ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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

B. Tech. Scheme of Examination & Syllabus 2024-25

INDUSTRIAL IoT

SEMESTER V

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks				Minimum Passing Marks	No. of Hrs. for ESE
				L	T	P		Mid Sem Examination	Continual Assessment	End Sem Examination	Total		
1.	PCC	**24II501T**	Operating Systems	3	-	-	3	20	20	60	100	45	03
2.	PCC	**24II502T**	Embedded Systems for IoT	3	-	-	3	20	20	60	100	45	03
3.	PCC	**24II502P**	Embedded Systems for IoT Lab	-	-	2	1	-	25	25	50	25	-
4.	PCC	**24II503T**	Database Management Systems	3	-	-	3	20	20	60	100	45	03
5.	PCC	**24II503P**	Database Management Systems Lab	-	-	2	1	-	25	25	50	25	-
6.	PEC	**24II504T**	Program Elective – I (Refer PE Basket)	3	-	-	3	20	20	60	100	45	03
7.	VSC	**24II505P**	Technical Skill Development – II	-	-	4	2	-	50	-	50	25	-
8.	SEC	**24II541P**	Career Development - V	-	-	2	1	-	50	-	50	25	-
9.	MDM	**24II531M**	MDM – III (Refer MDM Basket)	3	-	-	3	20	20	60	100	45	03
			Total	**15**		**10**	**20**	**100**	**250**	**350**	**700**		

Program Elective - I	
24II504T (i)	Control Systems
24II504T (ii)	Signals and Systems

Multidisciplinary Minor - III	
24II531M	IoT Connectivity and Communication Protocols

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		Date of Release	Version	

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II501T	Operating Systems	3	---	---	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended to 1. Make the students familiar with the basics of Operating system 2. Introduce the notation of process, various features of process, CPU scheduling algorithm 3. Discuss the goal and principles of system protection & Security in modern computer system	**Students will be able to** 1. Describe basic concept of Operating System. 2. Identify and solve problems involving process management & memory management. 3. Understand the Process synchronization in operating system. 4. Identify and solve problems involving in memory management issues. 5. Demonstrate security issues

Unit I	**[10 Hrs]**
Unit I : 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	**[10 Hrs]**
Unit II : 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	**[9 Hrs]**
Unit III :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 traslation,Non-contiguous Allocation -general concepts	
Unit V	**[8 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	The 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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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II502T	Embedded Systems for IoT	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended 1. To Understand the Requirements & Design issues of embedded systems design. 2. To study the architecture and Programming of ARM processor using Assembly & Embedded C language 3. To understand interfacing of various peripherals with ARM Processor. 4. To study the concept of Real Time Operating System for embedded system design.	Student will be able to 1. To Describe and analyse the Requirements & Design issues of embedded systems design. 2. To apply the knowledge of architecture and Programming of for development of simple applications. 3. To Describe and Demonstrate the interfacing of various peripherals with ARM Processor. 4. To explain the concept of Real Time Operating System for embedded system design. 5. 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 [10 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 [10 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 [9 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 [8 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 [8 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.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

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Embedded System Design	Steve Heath		Neuwans Publications
2	Learning Python with Raspberry Pi	Oliver Theobald		JohnWiley & Sons

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
24II502P	Embedded Systems for IoT Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
1. To be familiar with ARM7 software & KITS. 2. To enhance the ability of logical thinking so that student will be design an algorithm and program	1. Apply the knowledge of Instruction skill for the Development of Simple and Complex Programs. 2. Apply the programming skill for the Development of Simple application. 3. 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

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II503T	Database Management Systems	3	---	---	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended 1. To provide understanding of issues involved in design, implementation & manipulation of a relational DBMS 2. 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. 3. To develop comprehension of essential concepts of normalization, concurrency, integrity and security along with the advancements in DBMS	**Students will be able to** 1. Analyze data storage problem and derive an data model expressed. 2. To understand entity relationship or relational model. 3. Criticize a database design and improve the design using normalization process. 4. Understand query processing, optimization and storage structure of database. 5. Use the concepts of concurrency control, transaction management, scheduling, recovery while working in a database environment.

Unit I	**[9 Hrs]**
Introduction: DBMS Architecture, Data Models, **Relational Model: Entity**-Relationship model, Relational model, Database schema, Keys, Relational query languages: Relational algebra, SQL	
Unit II	**[9 Hrs]**
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	**[8 Hrs]**
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	**[9 Hrs]**
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

	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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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
24II503P	Database Management Systems Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. To understand and apply database creation and definition concepts using PostgreSQL, including execution of DDL and DML commands. 2. To develop proficiency in writing SQL queries by applying constraints and using clauses such as WHERE, ORDER BY, GROUP BY, HAVING, DISTINCT, and operators/functions. 3. To analyze and manipulate relational data using advanced SQL features including JOIN operations and SET operations. 4. To implement database security and transaction management using DCL and TCL commands in PostgreSQL 5. To design and implement procedural database programs using PL/SQL, including user-defined functions.	**Students will be able to** 1. Explain the fundamental concepts of databases and extend DDL, DML, DCL, and TCL commands in PostgreSQL. 2. Apply SQL queries using constraints, clauses (WHERE, ORDER BY, GROUP BY, HAVING, DISTINCT). 3. Construct and execute SQL queries involving JOINs and SET operations to combine and analyze data from multiple tables. 4. Analyze database transactions and implement access control using TCL and DCL commands in PostgreSQL. 5. Develop and analyze PL/SQL programs using user-defined functions for solving database-related problems.

Expt No.	Title of the experiment
1	**Create the database in postgres SQL and perform the DDL Commands.**
2	**Construct a Database in SQL and perform the DML commands.**
3	**Implementation of SQL Query for Constraints.**
4	**Demonstrate the working of PostgreSQL Select with Where, Orderby, Fetch clause, IN operator and length function.**
5	**Demonstrate the working of PostgreSQL Select with Group By Clause, having clause, With clause, Like clause & Distinct keyword.**
6	**Implementation of DCL (Data Control Language) commands in PostgreSQL.**
7	**To perform the TCL (Transaction control) commands on relation student or employee.**
8	**To perform JOIN and SET Operation on Company & Department relation.**
9	**Implement the program using PL/SQL to demonstrate the use of user defined function.**

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

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S.N	Title	Authors	Edition	Publisher
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2	Next-Generation Databases	Guy Harrison.		Apress

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II504T(i)	PE – I Control Systems	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
1. To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified 2. To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions 3. Formulate different types of analysis in frequency domain to explain the nature of stability of the system.	**Students will be able to** 1. Classify control systems and represent in various models 2. Apply standard test signals to a system to determine their characteristics 3. Apply stability concepts to obtain the desired characteristics 4. Determine the characteristics of a linear control system using root locus 5. Determine the characteristics of a linear control system in frequency domain

Unit I: Introduction	**[09 Hrs]**
Concepts of control systems. Examples of control systems, classification of control systems, Block diagram algebra, Representation by Signal flow graph. Reduction using Mason's gain formula. Feedback Characteristics, Effects of feedback. Mathematical modelling of systems – Electrical, mechanical translational and rotational systems.	
Unit II : Time domain analysis	**[09 Hrs]**
Time response of system, first order and second order system, standard inputs, concept of gain and time constant. Steady state error, type of control system, approximates methods for higher order system.	
Unit III : Stability of control system	**[09 Hrs]**
Stability of control systems, condition of stability, characteristics equation, Routh Hurwitz criterion, special cases for determining relative stability.	
Unit IV : Stability Analysis in S-Domain	**[09 Hrs]**
Construction of Root locus. Effects of adding poles and zeros to open loop transfer function on the root loci.	
Unit V : Frequency response analysis	**[09 Hrs]**
Correlation between time and frequency responses. Determination of frequency domain specifications, Gain margin and Phase margin -Stability Analysis from Bode Plots and Polar plots.	

Text Books

S. N.	Title	Authors	Edition	Publisher
1	Automatic Control Systems	B.K. Kuo	First Edition	PHI
2	Control Systems Engineering	M. Gopal	2008	TMH ,

Reference Books

T. N.	Title	Authors	Edition	Publisher
1	Modern Control Engineering	Ogata	2011	Prentice Hall of India
2	Control Systems Engineering	Nise	3rd Edition 2000	John Wiley

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II504T (ii)	PE-I Signals and Systems	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
1. The primary objective of this course is to provide a thorough understanding and analysis of signals and systems 2. Understand different concepts in the context of signals & systems and lay down the foundation for advanced courses in telecommunication engineering	3. After completion of the course students are able to, Define & classify signals along with their mathematical representation, basic operations on signals and their properties 4. Define & classify systems along with properties, interconnection their block diagram representation and description by use of differential and difference equations 5. Analyze periodic and aperiodic signals using Fourier Series and Fourier Transform 6. Analyze continuous time LTI systems using Laplace transform Analyze and explain Sampling theory involved in analysis of signals

Unit I: Signals	**[07 Hrs]**
Basics of Signals & Systems: Introduction, Continuous-Time and Discrete-Time Signals, Examples and Mathematical Representation, Classification of signals, Basic Operations on Signals, Elementary Signals, singularity functions	
Unit II: Systems	**[09 Hrs]**
Continuous-Time LTI Systems: Classification of Systems, The Convolution Integral, Properties of LTI Systems, interconnection of systems in series/parallel, Relations between LTI system properties and impulse response, Step response, Causal LTI Systems Described by Differential and Difference Equations, Block Diagram Representations of First-Order Systems.	
Unit III: Fourier Series and Fourier Transform	**[10 Hrs]**
Fourier Series representation of periodic signals: Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Representation of Aperiodic Signals: The Continuous-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, The Magnitude-Phase Representation of the Fourier Transform of LTI Systems	
Unit IV: Laplace Transform	**[10 Hrs]**
Representing signals by using CT complex exponential: Laplace transforms, poles and zeros, the region of Convergence, Inverse Laplace Transform, properties of Laplace Transform, the unilateral Laplace transform, properties of the unilateral Laplace transform, inversion of the unilateral Laplace Transform, the bilateral Laplace transform, properties of the bilateral Laplace transform, inversion of the bilateral Laplace Transform, Analysis and Characterization of LTI Systems Using the Laplace	
Unit V: Sampling Theory	**[09 Hrs]**
Introduction, Representation of a Continuous-Time Signal by Its Samples, The Sampling Theorem, Impulse-Train Sampling, Sampling with a Zero- Order Hold, Reconstruction of a Signal from Its Samples Using Interpolation, oversampling and under sampling, The Effect of Under sampling: Aliasing, Anti- Aliasing filter, Reconstruction: Ideal Inter polators, zero order hold and first order hold	

Text Books

S. N.	Title	Authors	Edition	Publisher
1	Signals and Systems	Alan V. Oppenheim and Alan S. Wilsky	II	Prentice Hall
2	Signals and Systems	Simon Haykin and Barry Van Veen	II	Wiley

Reference Books

T. N.	Title	Authors	Edition	Publisher
1	Signals and Systems	A. Anand Kumar	II	Prentice Hall
2	Signals and Systems	Tarun Rawat	II	Oxford Press

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
24CE541P	Career Development – V	-	-	2	1	50	-	50

Course Objectives	Course Outcomes
To enhance students' aptitude, analytical reasoning, communication, teamwork, and professional presentation skills required for competitive examinations, higher education, and workplace success.	**CO1.** Students will be able to solve problems related to time and work, pipe and cisterns, geometry, mensuration, and analytical puzzles using logical and quantitative reasoning skills. **CO2.** Students will be able to apply concepts of time, speed, and distance and solve coding-decoding and direction sense problems accurately using analytical thinking. **CO3.** Students will be able to perform SWOC analysis, set SMART goals, and deliver effective self-introductions with confidence and professional communication skills. **CO4** Students will be able to conduct company profile presentations and participate effectively in table topic group discussions demonstrating teamwork, critical thinking, and spontaneous speaking skills. **CO5.** Students will be able to demonstrate improved verbal ability, grammar, vocabulary, reading comprehension, and active classroom participation for professional communication.

Unit I (15marks)	**[7Hrs]**
Time and Work, Chain Rule, Pipe and Cistern, Geometry and mensuration **Puzzles:-** Analytical puzzle, Tabular Puzzle, Box or Floor based Puzzle, Rank based Puzzle	
Unit II (10marks)	**[7Hrs]**
Time Speed and Distance:- Basic Problems, Average Speed, Relative Speed, Problems on Trains, Boats and Streams, Escalators, Directions sense Problems Coding and Decoding	
Unit III (5marks)	**[5Hrs]**
SWOC Analysis and SMART Goal Setting - for Personal and Professional Development **Self-Elevator Pitch –** Self Introduction, Confidence Building, and Professional Communication Skills (5marks)	
Unit IV (10marks)	**[6Hrs]**
Company Profile Group Presentation – Research, Team Coordination, and Presentation Techniques (5marks) **Table Topic Group Discussion –** Critical Thinking, Spontaneous Speaking, and Team Interaction	
Unit V (10marks)	**[3Hrs]**
Verbal Ability Quiz – Grammar, Vocabulary Building, and Reading Comprehension for Professional Communication **Continuous Assessment -** Attendance, Individual Engagement & Team Dynamics	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude By R. S. Aggarwal	R.S. Aggarwal		
2	Quantitative Aptitude	Shripad Deo		Allied Publication
3	A Modern Approach to Verbal & Non-Verbal Reasoning	R.S. Aggarwal		

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude for CAT by Arun Sharma	Arun Sharma		
2	Developing Communication Skills	Krishna Mohan & Meera Banerji	2002	
3	Professional Communication Skills	Alok Jain	2006	S Chand & Company Ltd.
4	Personality Development & Soft Skills	Barun Mitra	2019	Cambridge University Oress

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24II531M	MDM – III IoT Connectivity and Communication Protocols	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended 1. To impart a comprehensive understanding and knowledge of the different IoT communication and connectivity technologies along with the interoperability of IoT systems	Student will be able to 1. Explain the basic principles involved in IoT systems. 2. Illustrate different IoT Networking and Addressing issues. 3. Analyze and gain an in-depth comprehensive understanding of different IoT Connectivity Technologies. 4. Analyze and gain an in-depth understanding of the 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 **[9 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 **[9 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 **[9 Hrs]**

IoT Connectivity Technologies: Introduction, Wireless HART, NFC, DASH7, Z-Wave, Weightless, SigFox, NB-IoT, Thread, ISA 100.11A

UNIT-IV IoT Communication Protocols **[9 Hrs]**

Introduction, Infrastructure Protocols: Internet protocol version 6 (IPv6), LOADng, RPL, Micro Internet Protocol (uIP), Nano Internet Protocol (nanoIP), Identification Protocols: EPC, URIs.

UNIT-V Interoperability and Standards **[9 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

Text & Reference Books

S.N	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