

### Subject Description Form

<b>Subject Code</b>	EIE3127
<b>Subject Title</b>	Artificial Intelligence Enabled Internet of Things
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: EIE2112 Foundation Techniques in Artificial Intelligence <b>AND</b> EIE2113 Introduction of IoT
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To introduce major application scenarios of artificial intelligence (AI) in Internet of things (IoT) and their societal impacts.</li> <li>2. To introduce AI techniques for IoT applications.</li> <li>3. To introduce communication, networking, and computing technologies in AI enabled IoT.</li> </ol>
<b>Intended Subject Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand key features of IoT systems and design principles.</li> <li>2. Understand AI techniques, cloud/edge computing platforms, and wireless communication and networking techniques for AI enabled IoT.</li> <li>3. Understand key application scenarios of AI in IoT and their social impacts.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Think critically and creatively.</li> <li>5. Assimilate new technological development in related field.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <u>IoT Basics</u>: Key features of IoT; Applications of IoT; Market and ecosystem of IoT.</li> <li>2. <u>Communication and Networking for IoT</u>: Wireless communications and networking for IoT; Communication standards and protocols for IoT, IoT for massive machine type communications, IoT for ultra-reliable and low latency communications</li> <li>3. <u>Machine Learning for IoT</u>: Introduction of basic machine learning techniques for basic AI enabled IoT.</li> <li>4. <u>IoT Devices</u>: Onboard processors; Onboard sensors; Communication modules; AI accelerators.</li> <li>5. <u>Cloud/edge Computing for AI enabled IoT</u>: Cloud computing platforms; edge computing platforms, federated learning for AI enabled IoT</li> <li>6. <u>AI enabled IoT with Resource Constraints</u>: Neural network compression; Edge computing-assisted inference.</li> <li>7. <u>Security and privacy for AI enabled IoT</u>: AI enabled IoT attacks and defense, AI enabled IoT platform security, AI voice interface security, AI image interface security.</li> <li>8. <u>AI enabled IoT application scenarios</u>: Smart City; Industrial automation; Internet of vehicles. For example: <ul style="list-style-type: none"> <li>- Water quality monitoring</li> <li>- Human activity monitoring</li> <li>- Communication channel estimation in Internet of vehicles</li> </ul> </li> </ol>

<b>Teaching/Learning Methodology</b>	<p>The basic features of AI enabled IoT will be described and explained in lectures. Supporting techniques, including wireless communication and networking, cloud/edge computing, as well as machine learning techniques, will be presented in lectures and tutorials. The application scenarios of AI enabled IoT will be introduced in lectures. Tutorial and lab sessions will be conducted to deliver hands-on skills on AI enabled IoT applications. The assignments and lab exercises will help students review the knowledge taught in class.</p>											
	<b>Teaching/Learning Methodology</b>	<b>Intended Subject Learning Outcomes</b>										
	Lectures / Tutorials /Test	✓	✓	✓	✓	✓						
	Laboratory			✓	✓	✓				✓		
<b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b>	<b>Specific assessment methods/tasks</b>	<b>% weighting</b>	<b>Intended subject learning outcomes to be assessed (Please tick as appropriate)</b>									
	1. Assignments	25%	✓	✓	✓	✓						
	2. Test	15%	✓	✓	✓							
	3. Laboratory	20%			✓	✓				✓		
	4. Examination	40%	✓	✓	✓							
	Total	100%										
	<b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b>											
	<p>Assignments, test, and examination let students review the taught materials, do further reading for deeper learning and apply the learnt materials to solving problems for AI enabled IoT.</p>											
	<p>Laboratory requires students to do further reading, search for information, and develop AI enabled IoT applications.</p>											
<b>Student Study Effort Expected</b>	<b>Class contact (time-tabled):</b>											
	<ul style="list-style-type: none"> <li>Lectures</li> </ul>										27 Hours	
	<ul style="list-style-type: none"> <li>Tutorial/Laboratory</li> </ul>										12 Hours	
	<b>Other student study effort:</b>											
	<ul style="list-style-type: none"> <li>Lecture: preview/review of notes; assignment; preparation for test/examination</li> </ul>										36 Hours	
	<ul style="list-style-type: none"> <li>Tutorial/Laboratory: preview of materials, revision and/or reports writing</li> </ul>										30 Hours	
	<b>Total student study effort:</b>										<b>105 Hours</b>	

<b>Reading List and References</b>	<p><b>Textbook:</b></p> <ol style="list-style-type: none"> <li>1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos and David Boyle, <i>From Machine-To-Machine to the Internet of Things: Introduction to a New Age of Intelligence</i>, Academic Press, 2014.</li> <li>2. Gurjit Kaur, Pradeep Tomar, and Marcus Tanque, <i>Artificial Intelligence to Solve Pervasive Internet of Things Issues</i>, Academic Press, 2020.</li> <li>3. Yaser S. Abu-Mostafa, Malik Magdon-Ismael, and Hsuan-Tien Lin, <i>Learning from Data</i>, AMLBook, 2017.</li> </ol> <p><b>Reference Materials:</b></p> <ol style="list-style-type: none"> <li>1. J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, "Internet of Things (IoT): A vision, architectural elements, and future directions," <i>Future Gener. Comput. Syst.</i>, vol. 29, no. 7, pp. 1645–1660, Sep. 2013.</li> <li>2. A. A. Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari, and M. Ayyash, "Internet of Things: A survey on enabling technologies, protocols, and applications," <i>IEEE Commun. Surveys Tuts.</i>, vol. 17, no. 4, pp. 2347–2376, 4th Quart., 2015.</li> </ol>
<b>Last Updated</b>	Oct 2022
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