Subject Description Form

Subject Code	BME34145
Subject Title	**AIDA for Health Care and Smart Ageing**
Credit Value	3
Level	3
Pre-requisite / Co-requisite	ENG2002 Computer Programming
Objectives	The objectives of this subject are to: 1. Introduce the concept of precision medicine in the hospital and community healthcare service models in ageing society 2. Equip the students with the fundamental knowledge of artificial intelligence techniques and machine learning algorithms in healthcare applications 3. Master the clinical problem formulation and typical data analytic skills 4. Understand the trend of technical development in artificial intelligence for medical applications 5. Appreciate the ethical and legal issues related to medical artificial intelligence
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand ideological and theoretical underpinning of precision medicine b. Describe the emerging and increasing healthcare demands in an ageing society c. Articulate the major technological approaches of articular intelligence and machine learning to transform current healthcare service model in both hospital and community setting d. Apply basic articular intelligence techniques and machine learning algorithm to tackle the given medical problems
Contribution to Programme Outcomes (Refer to Part I Section 10)	▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach) ▪ Programme Outcome 2: Demonstrate an ability to design and conduct BME experiments, as well as to analyze and interpret data. (Teach and Practice) ▪ Programme Outcome 4: Demonstrate an ability to identify, formulate, and solve BME problems. (Teach, Practice and Measure)

	▪ Programme Outcome 5: Demonstrate an ability to understand the impact of BME solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public. (Teach) ▪ Programme Outcome 11: Demonstrate an ability to communicate effectively and advise clients, professional colleagues and other members of the community. (Teach and Practice)
Subject Synopsis / Indicative Syllabus	▪ Introduction and overview ▪ The unmet needs in healthcare with global ageing ▪ Fundamental knowledge and scientific perspectives of ageing and age-related pathologies ▪ The concept of precision medicine with 4 "P" principle: predictive, preventive, personalized and participatory ▪ The trend of artificial intelligence and data technology to transform current healthcare system ▪ Artificial intelligence and data technology to address the health problems in both hospital and community settings including but not limited to following aspects: **AI and data technologies to transform the healthcare service in the future of hospital** ▪ Introduction to Hospital Authority Data Sharing Portal ▪ AI-enabled patients triage system and surgical planning ▪ Big data analytics-based diagnostics and prognostics ▪ Brain-machine interface, neural decoding, neuralink ▪ Patients data privacy and security **AI and data technologies to promote healthy ageing in the community** ▪ Health and wellness monitoring using wearable sensors, the design of intelligent home for the older adults, such as fall prevention and motion detection ▪ Smart devices for food safety and balanced diet, e.g. to monitor salt and sugar intake, and natural extracts ▪ Mental health promotion via robotics-assisted speech, facial and emotion recognition **Laboratory sessions with hand-on experience on dealing various types of clinical tabular, imaging and bio-signal datasets** ▪ Tabular data retrieval and analysis ▪ Compute vision for medical imaging (histopathology) ▪ Advanced electrophysiology: practical session

Teaching and Learning Methodology	It is an advanced course for the engineering students, aiming to facilitate students to gain the basic AI knowledge and data analytic skills to tackle healthcare problems. In the lectures, experts' experiences in AI and data technology development and applications will be shared. The guided reading and self-study will be further extended students' knowledge in the respective areas. In preparing the guided group discussion in tutorials, students will actively participate in the laboratory session and obtain the first-hand experiences on the cutting-edge AI and data technologies. Students will critically evaluate themselves during the group discussion. The group discussion and students' preparatory work will facilitate their writing of the laboratory reports. In the student group presentation, they will present the basic principles and findings from the lectures, self-study and laboratory sessions. What they learn from the lectures and tutorials will also be reflected in this group discussion and sharing, self-study, and student presentation.

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
▪ Mid-term Quiz	30%	✓	✓	✓	
▪ Group project	40%			✓	✓
▪ Assignment	30%	✓	✓	✓	✓
Total	100%				

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

The basic knowledge and understanding of AIDA in healthcare will be examined in in-class MCQs, mid-term quiz, and also group project. The knowledge application will be tested in in-class discussion, group presentation and assignment.

Student Study Effort Expected

Class contact:	
▪ Lectures	30 Hrs.
▪ Laboratory	9 Hrs.

	Other student study effort:	
	▪ Assignments	9 Hrs.
	▪ Open education resources	30 Hrs.
	▪ Group project	39 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	Textbooks: ▪ Artificial intelligence in medical imaging: opportunities, applications and risks; Erik R Ranschaert (editor), Sergey Morozov (editor), P. R. Algra (editor); Cham, Switzerland: Springer; 2019 ▪ Medical imaging: artificial intelligence, image recognition, and machine learning techniques; K. C. Santosh (editor); Boca Raton, FL: CRC Press; 2020	
Date of Last Major Revision	August 2022	
Date of Last Minor Revision	5 July 2023	