The Hong Kong Polytechnic University

Subject Description Form

Subject Code	COMP5582
Subject Title	Artificial Intelligence of Things
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil (but knowledge in Computer Networks, Embedded Systems, Big Data Analytics, Artificial Intelligence are preferable)
Objectives	This subject introduces the concepts, principles, architectures and applications of AI empowered Internet-of-Things (AIoT) systems. It teaches students the fundamentals and advanced AIoT technologies. The covered topics include smart sensors/actuators, advanced sensing technologies, AIoT communication technologies and protocols, methodologies for large-scale AIoT data collection and analytics, system optimization, and emerging applications of AIoT in various fields such as healthcare, smart cities, low-altitude economy, robotics, etc.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Demonstrate in-depth understanding of the fundamental concepts, core problems, technical challenges, and the state-of-the-art technology development and applications of AIoT; (b) Learn and understand the IoT communication and networking protocols, AI algorithms and processing platforms for smart sensing, and data analytics in AIoT systems; (c) Familiar with the AI models, algorithms and techniques for AIoT system optimization, smart environmental perception, agentic-based event detection and robotic actuation; (d) Apply and deploy AIoT methods and techniques in practical usage scenarios with innovative solutions.
Subject Synopsis/ Indicative Syllabus	**<u>Fundamentals</u>** 1. Introduction to AIoT i. AIoT concepts ii. Enabling technologies iii. System architectures iv. Representative applications 2. Devices for AIoT i. Smart sensors and actuators ii. AIoT devices and gateways iii. Embedded systems: development platform and tools (e.g., Arduino, Rasperry Pi, Nvidia Jetson, etc.)

	3. Communication systems for AIoT i. IoT communication technologies ii. Networking architectures, protocols, and platforms iii. Message delivery and data processing **<u>Advanced topics</u>** 4. Everything gets connected i. Smart object identification ii. Massive connectivity technologies iii. Low-power optimization 5. Sensing meets AI i. Positioning and tracking ii. Environmental perception iii. Intelligence at the edge (edge computing) iv. Robotics and embodied intelligence 6. Security and Privacy **<u>Applications (case study, seminar talk, and project)</u>** 7. Human sensing applications i. Wearables, Smart health ii. Acoustic/mmWave sensing 8. Smart city applications i. UAV auto-piloting ii. Low-altitude economy: Drone delivery iii. Smart transportations 9. Smart agriculture applications i. Agricultural data collection, foundation model, and Agentic AI for agriculture ii. Agricultural inspections with UAVs
Teaching/Learning Methodology	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. During tutorials, students will be presented with both theoretical questions and practical applications 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. Students are also required to give seminar talks about selected advanced topics and practical case studies that are designed to reinforce their understanding of knowledge taught and to explore further topics and issues.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d		
Assignments, Tests, and Projects	30%	√	√	√	√		
Final Exam	70%	√	√	√			
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

- Students will be assessed by their performance in two parts: continuous assessment and final examination.
- Continuous assessments consist of assignments, in-class tests, or group projects, which are designed to train students to achieve intended learning outcomes.
- Assignments are written homework that assess students' abilities for comprehension of concepts and principles, algorithm design, and problem solving.
- Projects involve a group of students to design and implement a solution for a practical AIoT application. Students collaboratively work together to to conduct in-depth study with certain topics, apply what they have learned in the class to solve practical problems. The results are to be presented in the form of reports and presentations.
- Exam is designed to assess student's understanding and usage of AIoT technologies.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial/Lab/Seminar talk/Project presentation	13 Hrs.
	Other student study effort:	
	▪ Project development	30 Hrs.
	▪ Self-study, reading, practice, etc.	53 Hrs.
	Total student study effort	122 Hrs.

Reading List and References

Reference Books:

	1. Qureshi, K. N., & Newe, T. (Eds.). (2024). Artificial intelligence of things (AIoT) : new standards, technologies and communication systems (First edition.). CRC Press. 2. Batra, N., & Goyal, S. (2025). IoT fundamentals with a practical approach (First edition). CRC Press. 3. Bunz, M., & Meikle, G. (2018). The internet of things. Polity Press. 4. Gunjal, P. R. (2024). Internet of Things : Theory to Practice (First edition.). CRC Press. 5. Yang, Z., Qian, K., Wu, C., & Zhang, Y. (2021). Smart wireless sensing : from IoT to AIoT. Springer. 6. Stephan, T., Punitha, S., Al-Turjman, F., Perumal, T., & Kulkarni, V. R. (2025). AIoT and Smart Sensing: A Comprehensive Guide to the Next Generation of Smart Devices (First edition.). CRC Press. 7. Al-Turjman, F. (Ed.). (2024). AIoT and smart sensing technologies for smart devices. IGI Global, Engineering Science Reference.