

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four -year B.Sc.(Hons)
Domain Subject: **Computer Science**
IV Year B. Sc.(Hons) – Semester – V

Max Marks: 100 + 50

Course 6B: INTERNET OF THINGS
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes: Students after successful completion of the course will be able to:

1. Appreciate the technology for IoT
2. Understand various concepts, terminologies and architecture of IoT systems.
3. Understand various applications of IoT
4. Learn how to use various sensors and actuators for design of IoT.
5. Learn how to connect various things to Internet.
6. Learn the skills to develop simple IOT Devices.

II. Syllabus: *(Total Hours: 90 including Teaching, Lab, Field training, Unit tests etc.)*

Unit - I (10 hours)

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

Unit - II (10 hours)

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

Unit - III (10 hours)

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet And Modbus.
IP Based Protocols for IoT IPv6, 6LowPAN, LoRA, RPL, REST, AMPQ, CoAP, MQTT.
Edge connectivity and protocols.

Unit - IV (10 hours)

Arduino Simulation Environment: Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD.

Sensor & Actuators with Arduino: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

Unit - V (10 hours)

Developing IOT's: Implementation of IoT with Arduino, Connecting and using various IoT Cloud Based Platforms such as Blynk, Thingspeak, AWS IoT, Google Cloud IoT Core etc. Cloud Computing, Fog Computing, Privacy and Security Issues in IoT.

III. References

9. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547
10. Vijay Madiseti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014
11. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
12. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
13. Open source software / learning websites
 - a. <https://github.com/connectIOT/iottoolkit>
 - b. <https://www.arduino.cc/>
 - c. https://onlinecourses.nptel.ac.in/noc17_cs22/course
 - d. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
 - e. Contiki (Open source IoT operating system)
 - f. Ardudroid (open source IoT project)
 - g. <https://blynk.io> (Mobile app)
 - h. IoT Toolkit (smart object API gateway service reference implementation)
6. Other web sources suggested by the teacher concerned and the college librarian including reading material.

IV. Co-Curricular Activities:

- a) Mandatory:** (*Training of students by teacher in field related skills: (lab: 10 + field: 05) :*
1. **For Teacher:** Field related training of students by the teacher in laboratory/field for not less than 15 hours on identifying the case study for the IoT, design an IoT solution, build physical IoT device, connect it to a mobile app and deploy the IoT device.
 2. **For Student:** Students shall (individually) search online and visit any of the places like aquaculture farms, agencies using IOT devices, etc to identify problems for IoT solution and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. Example: Choosing a Problem for IoT solution (agriculture, aquaculture, smart home appliances, testing moisture levels, oxygen levels, etc), reasons why IoT solution is feasible for the said problem, material required, Design and architecture for the proposed IoT device, method of implementation and how to connect the device to mobile.
 3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Project work Report: 05.
 4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of websites searched, place visited, observations, findings, proposed IOT problem, and design of the IOT device, implementation and acknowledgements.*
 5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments
3. Preparation and presentation of power-point slides, which include videos, animations, pictures, graphics, etc by the students.
4. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
5. Field visits to identify the problems for IoT solutions.

Course 6B: Internet of Things – PRACTICAL SYLLABUS**V. Learning Outcomes:**

On successful completion of this practical course, student shall be able to:

1. Acquire the skills to design a small IoT device.
2. Connect various sensors, actuators, etc to Arduino board.
3. Connect the things to Internet
4. Design a small mobile app to control the sensors.
5. Deploy a simple IoT device.

VI. Practical (Laboratory) Syllabus: (30 hrs)

1. Understanding Arduino UNO Board and Components
2. Installing and work with Arduino IDE
3. Blinking LED sketch with Arduino
4. Simulation of 4-Way Traffic Light with Arduino
5. Using Pulse Width Modulation
6. LED Fade Sketch and Button Sketch
7. Analog Input Sketch (Bar Graph with LEDs and Potentiometre)
8. Digital Read Serial Sketch (Working with DHT/IR/Gas or Any other Sensor)
9. Working with Adafruit Libraries in Arduino
10. Spinning a DC Motor and Motor Speed Control Sketch
11. Working with Shields
12. Design APP using Blink App or Things peak API and connect it LED bulb.
13. Design APP Using Blynk App and Connect to Temperature, magnetic Sensors.