Subject Description Form

Subject Code	BME32165
Subject Title	**Applied Technology in Sports and Performance Analysis**
Credit Value	3
Level	3
Prerequisite	BME21151 Engineering Design & Biomechatronics
Objectives	To introduce students to the latest technologies utilized in sports, such as performance enhancement, movement tracking systems, and fan engagement platforms. The course aims to equip students with the knowledge and skills to analyze and evaluate sports performance using advanced methods. The students will be provided with practical exposure to the application of sports equipment, apparel, and wearable technologies in enhancing athletic performance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand and apply the latest performance enhancement and tracking technologies in sports. b. Analyze and interpret data obtained from sports gear, optical motion capture, wearable devices, and other assessment technologies in sports. c. Evaluate the effectiveness of cutting-edge broadcasting tools (e.g., immersive technology) and their role in enhancing fan engagement and decision-making. d. Design and conduct experiments using modern sports equipment and instruments to assess their impact on athletic performance. e. Learn the latest technical advancements in sports performance analysis and current challenges/issues in the field.
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, Practice and Measure) ▪ 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 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice. (Practice and Measure) ▪ Programme Outcome 12: Demonstrate an ability to recognize the need for, and to engage in life-long learning. (Teach)

Subject Synopsis / Indicative Syllabus	**Sports Equipment & Apparel:** Advances in sports gear, including impact-absorbing materials, aerodynamic designs, customized footwear, etc. **Performance Tracking & Monitoring:** Introduction to GPS tracking, optical motion capture, computer vision, and other movement/performance measurement tools used in sports. **Wearable Technologies:** Exploration of smart wearables (e.g., inertial measurement units, fitness trackers, and smart clothing/textile materials) and their applications in monitoring athlete health and performance. **Broadcasting & Fan Engagement:** Role of VAR, instant replay systems, and fan engagement technologies in enhancing the sports viewing experience. **Data Analysis:** Methods, algorithms, and tools for data collection, processing, and analysis in evaluating athlete performance.

Teaching and Learning Methodology

The course will consist of a combination of lectures, lab sessions, and tutorials to provide a comprehensive understanding of emerging technologies in sports performance tracking and analyses.

Teaching/ learning methodology	Intended subject learning outcomes					
	a	b	c	d	e	
1. Lectures	✓	✓	✓		✓	
2. Laboratories		✓	✓	✓		
3. Tutorials	✓		✓	✓	✓	

- Lectures will cover the theoretical aspects, introducing students to the basic knowledge, principles, significance, and applications of various technologies.
- Lab sessions will offer hands-on experience with a series of sports gear, motion sensors, wearable devices, and data analytics platforms, allowing students to apply their knowledge in real-world contexts.
- Tutorials will include procedure reviews to consolidate the student's comprehension of the technologies and corresponding operation skills. Tutorials will also incorporate case studies to illustrate the implementation of these technologies in different sports settings, fostering critical thinking and a problem-solving mindset.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	
Continuous assessment	60%						
1. In-class quiz	*30%*	✓	✓	✓		✓	
2. Lab reports	*30%*		✓	✓	✓		
Final exam	40%	✓	✓	✓		✓	
Total	100 %						

Assessment Methods in Alignment with Intended Learning Outcomes	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.	
Student Study Effort Required	Class contact:	
	▪ Lecture / Laboratories	36 Hrs.
	▪ Tutorials	3 Hrs.
	Other student study effort:	
	▪ Self-study	39 Hrs.
	▪ Assignments and paper preparation	39 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	▪ Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press. ▪ EMC Education Services. (2015). Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data. Wiley. ▪ Colyer, S.L., Evans, M., Cosker, D.P. et al. A Review of the Evolution of Vision-Based Motion Analysis and the Integration of Advanced Computer Vision Methods Towards Developing a Markerless System. Sports Med - Open 4, 24 (2018). ▪ Lara-Bercial, S., & Mendo-Castillo, I. (2020). Wearable Technology in Sport: A Practical Guide to the Use of Wearables to Improve Athletic Performance. Human Kinetics. ▪ Li RT, Kling SR, Salata MJ, Cupp SA, Sheehan J, Voos JE. Wearable Performance Devices in Sports Medicine. Sports Health. 2016;8(1):74-78. ▪ Memmert, D. (2024). Sports Technology: Technologies, Fields of Application, Sports Equipment and Materials for Sport. Springer Spektrum.	
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Date of Last Minor Revision	29 August 2024	