FIFTH SEMESTER

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
				L	T	P		Continual Assessment	End Sem Examination	Total
1	PCC	**23II501T**	Embedded Systems for IoT	**4**	**-**	**-**	**4**	**30**	**70**	**100**
2	PCC	**23II501P**	Embedded Systems for IoT Lab	**-**	**-**	**2**	**1**	**25**	**25**	**50**
3	PCC	**23II502T**	Database Management Systems	**4**	**-**	**-**	**4**	**30**	**70**	**100**
4	PCC	**23II502P**	Database Management Systems Lab	**-**	**-**	**2**	**1**	**25**	**25**	**50**
5	PCC	**23II503T**	Operating Systems	**3**	**-**	**-**	**3**	**30**	**70**	**100**
6	PEC	**23II504T**	Professional Elective – I	**3**	**-**	**-**	**3**	**30**	**70**	**100**
7	OE	**23II561O**	Open Elective – II	**3**	**-**	**-**	**3**	**30**	**70**	**100**
8	VSC	**23II505T**	Technical Skill Development – II	**2**	**-**	**-**	**2**	**50**	**-**	**50**
9	SEC	**23II506P**	Career Development – V	**-**	**-**	**2**	**1**	**50**	**-**	**50**
			Total	**19**	**0**	**6**	**22**	**300**	**400**	**700**
12	MDM	**23II531M**	Multidisciplinary Minor – III	**3**	**-**	**-**	**3**	**30**	**70**	**100**
			Total	**22**	**0**	**6**	**25**	**330**	**470**	**800**

Open Elective – II	
23II561O (i)	IoT Connectivity and Communication Protocols
23II561O (ii)	Fundamentals of Industrial Automation

Professional Elective- I	
23II504T (i)	Computer Architecture and Organization
23II504T (ii)	Signal Processing

Multidisciplinary Minor - III	
23II531M	Introduction to IoT

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II501T	Embedded Systems for IoT	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To Understand the Requirements & Design issues of embedded systems design. ● To study the architecture and Programming of ARM processor using Assembly & Embedded C language ● To understand interfacing of various peripherals with ARM Processor. ● To study the concept of Real Time Operating System for embedded system design.	Student will be able to ● To Describe and analyse the Requirements & Design issues of embedded systems design. ● To apply the knowledge of architecture and Programming of for development of simple applications. ● To Describe and Demonstrate the interfacing of various peripherals with ARM Processor. ● To explain the concept of Real Time Operating System for embedded system design. ● To demonstrate the working of Raspberry Pi, its features and how various components can be used with Pi.

UNIT-I The concept of embedded systems design **[8 Hrs]**

History, Definition, and Classification of Embedded System, Design Metric & Its optimization, Embedded System Design Challenges, Processor selection Criteria, Building blocks of typical Embedded System – Core Types, Memory Architecture, Memory & Its Types, Sensors & Actuators, Communication Interfaces and Other system components and software architecture, Design tradeoffs due to process compatibility, thermal considerations, recent trends in embedded systems.

UNIT-II Technological aspects of embedded systems, Embedded microcontroller cores **[8 Hrs]**

Interrupt Service Mechanism, Context Switching, Device Drivers, Pin Configuration and Block Diagram of ARM7TDMI Microcontroller, Core of ARM7TDMI and Interrupt structure, Programming Model, Operating Modes, Exceptions and Interrupt Mechanism

UNIT-III Interfacing with external systems **[8 Hrs]**

Instruction set and Programming of ARM7TDMI Microcontroller using Assembly & Embedded C, Interfacing of external devices like LED's, 7--segment display, Switches, Multiplexed Keyboard, Stepper motor, concept of Timers and Counters ARM7TDMI Microcontroller. Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller

UNIT-IV Power Management and Real Time Operating System **[7 Hrs]**

Power consumption in embedded systems, Techniques for power optimization, Energy harvesting solutions, Implementing low-power modes in microcontrollers, Introduction to RTOS concepts, Task scheduling and resource management, Implementing an RTOS in IoT devices, Resource Management and concepts of Semaphore, Mailbox, Message queues, Pipes, Events, Timers, Memory Management

UNIT-V Introduction to Raspberry Pi **[9 Hrs]**

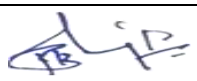
Basic Architecture, Specification, Raspberry Pi GPIO, Raspberry Pi pin configuration, Communication with devices through the pins of the Raspberry Pi, RPi.GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access , Interfacing Hardware with the Raspberry Pi, GPIO Control over Web Browser

Text Books

S. No	Title	Authors	Edition	Publisher
1	Embedded Systems	Raj Kamal		TMH Publications
2	Embedded System Design	Frank Vahid	New edition 2001	Wiley Publications
3.	Programming the Raspberry Pi: Getting Started with Python	Simon Monk		Mc Graw Hill Professional

Reference Books

S. No	Title	Authors	Edition	Publisher
1	Embedded System Design	Steve Heath		Neuwans Publications
2	Learning Python with Raspberry Pi	Oliver Theobald		John Wiley & Sons

		July 2025	1.0	Applicable for 2025-26
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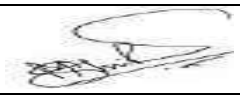
FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II501P	Embedded Systems for IoT Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
To be familiar with ARM7 software & KITS. To enhance the ability of logical thinking so that student will be design an algorithm and program	• Apply the knowledge of Instruction skill for the Development of Simple and Complex Programs. • Apply the programming skill for the Development of Simple application. • Apply and Demonstrate the Concept of Interfacing for the Development of Embedded System.

Expt. No.	Title of the experiment
1	To study the ARM Development Board.
2	To Write & Demonstrate the program display various pattern on leds Using ARM DEVELOPMENT BOARD.
3	To Write & Demonstrate the program to read switch status and displayed in point LEDs Using ARM Development Board.
4	To Write & Demonstrate the program for display of number from 0 to 9 on seven segment display Using ARM Development Board.
5	To Write and demonstrate the program for interfacing of a stepper motor and Rotate it in clockwise & anti-clock wise direction with equal delay Using ARM Development Board.
6	To Write and demonstrate the program for interfacing LCD Using ARM Development Board.
7	To Write & Demonstrate the program to demonstrate working of DAC Using ARM Development Board.
8	To Write & Demonstrate the program to demonstrate working of ADC Using Development Board.
9	To develop a 'C' code to create a mailbox and to understand the RTOS functions
10	To interface led with Arduino/ Raspberry Pi and write a program to control it through WiFi
11	Interfacing EPROM and interrupt

S.N	Title	Authors	Edition	Publisher
1	Embedded Systems	Raj Kamal		TMH Publications
2	Embedded System Design	Frank Vahid	New edition 2001	Wiley Publications
3.	Programming the Raspberry Pi: Getting Started with Python	Simon Monk		McGraw Hill Professional

		July 2025	1.0	Applicable for 2025-26
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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II502T	Database Management Systems	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To provide understanding of issues involved in design, implementation & manipulation of a relational DBMS ● To enable the student to design and build simple database systems and demonstrate the competence with the fundamental tasks involved with modeling, designing and implementing a DBMS. ● To develop comprehension of essential concepts of normalization, concurrency, integrity and security along with the advancements in DBMS	**Students will be able to** ● Analyze data storage problem and derive an data model expressed ● To understand entity relationship or relational model ● Criticize a database design and improve the design using normalization process ● Understand query processing, optimization and storage structure of database ● Use the concepts of concurrency control, transaction management, scheduling, recovery while working in a database environment

Unit I **[8Hrs]**

Introduction: DBMS Architecture, Data Models,

Relational Model: Entity-Relationship model, Relational model, Database schema, Keys, Relational query languages: Relational algebra, SQL

Unit II **[8Hrs]**

Relational Database Design: Dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, Normalization - 1NF, 2NF, 3NF and BCNF, Non-loss Decomposition & Dependency preservation, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF

Unit III **[10Hrs]**

Query Processing &Optimization: Query Processing, Evaluation of relational algebra expressions, Algorithms for SELECT and JOIN operations, Query optimization using Heuristics and Cost Estimation., Materialized Views

Storage Structure &strategies: RAID, Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing

Unit IV **[6Hrs]**

Transaction Processing: Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking –

Database Recovery: Failures and their classification, recovery and atomicity, recovery algorithms

Unit V **[8Hrs]**

Big Data & NoSQL databases: Big Data: Introduction to Big Data & Big Data Challenges, Hadoop & its Features, Hadoop Ecosystem,

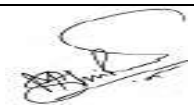
NoSQL Database: Concepts and evolution, Characteristics and significance, Key-value database, Graph Databases, Document Databases

Text Books

S.No.	Title	Authors	Edition	Publisher
1	Database System Concepts	Henry F. Korth, Abraham Silberschatz, S.Sudarshan		Mcgraw Hill Education
2	Learning SQL	Alan Beaulieu		O'Reilly Publications
3	The Art of SQL	Stephane Faroult, Peter Robson		O'Reilly Media

Reference Books

S. No.	Title	Authors	Edition	Publisher
1	An Introduction to Database Systems	C.J.Date, A.Kannan, S.Swamynathan	8th Edition	Pearson Education
2	Next-Generation Databases	Guy Harrison.		Apress

		July 2025	1.0	Applicable for 2025-26
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ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.Tech. Scheme of Examination & Syllabus 2023-24

Industrial IoT

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II502P	Database Management Systems Lab			2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended ● To provide ability to the student to design & implement a application based Database Management system and manipulate using SQL. ● To enable the student to work conveniently on modern tools of database management.	**Students will be able to** ● Analyze data storage problem and derive a data model expressed in the form of an entity relationship or relational model ● Use a SQL relational DBMS package to create, secure, populate, maintain, and query a database. ● Implement an application to access a database using ODBC/JDBC connectivity

Expt. No.	Title of the experiment
1	Introduction to SQL and DML query solving using SQL simulator sql-ex.ru
2	Data definition, constraints, and schema design.
3	Design, develop, and implement the specified queries for the above design using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
4	Demonstration of Views, Procedures, Functions & Triggers
5	Mini project on case study using Database Connectivity with Front End Tools

Text Books

S.N	Title	Authors	Edition	Publisher
1	Database System Concepts	Henry F. Korth, Abraham Silberschatz, S.Sudarshan		Mcgraw Hill Education
2	Learning SQL	Alan Beaulieu		O'Reilly Publications
3	The Art of SQL	Stephane Faroult, Peter Robson		O'Reilly Media

Reference Books

S.N	Title	Authors	Edition	Publisher
1	An Introduction to Database Systems	C.J.Date, A.Kannan, S.Swamynathan	8th Edition	Pearson Education
2	Next-Generation Databases	Guy Harrison.		Apress

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II503T	Operating Systems	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • Make the students familiar with the basics of Operating system • Introduce the notation of process, various features of process, CPU scheduling algorithm • Discuss the goal and principles of system protection & Security in modern computer system	**Course Outcomes:** **Students will be able to** • Describe basic concept of Operating System. • Identify and solve problems involving process management & memory management. • Understand the Process synchronization in operating system. • Identify and solve problems involving in memory management issues. • Demonstrate security issues

Unit I	**[8 Hrs]**
Importance of Operating Systems, Basic Concepts, and Terminology, An Operating System Architecture, types of Operating System, Operating System as a Manager: Manager Memory Management Functions, Processor Management Functions, Device Management Functions, Information Management Functions, Files and Security, System calls for Process Management, File Management and Directory Management.	
Unit II	**[9 Hrs]**
Management Processes Concept: Processes and Threads. Process Model and Thread Model. Job Scheduler, Process Scheduling, operation on the process,. Overview of Inter-process communication: Race Conditions, Critical Regions, Mutual Exclusion with busy waiting etc..CPU Scheduling: Introduction to Scheduling, Scheduling criteria, Scheduling Algorithms, Algorithm Evaluation and Scheduling in different Systems.	
Unit III	**[8 Hrs]**
Process Synchronization Synchronization Hardware, Semaphores, and Classical Problem of Synchronization, Monitors and Atomic Transaction Introduction to Deadlocks: Graphical representation of a deadlock,Deadlock strategies: Ignore a deadlock,detect a deadlock ,Recover from a deadlock ,Prevent a deadlock, Avoid a deadlock	
Unit IV	**[8 Hrs]**
Memory Management :Single Contiguous Memory Management ,Fixed Partition Memory Management : Introduction ,Allocation Algorithm,swapping , relocation and address traslation Variable Parttion: Introduction ,Allocation Algorithm,swapping ,relocation and address translation, Non-contiguous Allocation -general concepts	
Unit V	**[7 Hrs]**
Paging, Segmentation, Virtual Memory Management system :general concepts, Page replacement algorithm Operating system Security and protection, Introduction, Security Threats, Attacks on Security, Security Violation through parameters, Computer Worms	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Operating System	A. Godbole	3rd Edition	McGraw-Hill.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Operating System Concepts	Silberschatz, Galvin	8 or 10th edition	Wiley

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II504T (i)	PE - I Computer Architecture and Organization	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to provide comprehensive understanding of the basic principles and concepts in computer architecture and organization, including data representation, computer arithmetic, memory system and multiprocessors along with pipeline & vector processing	Students will be able To understand structure of computers, register transfer & micro-operations To understand basic computer organization & design To explain the micro-programmed and the concepts behind computer arithmetic To understand the concepts behind the memory system To explain the concepts involved in multiprocessors and pipeline & vector processing

Unit I [6Hrs]

STRUCTURE OF COMPUTERS: Computer types, functional units, basic operational concepts, Von-Neumann architecture, bus structures, software, performance, multiprocessors and multicomputer, Data representation. **REGISTER TRANSFER AND MICRO-OPERATIONS**: Register transfer language, register transfer, bus and memory transfers, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit

Unit II [9Hrs]

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, computer registers, computer instructions, instruction cycle, timing and control, memory-reference instructions, input-output and interrupt. **CENTRAL PROCESSING UNIT**: Stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, Reduced Instruction Set Computer (RISC).

Unit III [9Hrs]

MICRO-PROGRAMMED CONTROL: Control memory, address sequencing, micro-program example, design of control unit. COMPUTER ARITHMETIC: Addition and subtraction, multiplication and division algorithms, floating-point arithmetic operation, decimal arithmetic unit, decimal arithmetic operations.

Unit IV

[6Hrs]

THE MEMORY SYSTEM: Basic concepts, semiconductor RAM types of read - only memory, (ROM), cache memory, performance considerations, virtual memory, secondary storage, RAID, direct memory access (DMA).

UNIT V [10Hrs]

MULTIPROCESSORS: Characteristics of multiprocessors, interconnection structures, inter processor arbitration, inter processor communication and synchronization, cache coherence, shared memory multiprocessors. **PIPELINE & VECTOR PROCESSING**: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC pipeline, Vector Processing, Array Processors

Text Books

S. No.	Title	Authors	Edition	Publisher
1	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	V	Mc Graw Hill
2	Computer System Architecture	M. Morris Mano	III	Pearson Edn.

Reference Books

S. No.	Title	Authors	Edition	Publisher
1	Computer Organization & Architecture	William Stallings	V	Pearson Edn.
2	Computer Architecture & Organization	John P Hayes	III	Tata Mc Graw Hill

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B. Tech. Scheme of Examination & Syllabus 2023-24

INDUSTRIAL IoT

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II504T (ii)	PE-I Signal Processing	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
Understand the fundamental concepts of signals and systems, including their classifications, representations, and operations, enabling students to analyze and manipulate both continuous and discrete signals. Develop proficiency in the application of Fourier Series, Fourier Transform, and Z-Transform to analyze periodic and non-periodic signals, providing a strong foundation for studying signal behavior in both time and frequency domains. Gain practical skills in digital signal processing techniques, with an emphasis on discrete-time systems, the Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT), preparing students to analyze and design systems in real-world signal processing applications.	Students will be able to classify, represent, and perform basic operations on various types of signals and systems. Students will be able to apply Fourier Series and Fourier Transform to analyze periodic and non-periodic signals in both time and frequency domains. Students will develop the ability to analyze and process discrete-time signals using basic digital signal processing techniques, including convolution and correlation. Students will gain the skills to analyze discrete-time systems and solve difference equations using the z-transform and its properties. Students will be able to compute and apply the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) for efficient signal analysis and system design.

Unit I: INTRODUCTION TO SIGNALS AND SYSTEMS	**[4 Hrs]**
Representation of Signals, Elementary Signals, Basic Operations on Signals, Classification of Signals, Classification of Systems, Properties of Systems	
Unit II: FOURIER SERIES AND FOURIER TRANSFORM	**[10 Hrs]**
Fourier Series, Existence of Fourier Series, Different forms of Fourier Series, Wave Symmetry, Fourier Spectrum, Power Representation using Fourier Series, Fourier Transform Representation of Non-periodic Signals, Magnitude and Phase Representation of Fourier Transform, Existence of Fourier Transform, Fourier Transform of Standard Signals, Properties of Continuous Time Fourier Transform, Fourier Transform of a Periodic Signal, System Analysis with Fourier Transform	
Unit III: DIGITAL SIGNAL PROCESSING ESSENTIALS	**[8 Hrs]**
Basic Elements of a Digital Signal processing System, Advantages of Digital over Analog Signal Processing, The Concept of Frequency in Continuous-Time and Discrete-Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Discrete-Time Signals and Systems, Discrete Convolution and Correlation	
Unit IV: Z-TRANSFORM	**[8 Hrs]**
The *z* – transform, Properties of the ROC, Properties of *z* – transform, Rational *z* – transforms, Inverse *z* – transform, one sided *z* – transform, Analysis of Linear Time Invariant Systems in the z - Domain, Solution of Difference Equations using z-transforms, Deconvolution using z - transform	
Unit V: DISCRETE & FAST FOURIER TRANSFORM	**[10 Hrs]**
Discrete Fourier Series (DFS), Properties of DFS, The Discrete Fourier Transform (DFT), Relationship of the DFT to other transforms, Properties of DFT, Comparison between Circular Convolution and Linear Convolution, Evaluation of Circular Convolution, Linear Convolution from Circular Convolution, Filtering long Duration Sequences, Direct Evaluation of DFT, The Fast Fourier Transform (FFT), Decimation in Time (DIT) and Decimation in Frequency (DIF) algorithms, IDFT using FFT Algorithm	

TEXT BOOKS

S. No.	Title	Authors	Edition	Publisher
1	Digital Signal Processing	John G. Proakis, Dimitris G. Manolakis	III	Prentice Hall India
2	Digital Signal Processing	A. Anand Kumar	II	Prentice Hall
3	Digital Signal Processing	P. Ramesh Babu	IV	Scitech Publication

REFERENCE BOOKS

S. No.	Title	Authors	Edition	Publisher
1	Discrete Time Signal Processing	Alan V. Oppenheim, Ronald W. Schafer	II	Prentice Hall India
2	Fundamentals of Digital Signal Processing using MATLAB	Robert J. Schilling, Sandra L. Harris	---	Tata McGraw Hill

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II531M	Introduction to IoT	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
Students will be able to: • To understand the fundamentals of networking and different network configurations and models relevant to IoT. • To provide an overview of IoT, its characteristics, and various applications. • To understand the role of sensors and actuators in IoT systems, including their types and characteristics. • To introduce IoT development platforms and communication protocols essential for data transmission. • To explore real-world IoT applications and the challenges associated with their implementation.	**Students will be able to:** • Identify and explain the basic types of networks and configurations like LAN, WAN, MAN, and gateways also compare OSI and TCP/IP layered network models. • Define IoT and explain its key characteristics and application domains also evaluate different IoT connectivity options. • Classify and Explain how sensors and actuators interact in an IoT environment. • Understand development platforms like Arduino and Raspberry Pi also analyze the suitability of protocols for specific IoT applications. • Evaluate the impact and scalability of IoT systems in different domains and the challenges.

Unit I: BASICS OF NETWORKING	**[6 Hrs]**
Basics of Networking: Introduction, Network Types, Network Configurations: LAN, WAN, MAN, Gateway, Layered Network Model: OSI and TCP/IP Model, IPv4, IPV6, Wireless Sensor Networks, Machine to Machine Communication	
Unit II: INTRODUCTION TO IoT	**[10 Hrs]**
IoT Definition, Characteristics, Applications, IoT versus: M2M, CPS, WoT, IoT Enabling IoT and Complex Interdependence of Technologies, IoT Connectivity Technologies: RFID, Zigbee, Bluetooth, IEEE802.15.4, Ethernet, WiFI, LORA	
Unit III: IoT SENSING AND ACTUATION	**[8 Hrs]**
Introduction to Sensor, Sensor Characteristics, Sensing Types, Sensing Consideration, Types of Sensors: Temperature, Humidity, Light, Sound, Actuators, Actuator Types: Hydraulic, Pneumatic, Electric, Mechanical, Actuator Characteristics,	
Unit IV: IoT PLATFORMS AND PROTOCOLS	**[8 Hrs]**
Introduction to Arduino, Introduction to Raspberry Pi, Data formats, Data Protocols: MQTT, CoAP, AMQP, XMPP, REST, WebSocket, SOAP, Infrastructure Protocol: 6LoWPAN	
Unit V: IoT CASE STUDIES	**[8 Hrs]**
Challenges Associated with IoT, Agriculture IoT, Vehicular IoT, Healthcare IoT, Smart City, Smart Homes, Smart Grid, Industrial Iot.	

TEXT BOOKS

S. No.	Title	Authors	Edition	Publisher
1	Introduction to IoT	S. Misra, A. Mukherjee, and A. Roy		Cambridge University Press
2	Introduction to Industrial Internet of Things and Industry 4.0	S. Misra, C. Roy, and A. Mukherjee		CRC Press.

REFERENCE BOOK / NPTEL Course Link

S. No.	Title	Authors	Edition	Publisher
1	Internet of Things: A Hands-on Approach	Arshdeep Bahga, Vijay Madisetti		Universities Press
2	https://onlinecourses.nptel.ac.in/noc24_cs115/preview	Sudip Misra	---	---

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II561O	IoT Connectivity and Communication Protocols	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
To impart a comprehensive understanding and knowledge of the different IoT communication and connectivity technologies along with the interoperability of IoT systems	1. Understand the basic principles involved in IoT systems 2. Understand and gain comprehensive understanding of different IoT Networking and Addressing issues 3. Understand and gain comprehensive understanding of different IoT Connectivity Technologies 4. Understand and gain comprehensive understanding of different IoT Communication Technologies 5. Analyze and gain an in-depth understanding of the issues related to IoT interoperability

Unit I: Emergence of IoT and Architecture **[09 Hrs]**

Introduction and Evolution of IoT, Definition and characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Levels and Deployment Templates, IoT and M2M: differences, SDN and NFV for IoT, Enabling IoT and the Complex Interdependence of Technologies.

Unit II: IoT Networking and Addressing **[09 Hrs]**

IoT Networking Components, Addressing Strategies in IoT, IoT Processing Topologies and Types, Data Format and Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.

Unit III: IoT Connectivity Technologies **[10 Hrs]**

IoT Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Wi-Fi, Bluetooth.

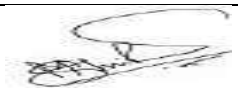
Unit IV: IoT Communication Protocols **[10 Hrs]**

Introduction, Infrastructure Protocols: LOADng, RPL, Micro Internet Protocol (uIP), Nano Internet Protocol (nanoIP). Data Protocols: MQTT, CoAP, AMQP, Identification Protocols: EPC, URIs.

Unit V: IoT Interoperability and Standards **[07 Hrs]**

Introduction to Interoperability in IoT, Taxonomy of interoperability: Type and Levels, Importance of Interoperability for IoT Ecosystems, Overview of Key IoT Standards and Protocols: DLNA (Digital Living Network Alliance), KNX (Konnex) Standard for Home and Building Automation

S.No	Title	Authors	Edition	Publisher
1.	Introduction to IoT	Sudip Misra, Anandrup Mukherjee, Arijit Roy	1st edition	Cambridge University Press
2.	Internet of Things	Jeeva Jose	1st edition	Khana Publishers
3.	Internet of Things– A Hands-on Approach	Arshdeep Bahga, Vijay Madisetti,		Universities Press, 2015.

		July 2025	1.1	Applicable for 2025-25
Chairman - BoS	Dean – Academics	Date of Release	Version	