Date: 10 July 2025

Course Code: IT 412   **Course Name: Internet of Things**

Credit Points: 4   **Max. Marks: 100 (CA: 40 + ESA: 60)**

Course Instructor: Mr. Kanwaljeet Singh, Assistant Professor, Centre for Artificial Intelligence

Course Outcomes:
On completion of the course, the student will be able to:
CO 1   Understand the concept of IoT.
CO 2   Understand what constitutes an IoT design solution.
CO 3   Identify the sensors and basic electronic design needed for different IoT solutions.
CO 4   Analyze basic protocols of IoT.
CO 5   Implement basic IoT applications on Arduino and Raspberry Pi to provide IoT solutions for
        domains.

Syllabus:
Section – A
Introduction of IoT, Sensing, Actuation, Sensor Networks, Machine-to-Machine Communications M2M to
IoT Introduction, industrial structure for IoT, architecture for conversion of M2M to IoT, design principles,
capabilities of IoT, IoT network architecture, standard protocols, IoT Architecture Reference Model,
Introduction to SDN, SDN for IoT, Data Handling and Analytics, Introduction to Cloud and Fog Computing,
Sensor Cloud. Domain specific applications of IoT: Home automation, Industrial applications, Surveillance
applications, other IoT applications.
Section -- B
IoT Access Technologies: Physical and MAC layers, Bluetooth, RFID, WiMAX, topology and Security of
IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions,
Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing
protocols (Routing over Low Power and Lossy Networks) Application Transport Methods: Supervisory
Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT, Security in IoT protocols.
Section – C
Introduction to concept of IoT devices, IoT configurations, basic components, networking, sensors,
introduction to Edge computing and Embedded IoT. Introduction to Arduino, types of Arduinos, Arduino
toolchain, Arduino programming structure, Sketches, Pins, Input-output from pins using sketches,
Introduction to Arduino shields, Introduction to Raspberry-Pi microcomputer Accessing GPIO pins, Sending
and receiving signals using GPIO pins.

Suggested Books:
R1.   Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,
        Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition,
        Academic Press, 2014.
R2.   Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT,
        2014. R3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting
        Everything", 1st Edition, Apress Publications, 2013.
R3.   Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",
        1st Edition, Apress Publications, 2013

Suggested E-Learning Materials:
E1.   https://onlinecourses.nptel.ac.in/noc19_cs31
E2.   https://www.edx.org/course/introduction-to-the-internet-of-things-iot-1
E3.   https://alison.com/course/ xee100-introduction internet-of-things-and-the-cloud
E4.   https://online.stanford.edu/courses/ -internet-things

Assessment Schedule:

Component	Marks	Submission/ Examination date	Allotment
Home assignment 1**	10	17 August, 2025	Topics shall be allotted in the class by 1 August 2025
Periodical test I	10	29 August - 1 September, 2025*	Lecture No. 01 to 21
Home assignment II**	10	19 September, 2025	Topics shall be allotted in the class by 3 September, 2025
Periodical test II	10	12-16 October, 2025*	Lecture No. 22 to 40
Semester Examination	60	1-19 December, 2025*	Lecture No. 01 to 50 (Entire Syllabus)

Subject to change.
***Evaluation is based on written document, test, viva and any other component(s) as decided by the instructor(s) on regular.*

Lecture-Wise Schedule:

Lect. No.	Topics to be covered	Text/Ref. Books
	SECTION A	
1-3	**Introduction of IoT, M2M (Machine-to-Machine) towards IoT-the global context, Differing Characteristics.**	**R1**
4-7	**M2M to IoT – Introduction, Some Definitions, industrial structure for IoT, architecture for conversion of M2M to IoT**	**R1/R2**
8-11	**Design principles, capabilities of IoT, IoT architecture, standard protocol, IoT Architecture Reference Model**	**R1/R2**
12-15	**Functional View, Information View, Deployment and Operational View**	**R1/R2**
16-18	**Introduction to SDN, SDN for IoT, Data Handling and Analytics, Introduction to Cloud and Fog Computing, Sensor Cloud.**	**R1/R2**
19-21	**Domain specific applications of IoT: Home automation, Industrial applications, Surveillance applications, Other IoT applications**	**R1/R2**
	SECTION B	
22-24	**IoT Access Technologies: Physical and MAC layers, topology**	**R1/R2**
25-29	**Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN**	**R1/R2**
30-32	**Network Layer: IP versions, Constrained Nodes and Constrained Networks**	**R1/R2**
33-34	**Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks**	**R1/R2**
35-37	**Application Transport Methods: Supervisory Control and Data Acquisition**	**R1/R2**
38-39	**Application Layer Protocols: CoAP and MQTT, Security in IoT protocols.**	**R1/R2**
	SECTION C	

40-42	**Introduction to concept of IoT devices, IoT devices versus computers, IoT configurations, basic components networking, sensors,**	**R1/R2**
43-44	**Introduction to embedded systems**	**R1/R2**
45-46	**Introduction to Arduino, types of Arduino, Arduino toolchain, Arduino programming structure,**	**R1/R2**
47-48	**Sketches, Pins, Input-output from pins using sketches, Introduction to Arduino shields,**	**R1/R2**
49-50	**Introduction to Raspberry-Pi microcomputer, Accessing GPIO pins, Sending and receiving signals using GPIO pins**	**R1/R2**

(Kanwaljeet Singh)