

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	COMP6711
Subject Title	Advanced Artificial Intelligence of Things
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil (but knowledge in Computer Networks; Big Data Analytics are preferable)
Objectives	This subject introduces the concepts and principles of AI empowered IoT. It teaches students the fundamentals and advanced AIoT technology, covering methods, techniques, systems and applications.
Intended Learning Outcomes (Note 1)	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Show in-depth understanding of the fundamental concepts, research issues and technical challenges, and the state-of-the-art technology development and applications of AIoT; (b) Research the advanced protocols, algorithms and processing platforms for sensing, networking and data analytics in IoT systems; (c) Learn and deploy the AI models, algorithms and robotics techniques for IoT operation efficiency, cost reduction, event detection, and predictive maintenance in practice. (d) Discover potential AI-oriented usage scenarios in IoT and apply AIoT methods and techniques to solve various challenging IoT problems for practical applications with innovative solutions.
Subject Synopsis/ Indicative Syllabus (Note 2)	<p><u>Fundamentals</u></p> <ul style="list-style-type: none"> • Introduction to IoT: IoT applications, sensors and embedded systems, IoT sensing techniques, IoT networking, IoT Data analytics, IoT platforms and systems • Introduction to AIoT: AIoT concepts and issues, Technologies behind AIoT, AIoT application segments. <p><u>Advanced topics</u></p> <ul style="list-style-type: none"> • Technical architecture of AIoT • Smart sensors and devices; Wearables; Smart object and human sensing • Challenges of AI in networks for IoT • AI for IoT data analytics and automation • Distributed intelligence at the edge of IoT systems (edge computing; blockchain, etc.) • Robotics for AIoT

	<p><u>Applications</u></p> <ul style="list-style-type: none"> Intelligent manufacturing; Smart health; Smart infrastructure and construction. 																																																						
<p>Teaching/Learning Methodology</p> <p><i>(Note 3)</i></p>	<p>The course is comprised of lectures, tutorials, seminars and case studies. During lectures, students are taught the important concepts, principles and technologies that drive the development of AIoT.</p> <p>During tutorials, students will be presented with both theoretical questions and practical scenarios of AIoT, and are required to study, analyze and propose solutions. Small group discussions will be encouraged and students will need to present their results and solutions in the form of reports and presentations.</p> <p>Students are also required to give seminar talks about topics and case studies that are designed to reinforce their understanding of knowledge taught and to explore further topics and issues.</p>																																																						
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p> <p><i>(Note 4)</i></p>	<table border="1" data-bbox="518 884 1465 1440"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Assignments</td> <td>30%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Seminar talks</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>3. Project</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>4. Take-home Exam</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="6"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Students will be assessed by their performance in four parts: assignments, Seminar talks, project, and examination.</p> <p>Assignment are written homework that assess students' abilities for comprehension of concepts and principles, algorithm design, and problem solving.</p> <p>Seminar talks engage students to actively participate in learning and research by identifying and exploring important issues and problems, and present existing / promising solutions.</p> <p>Projects involve a group of students to design and implement a solution for a practical AIoT application. Students collaboratively work together to apply what they have learned in the class to solve practical problems. The results are to be presented in the form of reports and / or presentations.</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a	b	c	d	e		1. Assignments	30%	✓	✓	✓				2. Seminar talks	20%	✓	✓	✓	✓			3. Project	25%	✓	✓	✓	✓			4. Take-home Exam	25%	✓	✓	✓	✓			Total	100 %						
Specific assessment methods/tasks	% weighting			Intended subject learning outcomes to be assessed (Please tick as appropriate)																																																			
		a	b	c	d	e																																																	
1. Assignments	30%	✓	✓	✓																																																			
2. Seminar talks	20%	✓	✓	✓	✓																																																		
3. Project	25%	✓	✓	✓	✓																																																		
4. Take-home Exam	25%	✓	✓	✓	✓																																																		
Total	100 %																																																						

	Take-home exam is designed to assess students for their critical thinking skills and independent problem solving ability.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial / Seminar	13 Hrs.
	Other student study effort:	
	▪ Self-study: Reading, discussion, etc.	83 Hrs.
	▪	Hrs.
	Total student study effort	122 Hrs.
Reading List and References	Reference Books: <ol style="list-style-type: none"> 1. “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, by Francis DaCosta. Publisher: Apress. 2013. 2. “Internet of Things”, by Vlasios Tsiatsis Stamatis Karnouskos Jan Holler David Boyle Catherine Mulligan. Publisher: Elsevier. 2nd edition. 2018. 3. “Big-Data Analytics for Cloud, IoT and Cognitive Computing”, by Kai Hwang and Min Chen. Publisher: Wiley. 2017. 4. “Hands-On Artificial Intelligence for IoT: Expert machine learning and deep learning techniques for developing smarter IoT systems”, by Amita Kapoor. Publisher: Packt Publishing Ltd. 2018. 5. “AIoT Innovation”, ed. Fadi Al-Turjman. Publisher: Springer. 2020 6. “The Future of Artificial Intelligence, the Internet of Things, and Blockchain: From AI to AIoT to AIoTB”. By Eugene Chang. Publisher: Amazon. 2019. 	

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.