

<b>Module title</b> Full-Stack Cloud Solution for Internet-of-Things (IoT)			
<b>Module code</b> Tbd.	<b>Level</b> Bachelor (B.Sc.)	<b>ECTS credits</b> 5	<b>Duration</b> 2 weeks block course
<b>Module instructor</b> Ooi Boon Yaik, Universiti Tunku Abdul Rahman	<b>Lecture type</b> Lectures + Guided Tutorial Sessions	<b>Prerequisite(s)</b> Python Programming and Web Technologies	<b>Grading</b> Tbd.
<p><b>Objectives</b> The advancement of mobile technology, cloud computing and embedded devices have accelerated the development of IoT solutions. This course focuses on training the students to use open source technologies to produce IoT solutions. Along the way, the students will understand the components in an IoT stack and the role of cloud computing. Full stack in this course covers the communication from sensor nodes to cloud including data visualization and analysis. Last but not least, the students will be able to estimate cost and benefits of various IoT architectures.</p> <p><b>Course Outcomes.</b> By the end of the course, students will be able to: <b>Knowledge &amp; Understanding:</b> a) Demonstrate an understanding of the purpose core components of IoT solutions; b) Identify the pros and cons of various IoT architectures; c) Understand the challenges of deploying IoT solutions and the importance of meta-monitoring;</p> <p><b>Skills &amp; Abilities:</b> a) Setup a full-stack cloud solution for IoT using open source technologies; b) Perform simple data analytics; c) Evaluate the cost and benefits of various IoT architectures.</p> <p>The course consists of a series of lectures, with guided practical sessions. The lectures cover the concepts and principles of IoT technologies. The practical sessions allow students to learn and use the technologies mentioned in the lecture. Last but not least, students will be developing a complete end-to-end IoT solution in a mini project style. The project will be evaluated and graded as the assignment of this module.</p>			
<p><b>Content</b></p> <ol style="list-style-type: none"> <li>1. <b>Introduction to Internet-of-Things (IoT)</b> <ol style="list-style-type: none"> <li>1.1. History</li> <li>1.2. Components of IoT</li> <li>1.3. Application of IoT in Home and Industry</li> <li>1.4. Challenges of developing and deploying IoT</li> </ol> </li> <li>2. <b>Networking for IoT</b> <ol style="list-style-type: none"> <li>2.1. Introduction to Internet</li> <li>2.2. Introduction to various connectivity mode such as Cellular Network, Wi-Fi, BLE and LoRa.</li> <li>2.3. REST Protocol and web services</li> <li>2.4. MQTT Protocol</li> </ol> </li> <li>3. <b>IoT-Sensor Nodes</b> <ol style="list-style-type: none"> <li>3.1. Introduction to various type of sensors and actuators</li> <li>3.2. Understanding the limitation of sensors nodes in terms of processing power and processing capabilities.</li> <li>3.3. Basic sensor nodes management and security</li> </ol> </li> <li>4. <b>Cloud Computing</b> <ol style="list-style-type: none"> <li>4.1. The purpose of edge and fog computing in IoT context</li> <li>4.2. The role of IoT Gateway</li> <li>4.3. Understanding the limitation of LAMP stack for IoT.</li> <li>4.4. Connectivity to the cloud (FTP, HTTP, MQTT)</li> </ol> </li> <li>5. <b>Data Storage and Visualization</b> <ol style="list-style-type: none"> <li>5.1. IoT Databases using InfluxDB and Elasticsearch</li> <li>5.2. Visualize data using Kibana and Grafana</li> <li>5.3. Data Analysis with IoT Data</li> </ol> </li> </ol>			
<p><b>Textbook/teaching material</b></p> <ul style="list-style-type: none"> <li>• Course notes</li> </ul>			

Note: this is not the official course descriptor according to the "Studien- und Prüfungsordnung" (SPO)

**Gemeinsam noch stärker:**

Die OTH Regensburg und die OTH Amberg-Weiden sind Kooperationspartner im Hochschulverbund Ostbayerische Technische Hochschule.