Subject Description Form

Subject Code	BME34145
Subject Title	**AIDA for Health Care and Smart Ageing**
Credit Value	3
Level	3
Pre-requisite	ENG2002 Computer Programming or COMP1012 Programming Fundamentals and Applications
Objectives	The objectives of this subject are to: 1. Understand current and emerging trends in AI development—particularly in smart-ageing technologies—and assess their potential impact on patient care. 2. Introduce the fundamental concepts and common algorithms of artificial intelligence, with an emphasis on their relevance to healthcare applications. 3. Describe the principles of precision medicine and critically compare hospital-based and community-based healthcare service models for an ageing population. 4. Apply basic deep-learning techniques and data-analytic methods to preprocess, model, and interpret clinical datasets. 5. Formulate real-world clinical problems and select, implement, and validate appropriate AI models to propose data-driven solutions in healthcare settings.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain the principles of precision medicine and illustrate its clinical applications. b. Analyze demographic and healthcare-service data to characterize the needs of an ageing population. 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 fundamental artificial-intelligence algorithms to formulate, implement, and evaluate solutions for well-defined medical-data 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)

	▪ Program Learning Outcome 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice (Teach and Practice) ▪ Program Learning Outcome 8: Demonstrate an ability to use the computer/IT tools relevant to the BME discipline along with an understanding of their processes and limitations (Teach and Practice)
Subject Synopsis / Indicative Syllabus	▪ Introduction and overview ▪ The unmet needs in healthcare with global ageing ▪ Fundamental knowledge of artificial intelligence ▪ 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 ▪ Deep learning typical networks for medical imaging ▪ AI solutions for medical problem: practical session

<table>
<tr><td>Teaching and Learning Methodology</td><td>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 project 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.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>▪ Mid-term Quiz</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>▪ Assignment</td><td>30%</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>▪ Group Project</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
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 mid-term quiz, assignments, and also group project. The knowledge application will be tested in in-class discussion, group presentation and assignment.</td></tr>
<tr><td rowspan="3">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>30 Hrs.</td></tr>
<tr><td>▪ Laboratory</td><td>9 Hrs.</td></tr>
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	Other student study effort:	
	▪ Assignments	19 Hrs.
	▪ Open education resources	20 Hrs.
	▪ Group project	39 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	Textbooks: ▪ Pine, D. J. (2019). Introduction to Python for Science and Engineering. CRC Press. ▪ Führer, C., Solem, J. E., & Verdier, O. (2014). Computing with Python: An Introduction to Python for Science and Engineering. Pearson. ▪ Chollet, F. (2018). Deep Learning with Python. Manning Publications. ▪ Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., … Wang, Y. (2017). Artificial intelligence in healthcare: past, present and future. Stroke and Vascular Neurology, 2(4), 230–243. ▪ Ranschaert, E. R., Morozov, S., & Algra, P. R. (Eds.). (2019). Artificial intelligence in medical imaging: Opportunities, applications and risks. Cham, Switzerland: Springer. ▪ Santosh, K. C. (Ed.). (2020). Medical imaging: Artificial intelligence, image recognition, and machine learning techniques. Boca Raton, FL: CRC Press. Online Resources ▪ Python official tutorials (https://docs.python.org/3/tutorial/) ▪ R Project manuals (https://cran.r-project.org/manuals.html) ▪ Kaggle (https://www.kaggle.com/) for datasets and hands-on notebooks.	
Date of Last Major Revision	July 2025	
Date of Last Minor Revision	July 2025	