DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	*B. Tech.* *Electronics and Communication Engineering*		
Course Title	*Internet of Things (IoT)*		
Course Code	*ECPE 24*	**No. of Credits**	*3 (Three)*
Course Code of Pre-requisite subject(s)	*CSIR11, C/C++ and Python Programming skills*		
Session	January 2022	**Section (if, applicable)**	*Both A and B*
Name of Faculty	*Dr. M. Bhaskar*	**Department**	*ECE*
Email	*bhaskar@nitt.edu*	**Telephone No.**	*0431-2503310*
Name of Course Coordinator(s) (if, applicable)	*Nil*		
E-mail	---	**Telephone No.**	---
Course Type	☐ **Core course**	√ **Elective course**	

Syllabus (approved in BoS)

1. Introduction to IoT and IoT levels
   Functional blocks of an IoT system (Sensors, Data Ingress, Data Aggregation Point Communication point back to the cloud, Analysis, Decision making, Actuation) Basic of Physical and logical design of IoT (IoT protocols, communication models) IoT enabled domains (Home automation, Smart cities, environment monitoring, renewable energy, agriculture, industry, healthcare, marketing and management) M2M, Difference between IoT, Embedded Systems and M2M, Industry 4.0 concepts

2. IoT sensors and hardware
   Passive and active sensors, differences, Different kinds of sensors (Temperature, humidity, pressure, obstacle, water flow, accelerometer, colour, gyro, load cell, finger print, motion, ultrasonic distance, magnetic vibration, eye blink, hear beat, PPG, glucose, body position, blood pressure), Multi-sensors, Pre-processing (sampling, filtering, ADC, size of data, local memory, compression), IoT front end hardware (Raspberry Pi, Arduino, Galileo, beagle bone equivalent platforms)

3. Introduction to IoT protocols
   Infrastructure (6LowPAN, IPv4/IPv6, RPL), Identification (EPC, uCode, IPv6, URIs), Communication/ Transport (Wi-Fi, Bluetooth, ZigBee, LPWAN), Data Protocols (MQTT, CoAP, AMQP, Websocket, Node)

4. IoT Cloud and data analytics
   Collecting data from sensors, Data Ingress, Cloud storage, IoT cloud platforms (Amazon AWS, Microsoft Azure, Google APIs), Data analytics for IoT, Software and management tool for IoT, Dashboard design

5. IoT architectures with case studies
   Business models for IoT, smart cities, agriculture, healthcare, industry. Case studies/Mini Projects for the real time IoT applications.

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books
1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

Reference Books
1. *Raj kamal, Internet of Things, Architecture and Design Principles, McGraw-Hill, 2017*
2. *Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.H.Gerez, "Algorithms for VLSI Design Automation", John Wiley, 1999.*
3. *Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.*

COURSE OBJECTIVES

To make familiar with IOT System, IoT sensors, IoT hardware and communication protocols, data storage, data analysis and use them for real time IoT enabled domains.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Understand basic premise of an IOT System	**PO1,PO2**
2. Be familiar with the sensors available for IoT applications	**PO1,PO2**
3. Learn the front-end hardware platforms and communication protocols for IoT.	**PO1,PO2,**
4. Understand cloud storage, data analysis and management	**PO1, pO2,PO3, PO4,PO5,PO6**
5. Usage for real time IoT enabled domains	**PO1,PO2,PO3,PO4, PO5,PO6,**

COURSE PLAN – PART II

COURSE OVERVIEW

To understand basics of an IOT System, IoT sensors, IoT hardware and communication protocols, data storage, data analysis and use them for real time IoT enabled domains. (Home automation, Smart cities, environment monitoring, renewable energy, agriculture, industry, healthcare, marketing and management)

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1	1st week (3 contact hours)	*Introduction, Functional blocks of IoT System*	*PPT, Online mode MS Teams*
2	2nd week (3 contact hours	*Physical and logical design of IoT, IoT enabled domains*	*PPT, Online mode MS Teams*
3	3rd week (3 contact hours)	*M2M, difference between IoT, Industry 4.0 concepts*	*PPT, Online mode MS Teams*
4	4th week (3 contact hours)	*IoT passive sensors*	*PPT, Online mode MS Teams*
5	5th week (3 contact hours)	*IoT active sensors* **Mini project – Abstract submission**	*PPT, Online mode MS Teams*
6	6th week (3 contact hours)	*Preprocessing and IoT front end hardware*	*PPT, Online mode MS Teams*
7	7th week (3 contact hours)	*Introduction to IoT protocols, Infrastructure*	*PPT, Online mode MS Teams*
8	8th week (3 contact hours)	*Communication, Transport and data protocols* **Mini project – First review**	*PPT, Online mode MS Teams*

9	9th week (3 contact hours)	IoT cloud, connecting sensors, data ingress, cloud storage	PPT, Online mode MS Teams
10	10th week (3 contact hours)	IoT cloud platforms, data analytics, dash board design	PPT, Online mode MS Teams
11	11th week (3 contact hours)	IoT architecture with case studies	PPT, Online mode MS Teams
12	12th week (3 contact hours)	**Mini Project – Evaluation**	Online mode MS Teams

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment - 1 (Descriptive exam) (1st and 2nd units)	5th week	1 hour	20 Marks
2	Assignment (2nd unit)	6th week	1 week	10 Marks
3	Assessment - 2 (Descriptive exam) (3rd and 4th units)	10th week	1 hour	20 Marks
4	Mini Project (Group Project)	5th week to 11th Week	Two Months	20 Marks
5	Final Assessment (Descriptive exam) (All units – End semester)	Final Week	2 hours	30 Marks

Compensation assessment (CPA) will be conducted, if required

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

1. *Feedback from students during class committee meetings*
2. *Feedback through questionnaire at the end of the semester*

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

COURSE ASSESSMENT:
1 *Attending all the assessments are MANDATORY for every student*
2 *If any of the student is not able to attend any of the continuous assessment descriptive examination due to genuine reason (any academic related work through department or medical grounds only), student is permitted to attend CPA.*
3 *Submission of assignments is MANDATORY for every student within the stipulated time failing which 10% weightage will not be considered for final grade assessment*
4 *There will not be any improvement test for the students who score low marks in continuous assessment test.*
5 *Finally, every student is expected to score minimum marks as per the regulations of the institute out of the total assessments 1,2,3,4/CPA and 5 to pass the course. Otherwise the student will be declared fail and 'F' grade will be awarded. Further the student can take up only FORMATIVE ASSESSMENT.*

MODE OF CORRESPONDENCE (email/ phone etc.)
1 *All students are advised to check their NITT webmail regularly. All the details about the schedule of classes, schedule of assessments, course material and any other information regarding the course will be sent through webmail only.*
2 *Doubts regarding the course can be clarified by fixing proper timing with the teacher during working hours only.*
3 *Queries, if any regarding the course shall only through email to the teacher.*

COMPENSATION ASSESSMENT POLICY

1 *Any student who fails to maintain 75% attendance only on reasonable medical/official grounds needs to appear for the compensation assessment (CPA) classes.*

2 *The portion for compensation assessment will be the portion of assessment 1 and 2.*

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

1. ***At least 75% attendance in each course is mandatory.***

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

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

ACADEMIC DISHONESTY & PLAGIARISM

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

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

3. *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

The faculty is available for consultation at times as per the intimation given by the faculty.

FOR APPROVAL

21-01-2022

Course Faculty _____   **CC-Chairperson** Dr R Malmathanraj   **HOD _____**