Gifted Education Fund: Off-school Advanced Learning Programmes

Title of Programme	**AIoT Coding and Engineering Skills Education for Gifted Students**
Programme Provider	Department of Electrical Engineering, City University of Hong Kong
Theme	• STEM-related Mentorship Programme • Self-initiated Research Study
Maximum No. of Participants and Class Level in the 2020/21 School Year	100 students (Secondary 4-5)
Pre-requisite	Applicants with basic knowledge of computer programming language, e.g. Python, C/C++, Java and Javascript, are preferred.
Programme Duration	About 9 months
Medium of Instruction	Course Material: English Class teaching/ Discussion: English supplemented with Cantonese
Objectives	• To provide the gifted students with relevant mathematical foundation knowledge with applications to artificial intelligence (AI) domain; • To equip them with the engineering skills and experiences to develop the Internet of Things (IoT) devices; • To develop their hands-on and minds-on coding abilities and problem-solving skills to implement AI projects; • To develop their hardware engineering skills to design and evaluate the IoT devices; • To inspire the gifted students about the role and computation of the system on chip (SoC) and Integrated Circuit (IC) in AI; and • To promote their awareness of the wide applications of AIoT and relevant ethical issues, and enlighten them to explore applications that can help to solve problems for the well-being of mankind.
Programme Outline*	This programme aims to enhance the gifted students' knowledge and skills related to AI and IoT, with a wide coverage of relevant mathematical knowledge, software programming and hardware programming skills as well as the skills related to engineering design and evaluation. Ethical use of AI is also emphasised in this programme for development of values and attitudes among the gifted students. The programme consists of five phases. Phase I

| | • Online/ face-to-face sessions (20 hours in total)
• Students will acquire knowledge of Python programming and learn to create a Github repository.

Phase II
• Lectures and laboratory sessions (16 hours in total)
• Students will learn the history and development of AI and machine learning and build their own convolutional neural network model using the Fashion MNIST dataset.

Phase III
• Lectures and laboratory sessions (12 hours in total)
• Students will apply their Python coding skills to programme an FPGA to accelerate AIoT applications, e.g. image recognition using a PYNQ board.

Phase IV
• Lectures and a laboratory session (8 hours in total) on Printed Circuit Board (PCB) design for creation of the extension board for the PYNQ board.
• Students will meet their mentors biweekly in groups of two for the project (1 hour each; 4 times in total).

Phase V
• A one-day exhibition for students to showcase their achievements in learning through project presentation and experience
• Self-documentation of students' project results and learning experience through report writing. |