam	--	Pearson Education Publications
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S.N	Title	Authors	Edition	Publisher
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2	Problem solving with C++ The OOP	W.Savitch	--	Pearson education.
3	C++, the Complete Reference	Herbert Scheldt	--	Tata McGraw Hill Publications.
4	Data Structures and Program Design in C++	Robert L. Kruse, Alexander J. Ryba	--	PHI Publications
5	Object Oriented Programming in Microsoft C++	Robert Lafore	--	Galgotia

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II304T	Analog and Digital Communication	4	---	---	4	30	70	100

Course Objectives	Course Outcomes
This course is intended	**Students will be able to**
- Impart the basic concepts of analog modulation schemes. - Describe different types of noise and predict its effect on various analog communication systems. - Know the techniques of analog communication and digital communication.	- Analyse basics of signals, its properties and application in communication system. - Compare different modulation techniques. - Evaluate the performance of pulse modulation and demodulation techniques in various transmission environments. - Explain digital modulation techniques in communication systems - Identify the basic elements of mobile communication system

UNIT I **INTRODUCTION TO ELECTRONIC COMMUNICATIONS AND SIGNALS** Introduction, Historical Perspective, Digital and Analog Sources and Systems, Deterministic and Random Waveforms Block Diagram of a Communication System, Power Measurements (dB, dBm, and Bel), Channel capacity and Ideal Communication Systems, Underpinning Theories of Communication Systems, analogy between Signals and Vectors, Properties of Signals and Noise, classification of signals and systems, Power Spectral Density, Bandlimited Signals and Noise, Bandwidth of Signals	10
UNIT II **AMPLITUDE MODULATION AND ANGLE MODULATION** Introduction, Types of communication, Need of modulation, Modulation, Modulation Index, Modulation of Complex Modulating Signal, Importance of Modulation Index, Suppressed Carrier Systems, SSB and VSB, Generation of AM waves, Demodulation of AM waves, AM Transmitters and Receivers, Noise in AM, Comparison of various AM Techniques, Basic Definitions, Properties of Angle-Modulated Waves, Relationship between PM and FM Waves, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, FM Modulators and Transmitters, FM Demodulator and Receivers, Noise in Angle Modulated Systems	10
UNIT III **PULSE AND DATA COMMUNICATION** Introduction, Pulse Amplitude Modulation (PAM), Generation and Detection of PAM signals, Sampling Process, Pulse Width Modulation: Generation and Detection of PWM signals, Pusle Position Modulation (PPM):Generation and Detection of PPM Signals, Completing the Transition from Analog to Digital, Quantization Process, Pulse Code Modulation: Bandwidth of PCM system, Noise in PCM system, Delta Modulation	08

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UNIT IV **DIGITAL MODULATION** Introduction, Binary Modulation Schemes, Amplitude Shift Keying (ASK): Mathematical Representation, Signal Space representation or Constellation Diagram, Probability of Error, ASK Generation, ASK Reception or Demodulation, Phase Shift Keying (PSK): Mathematical Representation, Signal Space representation, Probability of Error, PSK Generation, PSK Reception, Frequency Shift Keying (FSK): Mathematical Representation, Signal Space representation or Constellation Diagram, Probability of Error, FSK Generation, FSK Reception, Comparison of Binary Modulation Techniques, Quadrature Phase Shift Keying (QPSK): Mathematical Representation, Signal Space representation, Probability of Error, QPSK Generation, QPSK Reception, M-ary Modulation Techniques- M-ASK, M-PSK, M-QAM, M-FSK and comparison of all schemes	**12**
UNIT V **INTRODUCTION TO WIRELESS COMMUNICATIONS** Introduction, Advanced Mobile Phone System (AMPS), Architecture of AMPS, GSM System, Hierarchy & Architecture, Basic Terminology in Cellular Communications, Frequency reuse and hand-off, Multiple Access Schemes, FDMA, TDMA and CDMA, Comparison of all thre multiple access scheme	**06**

Text Books:

S.N	Title	Authors	Edition	Publisher
1	Analog & Digital Communication Systems	Simon Haykin and Micheal Moher		Wiley
2	Digital and Analog Communications System	Leon W. Couch		Pearson Education
3	Introduction to Analog and Digital Communication	M.A. Bhagyaveni, R Kalidoss, K.S. Vishvaksenan		River Publications

Reference Books:

S.N	Title	Authors	Edition	Publisher
1	Modern Digital and Analog Communication Systems	B.P. Lathi & Zhi Ding		Oxford Publications
2	Fundamentals of Digital Communication	Upmanyu Madhow		Cambridge University Press
3	Introduction to Communication Systems	Upmanyu Madhow		Cambridge University Press

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II304P	**Analog and Digital Communication**	---	---	2	2	25	25	50

Course Objectives	Course Outcomes
This course is intended	**Students will be able to**
• Impart the basic concepts of analog modulation schemes. • Know the techniques of analog communication and digital communication.	• Demonstrate generation and detection of analog and digital modulation techniques. • Demonstrate generation and detection of keying techniques techniques. • Compare different modulation techniques. • Identify the basic elements of mobile communication system

List of Experiments

- **Study of Block Diagram of Communication System**

- **Calculation of Modulation Index by observing AM wave**

- **To perform DS-AM generation & study using transmitter**

- **To perform FM modulator & Demodulator**

- **Write a MATLAB code to perform AM/FM**

- **To perform BPSK modulation/ demodulation & its spectral analysis**

- **To perform DPSK modulation/ demodulation & its spectral analysis**

- **To perform QPSK modulation/ demodulation & its spectral analysis**

- **To generate constellation for BPSK/ QPSK/QAM**

- **To implement various keying techniques using breadboard.**

Text Books

S.N	Title	Authors	Edition	Publisher
1	Analog & Digital Communication Systems	Simon Haykin and Micheal Moher		Wiley
2	Digital and Analog Communications System	Leon W. Couch		Pearson Education
3	Introduction to Analog and Digital Communication	M.A. Bhagyaveni, R Kalidoss, K.S. Vishvaksenan		River Publications

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References

S.N	Title	Authors	Edition	Publisher
1	Modern Digital and Analog Communication Systems	B.P. Lathi & Zhi Ding		Oxford Publications
2	Fundamentals of Digital Communication	Upmanyu Madhow		Cambridge University Press
3	Introduction to Communication Systems	Upmanyu Madhow		Cambridge University Press

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II305T	**Mechatronics**	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
To provide students with depth of knowledge of selection of sensors, actuators, signal conditioning, signal processing in design and analysis of Industrial IoT Systems for various applications.	1. To understand the key enablers/ technologies in the implementation of Industrial IoT system to convert factory to smart factory. 2. To classify and select sensors/ smart sensors for appropriate sensing parameter in the development of IoT system. 3. To develop actuation system to control action in IoT application 4. To understand the role of signal conditioning, signal processing, microprocessor, microcontroller and PLC in automated system.

Unit I [8 Hrs]
Basics of Industrial Internet of Things: Introduction to Industrial IoT: Industrial revolution, smart factories, elements of smart factories, Cyber Physical System in smart factories. Architecture of Industry 4.0: Layers of IoT, Design of IoT, Challenges in implementing Industry 4.0, Applications of IIoT.
Introduction to key Technologies in smart factories: IoT, Artificial Intelligence, Machine Learning, Cloud computing, Augmented Reality (AR), Virtual Reality (VR), Big Data Analytics, Cyber security.

Unit II [6 Hrs]
Sensors: Sensors/Transducers, Principles, Classification, Parameters, Static characteristics , Dynamic characteristics, Displacement sensors, Positioning sensor, Proximity sensors, velocity sensors, motion sensors, Force sensors, Accelerometer sensors, temperature sensors, Selection of sensors.

Unit III [6 Hrs]
Smart Sensors, Sensor Technologies and Applications: Smart sensor basics: Introduction, mechanical-elecronics transition in sensing, nature of sensors, Micro-electromechanical system (MEMS) sensors, integration of micromachining and microelectronics.
Micromachining techniques: Bulk micromachining, surface micromachining, LIGA process.

Unit IV [9 Hrs]
Actuators: Pneumatic & Hydraulic Actuation Systems: Actuation Systems, Pneumatic & Hydraulic Systems, Cylinders/Actuators, Directional Control Valves,Logic gate valves, direct & indirect control of single/double acting cylinder, development of pneumatic circuit for applications, cylinder sequencing.
Mechanical Actuation Systems: Mechanical Systems, Types of motion, Kinematic chains, Cams, Gear Trains, Ratchet and Pawls, Belt and Chain Drives, Bearings, Mechanical Aspects of Motor Selection,
Electrical Actuation Systems: Electrical Systems, Mechanical Switches, Solid-State Switches, Solenoid, DC Motors, AC Motors, Stepper Motors

Unit V [8Hrs]
Signal Conditioning, Microprocessor, Microcontrollers, and Programmable Logic Controllers
Signal Conditioning: Signal Conditioning, The Operational Amplifier, Protection, Filtering, Wheatstone Bridge, Digital Signals, Multiplexers, Data Acquisition, Digital Signal Processing, Pulse Modulation,
Microprocessors: Control, Microprocessors Systems, Microcontrollers, Applications,
Programmable Logic Controllers: Basic structure, I/O Processing, Data Handling, Analog Input/Output, Selection of PLC

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Mechatronics	W. Bolton		Pearson Education Ltd
2.	Sensors and Transducers	D. Patranabis		PHI Publication
3.	Mechatronics Integrated Mechanical Electronics Systems	K P Ramchandran, G k Vijayaraghavan, m S Balasundaram		Wiley

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Introduction to IoT	Sudip Misra, Anandrup Mukherjee, Arijit Roy		Cambridge University Press

		August 2023	1.1	Applicable for 2023-24
Chairman - BoS	Dean – Academics	Date of Release	Version	

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
II305P	Mechatronics Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
To provide students with practical knowledge of selection of sensors, actuators, signal conditioning, signal processing in design and analysis of Industrial IoT Systems for various applications.	● To demonstrate the working of sensors/ smart sensors for appropriate sensing parameter in the development of IoT system. ● To develop pneumatic circuit for given application using actuators and control valves. ● Implementation of ladder diagram, programming using PLC to develop a new Mechatronics application. ● To develop a measurements system by selecting appropriate building block to measure a physical quantity.

- **Minimum eight experiments to be performed from the list**

Expt. No.	Title of the experiment
1	Identification, study & demonstration of different sensors.
2	Design & Development of pneumatic cylinder using single acting & double acting cylinder.
3	Design & Development of pneumatic circuit for cylinder sequencing.
4	Trace and Interpret and Demonstrate working of Electrohydraulic system
5	To design & develop a measurement system using Data Acquisition System & LabVIEW software.
6	To Verify the truth tables of logic gates using Transistor-Transistor-Logic (TTL) Integrated Circuits ICs.
7	To study and demonstrate the working of Digital to Analog Converter.
8	To study and demonstrate the working of Analog to Digital Converter.
9	Development of ladder diagram, programming using PLC for Lift / elevator control.
10	Development of ladder diagram, programming using PLC for conveyor belt.

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Mechatronics	W. Bolton		Pearson Education Ltd
2.	Sensors and Transducers	D. Patranabis		PHI Publication
3.	Mechatronics Integrated Mechanical Electronics Systems	K P Ramchandran, G K Vijayaraghavan, M S Balasundaram		Wiley

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