NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF Computer Science and Engineering
COURSE PLAN – PART I

Name of the program and specialization	M.TECH Computer Science and Engineering		
Course Title	Internet of Things		
Course Code	CS626	No. of Credits	3
Course Code of Pre-requisite subject(s)	CSPC53		
Session	January 2023	Section (if, applicable)	
Name of Faculty	Madhukrishna Priyadarsini (L)	Department	CSE
Official Email	priyadarsini@nitt.edu	Telephone No.	
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	☐ Core course	✓ Elective course	

Syllabus (approved in BoS)

UNIT-I Fundamentals of IoT

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -- Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT-II IoT Protocols

IoT Access Technologies: Physical and MAC layers, 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 over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT-III Design and Development

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT-IV Data Analytics and Supporting Services

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT-V Case Studies/Industrial Applications

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Text Books
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use-Cases for Internet of Things, Cisco Press, 2017
2. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015

COURSE OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT system using Raspberry Pi
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1- Explain the concept of IoT	PO_1, PO_3, PO_6, PO_{10}, PO_{11}
2- Analyze various protocols for IoT	PO_1, PO_2, PO_{10}, PO_{11}
3- Design a PoC of an IoT system using Raspberry Pi	PO_1, PO_3, PO_5, PO_9
4- Apply data analytics and use cloud offerings related to cloud	PO_1, PO_3, PO_6, PO_{12}
5- Analyze applications of IoT in a real-time scenario	PO_3, PO_6, PO_{11}

COURSE PLAN – PART II

COURSE OVERVIEW

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	18/01/2023 to 20/01/2023 – 2 hours	Evolution of Internet of Things, Basic idea regarding IoT, IoT Architectures	**Lecture** *Chalk and Talk* *Power point presentation*
2	23/01/2023 to 27/01/2023 – 3 hours	Alternative IoT models, Simplified IoT Architecture, Core functional stack	**Lecture** *Chalk and Talk* *Power point presentation*
3	30/01/2023 to 03/02/2023 – 3 hours	Fog, Edge, Cloud in IoT, Functional blocks in a cloud ecosystem-sensors, actuators, Smart objects, Connecting smart objects	**Lecture** *Chalk and Talk* *Power point presentation*

4	06/02/2023 to 10/02/2023 – 3 hours	IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN	**Lecture** *Chalk and Talk* *Power point presentation*
5	13/02/2023 to 17/02/2023 – 3 hours	Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks	**Lecture** *Chalk and Talk* *Power point presentation*
6	20/02/2023 to 24/02/2023 – 1 hour	**Cycle Test 1**	**Written**
7	27/02/2023 to 03/03/2023 – 3 hours	Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT	**Lecture** *Chalk and Talk* *Power point presentation*
8	06/03/2023 to 10/03/2023 – 3 hours	Design Methodology – Embedded computing logic – Microcontroller, System on Chips	**Lecture** *Chalk and Talk* *Power point presentation*
9	13/03/2023 to 17/03/2023 – 3 hours	IoT system building blocks – Arduino – Board details, IDE programming, Raspberry Pi – Interfaces and Raspberry Pi with Python Programming	**Lecture** *Chalk and Talk* *Power point presentation*
10	20/03/2023 to 24/03/2023 – 1 hour	**Cycle Test 2**	**Written**
11	27/03/2023 to 31/03/2023 – 3 hours	Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning	**Lecture** *Chalk and Talk* *Power point presentation*
12	03/04/2023 to 07/04/2023 – 3 hours	No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark	**Lecture** *Chalk and Talk* *Power point presentation*
13	10/04/2023 to 14/04/2023 – 3 hours	Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework, AWS for IoT – System Management with NETCONF-YANG	**Lecture** *Chalk and Talk* *Power point presentation*
14	17/04/2023 to 21/04/2023 – 3 hours	Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model	**Lecture** *Chalk and Talk* *Power point presentation*
15	24/04/2023 to 28/04/2023 – 3 hours	Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking	**Lecture** *Chalk and Talk* *Power point presentation*

		Architecture and Smart Traffic Control	
16	01/05/2023	Compensation Assessment	Written

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1 - Theory		1 hour	15
2	Cycle Test 2 - Theory	As per schedule	1 hour	15
3	Project			20
CPA	Compensation Assessment* - Theory		1 hour	15
6	Final Assessment *		3 hrs	50

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. Students' feedback through class committee meetings
2. Feedbacks are collected before final examination through MIS or any other standard format followed by the institute
3. Students, through their Class Representatives, may give their feedback at any time to the course faculty which will be duly addressed.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Email, in-person – after 4.00 pm.
WhatsApp group

COMPENSATION ASSESSMENT POLICY

1. One compensation assessment will be given after completion of Cycle Test 1 and 2 for the students those who are absent for any assessment due to genuine reason.
2. Compensatory assessments would cover the syllabus of Cycle tests 1 & 2

3. Compensation assessment for programming assessment will be given after the 2 programming assessments and would cover the syllabus of Programming assessment 1 and 2.
4. Prior permission and required document must be submitted for absence.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

➢ At least 75% attendance in each course is mandatory.

➢ A maximum of 10% shall be allowed under On Duty (OD) category.

➢ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

➢ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

➢ The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

1. The Course Coordinator is available for consultation during the time intimated to the students then and there.
2. Relative grading adhering to the instructions from the office of the Dean (Academic) will be adopted for the course.

FOR APPROVAL

Course Faculty _____ CC- Chairperson _____ HOD _____