Subject Description Form

Subject Code	COMP5113
Subject Title	Artificial Intelligence and Big Data Computing Programming
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject are to: 1. provide students with the programming and real-world problem-solving skills in AI and big data computing. 2. equip students with the knowledge and skills in utilizing big data tools and techniques under various application scenarios. 3. offer hands-on experience to students under big data platforms (e.g., Hadoop, Python, NoSQL), and on the implementation of deep learning models.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a) understand the concept of artificial intelligence and big data computing, including terminologies, challenges, and applications; b) understand the major techniques, programming languages, and tools for big data computing; c) be familiar with big data computing tools; d) understand the typical machine learning algorithms, especially deep learning models; e) design and implement deep learning models to solve real-world problems.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	1. Introduction to Artificial Intelligence and Big Data Computing, including history, terminologies, techniques, and applications. 2. Introduction to programming languages and tools for AI and big data analytics. a. MapReduce and its open-source implementations, e.g., Hadoop. b. Machine learning development platforms, e.g., Python and its common libraries, such as scikit-learn, PyTorch, TensorFlow. c. Database systems for big data, e.g., NoSQL.

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3. Introduction to neural network-based machine learning models, including multilayer perceptron, deep belief networks, convolutional neural networks, and recurrent neural networks (e.g., LSTM).

4. Machine learning techniques that are implemented on Python, including the techniques of linear regression, multilayer perceptron, convolutional neural networks, and recurrent neural networks.

5. Artificial intelligence and big data applications and examples.
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<tr><td>Teaching/Learning Methodology
(Note 3)</td><td>The subject will be delivered via lectures followed by lab sessions. During the lectures, students will learn the concepts and techniques in AI and big data computing, as well as the corresponding platforms. In the lab sessions, students will learn programming skills and gain hands-on experience in using these machine learning tools for development. They will learn how to use deep learning models to analyze large-scale datasets. In the mini-project, students are required to use what they have learned to solve real-world problems of big data analysis.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">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><td>e</td></tr>
<tr><td>Continuous Assessment</td><td rowspan="4">55%</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. Assignments/Lab Exercises</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Quizzes</td><td>✓</td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>3. Project</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>Examination</td><td>45%</td><td>✓</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignments would help students better understand the concepts and knowledge of AI and big data learned during lectures. In the lab exercises, students could gain hands-on experience in using big data tools. In lectures and labs, students would learn several examples of using AI and big data to analyze standard large-scale data. Correspondingly, students have opportunities to develop and implement AI models to solve real-world problems.
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	Quizzes and examination would not only evaluate students' understanding of concepts and knowledge, but also encourage them to review the delivered content regularly.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorials/Laboratory	13 Hrs.
	Other student study effort:	
	▪ Assignments, projects, exams, self-study	66 Hrs.
	▪	Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeff Ullman, Cambridge University Press. Latest version can be downloaded from http://www.mmds.org 2. Hadoop Application Architectures: Designing Real-World Big Data Applications, Mark Grover, Ted Malaska, Jonathan Seidman and Gwen Shapira, O'Reilly Media, July 2015. 3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, O'Reilly Media, October 2019. 4. Kevin Patrick Murphy, Probabilistic Machine Learning: An Introduction, MIT Press, 2022. https://probml.github.io/pml-book/book1.html 5. Deep Learning with PyTorch, Eli Stevens, Luca Antiga, and Thomas Viehmann, Manning, July 2020. ISBN 9781617295263	