Subject Description Form

Subject Code	BME5350
Subject Title	**Artificial Intelligence and Data Analysis for Sports**
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To introduce the concept of artificial intelligence (AI) and data analytics within the context of sports technology and management. The course aims to equip students with fundamental knowledge of AI techniques and data analytic algorithms as they apply to sports performance and management. Students will learn to formulate sports-related problems and apply data analytic skills to solve these problems. The course will also provide an understanding of the trends in technical development within the field of sports AI.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the ideological and theoretical underpinnings, potentials, and fundamentals of artificial intelligence and data analytic techniques in sports. b. Describe the emerging and increasing demands for artificial intelligence and data analytics in sports performance and management. c. Develop practical skills in applying AI and data analytics to solve real-world problems in sports.
Contribution to Programme Outcomes (Refer to Part I Section 2)	Program Learning Outcome (a) Acquire and apply advanced levels of knowledge and skills in the sports technology and management discipline. (Teach, Measure) Programme Learning Outcome (c) Demonstrate a higher level of professional competence to cope with the rapid changes in practice in the sports technology and management discipline. (Teach, Practice, Measure) Programme Learning Outcome (e) Demonstrate abilities to continuously develop in professional practice. (Teach, Practice, Measure)
Subject Synopsis/ Indicative Syllabus	1. Introduction to AI and Data Analytics in Sports • Overview of AI and data analytics concepts • Historical development and significance in sports • Key applications in sports performance and management 2. Fundamental AI Techniques • Machine learning algorithms: Discuss essential algorithms; e.g. regression, classification, clustering, and their specific applications in sports analytics. • Deep learning and neural networks: Provide an overview of deep learning techniques, neural network architectures, and their role in advanced sports data analysis. • Natural language processing and computer vision: Explain the application of NLP for text analysis (e.g., social media sentiment) and computer vision for video analysis and motion tracking. 3. Data Collection and Management • Data sources and types in sports: Identify various data sources such as wearable devices, cameras, and sensors; and discuss the types of data they generate. • Data preprocessing and cleaning techniques • Data storage and management systems 4. Data Analytics in Sports • Descriptive, predictive, and prescriptive analytics • Statistical analysis and visualization tools: Introduce tools and software for analysing statistics & creating visualizations to interpret sports data.

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Case studies of data analytics in various sports: Analyze real-world examples from different sports to illustrate the application of data analytics techniques.

5. AI Applications in Sports Performance

Performance tracking and enhancement
Injury prediction and prevention
Game strategy and decision-making support

6. Technical Development Trends

Recent advancements in AI and data analytics
Emerging technologies and future directions
Integration of AI with other technologies: Discuss the convergence of AI with IoT, AR/VR, and other emerging technologies to create more comprehensive and immersive sports solutions.

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<tr><td>Teaching/Learning Methodology</td><td>
Students will learn the fundamental knowledge and principles in lectures; Sufficient laboratory and practice hours will be provided in labs and tutorials hours; Practice projects/assignments will be adopted to assess the students' learning outcome.
<table>
<tr><td rowspan="2">Teaching/ learning methodology</td><td colspan="6">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>1. Lectures</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Laboratories</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
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<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="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>1. In-class quiz</td><td>10%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Assignments</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>3. Lab reports</td><td>30%</td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>4. Final project</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
Note: Assignments, working sheet and class quiz will mainly assess outcome 1 and 2; while the lab report will mainly assess outcome 3.
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<tr><td>Student Study Effort Expected</td><td>
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<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>30 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>9 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self-study</td><td>30 Hrs.</td></tr>
<tr><td>▪ Assignments, lab reports, and project</td><td>48 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>

1. Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press.
2. He, H., & Ma, Y. (2013). Imbalanced Learning: Foundations, Algorithms, and Applications. Wiley.
3. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An Introduction to Statistical Learning: With Applications in R. Springer.
4. Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. Science, 349(6245), 255-260.

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	5. Sanderson, R., & Fischer, A. (2017). Big Data and Analytics in Sport: Principles and Practicalities. Routledge.
Date of Last Major Revision	20 August 2025
Date of Last Minor Revision	20 August 2025