



# JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

(Deemed University)

A-10, Sector 62, Noida, Gautam Buddh Nagar – 201 309 (U.P.)

AICTE Approved | UGC Approved | NAAC Accredited | NIRF Ranked

*An Institution Dedicated to Excellence in Higher Education*

**Introduces Online  
Certificate Courses**

## Programming in Internet of Things



### Preamble

Theory part this course enhances the learners to identify the purpose, requirements and description of various components and specifications of IoT devices, applications and protocols. The learners will be able to analyze the characteristics and functioning of various IoT specific communication protocols used in different layers of IoT devices. Further, the learners will be capable of evaluating various IoT protocols and components for building IoT applications for real world problems and sustainable solutions.

Practical part this course emphasis on fundamentals of various IoT Communication protocols, using Arduino and Raspberry Pi development boards along with sensors and actuators. The course provides hands-on experience for Applying concepts and evaluates the characteristics of different IoT devices. The learners will be able to design and develop IoT based applications for various challenges and problems related to various real-life practical problems towards sustainable Development that includes energy and waste management, water conservation, clean energy, improving public health, sustainable urbanization, smart agriculture etc.

**Duration of the Course:** 3 months

**Mode of Operation:** Blended mode(In Online/ Offline/ Blended mode)

**Number of Lectures of 1hour duration:** 24 hrs

**Number of Practical Sessions of 1 – 2 hours duration:** 24 hrs

### To be covered in each Lecture

L-1	<b>Module-1 :</b> Introduction to Internet of Things
L-2	<b>Module-1 :</b> Layers in IoT, IoT Communication Protocols at different layers,
L-3	<b>Module-1 :</b> Design steps for IoT, IoT Enabling Technologies,
L-4	<b>Module-1 :</b> IoT Levels.
L-5	<b>Module-2 :</b> Introduction to IEEE 802.15.4
L-6	<b>Module-2 :</b> The Physical Layer,
L-7	<b>Module-2 :</b> MAC Layer
L-8	<b>Module-2 :</b> MAC Layer Frame Format and their uses

L-9	<b>Module-3</b> : ZigBee Architecture,
L-10	<b>Module-3</b> : ZigBee Association,
L-11	<b>Module-3</b> : ZigBee Network Layer,
L-12	<b>Module-3</b> : Zigbee APS Layer, ZDO, Security, ZCL etc.
L-13	<b>Module-4</b> : Introduction to Arduino and Raspberry Pi,
L-14	<b>Module-4</b> : Connectivity of Arduino and Raspberry Pi with other components,
L-15	<b>Module-4</b> : Internet connectivity with Arduino and Raspberry Pi
L-16	<b>Module-4</b> : Programming of Arduino and Raspberry Pi
L-17	<b>Module-5</b> : Introduction to Internet Connecting Principles
L-18	<b>Module-5</b> : Media Access Control,
L-19	<b>Module-5</b> : IP addressing in IoT,
L-20	<b>Module-5</b> : RPL routing protocol
L-21	<b>Module-6</b> : Introduction to Application Layer Protocols
L-22	<b>Module-6</b> : MQTT,
L-23	<b>Module-6</b> : CoAP
L-24	<b>Module-6</b> : XMPP.

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1	Introduction to Internet of Things	Introduction to Internet of Things, Layers in IoT, IoT Communication Protocols at different layers, Design steps for IoT, IoT Enabling Technologies, IoT Levels.	4
2	IEEE 802.15.4	The Physical Layer, MAC Layer, MAC Layer Frame Format and their uses.	4
3	ZigBee	ZigBee Architecture, Association, ZigBee Network Layer, APS Layer, ZDO, Security, ZCL etc.	4
4	Introduction to Arduino and Raspberry Pi	Introduction to Arduino and Raspberry Pi, Connectivity with other components, internet connectivity.	4
5	Internet Connecting Principles	Media Access Control, IP addressing in IoT, RPL routing protocol.	4
6	Application Layer Protocols	MQTT, CoAP, XMPP.	4
Total			24

### To be covered in each Practical Session

<b>P-1</b>	: Introduction to Development board, sensors & Actuators
<b>P-2</b>	: Input and output pins usage for the sensor interfacing
<b>P-3</b>	: Connections using breadboard to interface sensor and actuator with development boards
<b>P-4</b>	: Program loading to the development board and viewing on serial port and output devices
<b>P-5</b>	: Programming for IoT Devices using HC- SR04 Ultrasonic Module and IR Infrared Obstacle Avoidance sensor for Arduino board
<b>P-6</b>	: Programming for IoT Devices using Soil Moisture Sensor and Microphone sensor for Arduino board
<b>P-7</b>	: Programming for IoT Devices using MQ-2 Gas sensor and SW-420 Motion sensor for Arduino board
<b>P-8</b>	: Programming for IoT Devices using DHT11 Temperature and Humidity sensor and RF 433MHz Transmitter/ Receiver for Arduino board
<b>P-9</b>	: Programming for IoT Devices using HC- SR04 Ultrasonic Module and IR Infrared Obstacle Avoidance sensor for Raspberry Pi board
<b>P-10</b>	: Programming for IoT Devices using Soil Moisture Sensor and Microphone sensor for Raspberry Pi board
<b>P-11</b>	: Programming for IoT Devices using MQ-2 Gas sensor and SW-420 Motion sensor for Raspberry Pi board
<b>P-12</b>	: Programming for IoT Devices using DHT11 Temperature and Humidity sensor and RF 433MHz Transmitter/ Receiver for Raspberry Pi board
<b>P-13</b>	: Internet Connectivity for IoT using ThingSpeak and its Features
<b>P-14</b>	: Setup of ThingSpeak to Collect data in private channels and Share data with public channels using sensor data
<b>P-15</b>	: Sensor data to ThingSpeak to create instant visualization of live data, and send alerts.

<b>P-16</b> :	Actuator Control via Thingspeak server
<b>P-17</b> :	Developing smart application for water management-1
<b>P-18</b> :	Developing smart application for water management-2
<b>P-19</b> :	Developing smart application for smart irrigation-1
<b>P-20</b> :	Developing smart application for smart home-1
<b>P-21</b> :	Developing smart application for smart home-2
<b>P-22</b> :	Developing smart application for energy saver
<b>P-23</b> :	Developing smart applications for public health care
<b>P-24</b> :	Developing smart applications for sustainable urbanization

Module No.	Title of the Module	Topics in the Module	No. of hours for the module
1	Introduction to Development board, sensors & Actuators	Study and interface of Arduino and Raspberry Pi with different types of sensors and actuators.	4
2	Programming for IoT Devices	Basic Arduino C programming.	4
3	Python for IoT Devices	Python for Raspberry Pi programming.	4
4	Internet Connectivity for IoT	Internet connectivity of IoT platform with Thingspeak cloud.	4
5	IoT Applications - Part I	Developing smart application using moisture sensor, humidity sensor, temperature sensor for water management & smart agriculture	4
6	IoT Applications - Part II	Developing smart applications using health care public health & sustainable urbanization	4
<b>Total</b>			<b>24</b>

**Pre-requisite, if any:** Basic programming in Python and C.

**Schedule of the Classes:** (Saturday/ Sunday – Duration on each day)

- Theory: Saturday - Forenoon -2 hrs
- Practical: Saturday - Forenoon -2 hrs

**Nature of the Course(Introductory/ Broad based/ Advance specialized):** Broad based

**Name of the Faculty Coordinators:** Dr. Hema N & Dr. K. Rajalakshmi

**Name(s) of the Faculty to be involved in conduction of the Course:** Dr. Hema N & Dr. K. Rajalakshmi

**Target Participants** (Professionals working in industry/ Job seekers/ Current Senior students who wish to upgrade their professional skills): All above

**Minimum Qualifications for participants** (Preferably undergraduate in any specialization also pursuing Undergraduate degree will also be considered): Undergraduates

**IPR Rights of the Content:** IIIT

**Mode of evaluation of the participants after every 7 - 10 Lecture Sessions**

- Midterm Examination (20%)
- End Term Examination (35%)
- Project (25%)
- TA(20%)

**Mode of evaluation of the participants after 3 – 4 Practical Sessions**

- Midterm Lab Examination (20%)
- End Term Lab Examination (35%)
- Project (25%)
- TA (20%)

**For course related query please mail to:** Dr. Hema N: [hema.n@jiit.ac.in](mailto:hema.n@jiit.ac.in) Dr. K. Rajalakshmi: [k.rajalakshmi@jiit.ac.in](mailto:k.rajalakshmi@jiit.ac.in)

**For course registration, click the link:** Link: <https://forms.gle/AkVidsjMp5ArfwNj7>