Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NCSD520	**Internet of Things**	3	0	0	3

Course Objective
This course teaches basic concepts and practices in development of IoT Prototypes for real world applications. It deals with connectivity, building systems to enable delivery of software services networked to the cloud platforms. At the end of the course the students will be in a position to launch an IoT product..
Learning Outcomes
Understand the usability of the IoTs across various real-world applications. Understand and design different application and communication protocols for IoTs. Understand integration of IoTs with cloud platform. Understand the distributed data analysis for IoTs. Design solutions for several applications using IoTs.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction: An overview: Introduction, IoTs Definition Evolution, Impact of IoT, IoT Challenges, IoT Architectures.	2	Understand Iot'sevol- ution and impact.
2	Things; Sensors, properties of sensors, Actuators, microcontroller and microprocessors, SoC boards: Raspberry Pi, Important peripheral components of microcontrollers I2C, SPI, UART, PWM. Etc.	6	Identify sensor types and their properties. Actuators and their role IoT applications. Boards and their properties
3	Communication technology for IoT: Wi-Fi, Bluetooth, BLE, IEEE 802.15.4, IEEE 802.15.4e, IEEE 802.11ah, IEEE 1901.2a, NB-IoT and others	8	Understanding various connectivity technologys. Compare and contrast IoT communication protocols.
4	Programming Frameworks for Internet of Things: Introduction, Background, IoT programming frameworks. Programming ESP8266 and ArduinoBoard. Other IoT development platforms: Node-Red, Thingbox etc. IoT operating systems: Contiki, RTOS etc.	7	Evaluating IoT develop- Ment platforms like Node-Red and Thingbox.
5	IoT protocols: MQTT, CoAP, AMQP and etc.	4	Defiming and comparinh IoT protocols: MQTT, CoAP, AMQP.
6	IoT Platforms: Introduction, AWS IoT, Azure IoT, ThingsSpeak and others. Edge/Fog computing and IoT.	5	Understanding IoT platforms: AWS IoT, Azure IoT, ThingsSpeak, etc.
7	Data and Analytics for IoT: IoT Middleware, Data analytics for IoT, Big Data analytics tools and technology. Databases for IoT: MongoDB and Cloud native databases	4	Comparimh databases for IoT: MongoDB, cloud-native options.Evaluate big data analytics tools

			for IoT.
8	IoT security: Threats and Main challenges, NIST standards, IoT botnets, IoT Security architectures. IoT security best practises.	3	Outline best practices for IoT security.
9	IoT Application study case studies: mart City, Smart Grid, Smart Transportation, Smart Manufacturing, Smart Healthcare.	3	Examining IoT's role in real applications.
	Total	42	

Text Books:

1. D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, J. Henry; IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1st Edition, Pearson India Pvt. Ltd., 2018.
2. A. Bahga, V. Madisetti; Internet of Things: A Hands-on Approach, 1st Edition, Universities Press (India) Pvt. Ltd., 2015