



Course Title: IOT BASED PRODUCT DESIGN

L	T	P/ S	SW/F W	TOTAL CREDIT UNITS
0	1	0	2	2

Course Code:

Credit Units: 2

Level: UG

	Course Title: IOT BASED PRODUCT DESIGN	Comments (if any)
1	<p><b>Course Objectives:</b></p> <p>To make them understand how the rise of the Internet of Things (IoT) produces many new concepts including The Next Industrial Revolution and Industry 4.0. This course will address some basic design methodologies along with the practical implementation to build a successful IoT product. Moreover, this course will focus on IoT business models and use cases and deliver entrepreneurship opportunities in IoT businesses.</p>	
2	<p><b>Prerequisites:</b></p> <p>Programming concepts</p>	
3	<p><b>Student Learning Outcomes:</b></p> <p>The students will be able to</p> <ul style="list-style-type: none"><li>• Identify the role of IoT within the digital transformation of society and industries</li><li>• Understand the differences between IoT and non-IoT businesses</li><li>• Ideate the product</li><li>• Build a prototype</li></ul>	

4	<p><b>Module I: Introduction to IoT</b></p> <p>Introduction: Defining IoT, Data flow in IoT, Understanding IoT architecture, IoT Applications around the world which includes IoT in Healthcare, Blockchain and IoT, Augmented Reality and IoT etc.</p> <p>Sensors and Actuators: Introduction, Sensors, Actuators</p> <p>Microcontroller and Microcomputer: Introduction and differences, Hands-on ESP32: Internals, API's, IO, Setting Programming Environment, Embedded C Programming, Glow an LED, Environmental Monitoring; Hands-on Raspberry Pi: Internals, Configuring the Raspberry Pi(NOBS and Other Languages &amp; Tools), Python Programming, GPIO, Web Stack, Connecting ESP32 with Pi.</p> <p>Innovation and Entrepreneurship in IoT</p>	30%
5	<p><b>Module II: IoT Communication Protocol and Device Management</b></p> <p>IoT Communication Protocol: IoT Wireless Protocols, IoT Communication Channels, IoT Network Protocols</p> <p>MQTT IoT Protocol: MQTT with Raspberry Pi</p> <p>Messaging Communication: Channels, Protocol, Service Bus Queues, Message Routing, Hands-on Google Cloud Services Message Communication: To Configure Connection Strings, To Send a Message or Sensor Data.</p> <p>IoT Device Management: Introduction, Hands-on Direct Method: To make a Continuously Running Function, To Receive Direct Methods, To Invoke a Direct Method; Hands-on Device Simulation: To Create an IoT Device ID, Simulated Device App, To Create an App that invokes the Direct Method, To Run the Simulated Firmware Update</p>	40%
6	<p><b>Module III: IoT Analytics, ML, Business Intelligence, Storage and Visualization</b></p> <p>IoT Analytics and ML: Introduction to Bigdata, Techniques and Tools, Hands-on Stream Analytics: Stream Analytics Job, Stream Analytics Input &amp; Output, Service Bus Namespace and Queue, Stream Analytics Query;</p> <p>Hands-on: Predictive Analytics for Google Cloud IoT</p> <p>Business Intelligence, Storage and Visualization: Introduction, Data Storage Options, DocumentDB, Data Visualization and Story Telling, Hands-on Power BI Software: Stream Analytics Job for Power BI, Visualize Real-Time Data in Power BI</p>	30%
7	<p><b>Module IV: IoT Solution &amp; Security</b></p>	

	Introduction, IoT Reference Architecture, Hands-on: Choose One Real Life Problem and implement the solution based on IoT methodologies. IoT Security: Security Architecture, Endpoint and Device Security, Implementation Obstacles, Best Practices, Hands-on: Applying Security Principles on the Chose Real Life Problem																					
<b>8</b>	<p><b>Pedagogy for Course Delivery:</b></p> <ul style="list-style-type: none"> <li>The course delivery follows problem-based and work-based learning approaches. Through problem based learning, we present students with a real life problem of society and they need to find out the solution of the particular problem. Work-based learning could be done through field trips which provide students with real-life work experiences to aid their learning and improve their employability. This allows students to experience theories in practice.</li> </ul>																					
	<p><b>Assessment/ Examination Scheme:</b></p> <table border="1"> <thead> <tr> <th>Theory L/T (%)</th> <th>Lab/Practical/Studio/SW (%)</th> <th>Total (%)</th> </tr> </thead> <tbody> <tr> <td><b>0</b></td> <td><b>100</b></td> <td><b>100</b></td> </tr> </tbody> </table> <p><b>Lab/ Practical/ Studio/SW Assessment:</b></p> <table border="1"> <thead> <tr> <th>Internal Components (Drop down)</th> <th>Presentation (P)</th> <th>Home Assignment (HA)</th> <th>Project (P)</th> <th>Case Discussion (CD)</th> <th>Viva Voce (V)</th> <th>Attendance (A)</th> </tr> </thead> <tbody> <tr> <td><b>Weightage (%)</b></td> <td><b>10</b></td> <td><b>10</b></td> <td><b>40</b></td> <td><b>20</b></td> <td><b>15</b></td> <td><b>5</b></td> </tr> </tbody> </table>	Theory L/T (%)	Lab/Practical/Studio/SW (%)	Total (%)	<b>0</b>	<b>100</b>	<b>100</b>	Internal Components (Drop down)	Presentation (P)	Home Assignment (HA)	Project (P)	Case Discussion (CD)	Viva Voce (V)	Attendance (A)	<b>Weightage (%)</b>	<b>10</b>	<b>10</b>	<b>40</b>	<b>20</b>	<b>15</b>	<b>5</b>	
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#### References:

1. The Internet of Things (MIT Press) by Samuel Greengard.
2. The Internet of Things (Connecting objects to the web) by Hakima Chaouchi (Wiley Publications).
3. Internet of Things ( A Hands-on-Approach) by Arshdeep Bhaga and Vijay Madisetti.
4. The Internet of Things Key applications and Protocols, 2nd Edition, (Wiley Publication) by Olivier Hersent, David Boswarthick and Omar Elloumi.
5. IoT –From Research and Innovation to Market development (River Publication) by Ovidiu Vermesan and Peter Friess.
6. Building Internet of Things with Arduino by Charalampos Doukas.
7. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024, Yole Development Copyrights ,2014
8. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
9. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

10. N. Ida, *Sensors, Actuators and Their Interfaces*, Scitech Publishers, 2014.