SEMESTER S5

IOT AND APPLICATIONS

Course Code	PEMRT525	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	5/3	Exam Hours	2 Hrs.30 Min.
Prerequisites (if any)	None	Course Type	

Course Objectives:

1. Equip students with a comprehensive understanding of IoT technology, including its architecture, enabling technologies, communication models, and protocols, to effectively design and deploy IoT systems.
2. Enable students to address IoT security, privacy, and vulnerability issues, and apply practical IoT solutions using platforms like Raspberry Pi for real-world applications such as smart cities.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to IoT technology: Definitions and Characteristics of IoT, IoT Architectural View, Physical Design of IOT, Logical Design of IoT- IoT Functional blocks, IoT communication models, IoT Enabling Technologies, IoT Levels & Deployment Templates.	9
2	IoT and M2M- M2M, Difference between IoT and M2M, SDN and NFV for IoT, Smart Objects: The "Things" in IoT: Sensors, Actuators, and Smart Objects, Sensor Networks- Wireless Sensor Networks (WSNs), Communication Protocols for Wireless Sensor Networks- Connecting Smart Objects- Communication Criteria.	9
3	Unified Data Standards –Protocols –IEEE 802.15.4 -The Physical Layer, The Media-Access	9

	Control Layer, Uses of 802.15.4, The Future of 802.15.4: 802.15.4e and 802.15.4g–Modbus– ZigBee-Zigbee Architecture- LoRaWAN -Standardization and Alliances, Physical Layer, MAC Layer, Topology, LTE-M, NB-IoT-Network layer –The next generation: IP-based protocols	
4	Raspberry-Pi-Raspberry-Pi Interfaces (serial, SPI, I2C). Raspberry Pi interfacing and programming examples using python (LED, switch, sensor, serial, SPI, I2C devices). IoT privacy, security and vulnerabilities solutions, vulnerabilities, security requirements, threat analysis, security tomography, layered attacker model, Identity management, access control, secure message communication. Smart City IoT Architecture-Street Layer, City Layer, Data Center Layer, Services Layer.	**9**

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

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Continuous Internal Evaluation Marks (CIE):

Attendance	*Internal Ex*	*Evaluate*	*Analyse*	*Total*
5	**15**	**10**	**10**	**40**

Criteria for Evaluation(Evaluate and Analyse): 20 marks

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• 2 questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. • Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the IoT fundamentals and architecture modelling	**K2**
CO2	Understand the smart things in IoT and functional blocks	**K2**
CO3	To understand the communication networks and protocols used in IoT.	**K2**
CO4	To understand the cloud resources, data analysis and applications.	**K2**
CO5	To apply the IoT processes in embedded applications.	**K4**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		1			2				2
CO2	3	3	3		3			2				2
CO3	3	3	3		3			2	3			2
CO4	3								3			2
CO5	3								3			2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Internet of Things (A Hands - on-Approach)	Vijay Madisetti and ArshdeepBahga	VPT	Ist Edition,2014
2	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry,	Cisco Press	Ist Edition,2017
3	Internet of Things: Architecture and Design Principles	Rajkamal	McGraw Hill (India)	2nd edition, 2022
4	Raspberry Pi Cookbook, Software and Hardware Problems and solutions	Simon Monk, O'Reilly (SPD)	ISBN	2016

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	"The Internet of Things –Key applications and Protocols",	Olivier Hersent, David Boswarthick, Omar Elloumi	Wiley,	2012
2	Internet of things: A survey on enabling technologies, protocols, and applications.	Al-Fuqaha *et.al*	IEEE Communications Surveys & Tutorials	(2015), pp. 2347-2376.
3	The Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems	Ovidu Vermesan and Peter Friess	River Publishers	1st edition, 2013
4	Internet of Things - From Research and Innovation to Market Deployment-	Ovidu Vermesan	River Publishers	1st edition, 2014

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2	https://nptel.ac.in/courses/106105081
3	https://nptel.ac.in/courses/108108098
4	https://onlinecourses.nptel.ac.in/noc21_cs14/preview

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