Subject Description Form

Subject Code	BME42166
Subject Title	**Sports Product Design and Engineering**
Credit Value	3
Level	4
Pre-requisite	BME32165 Applied Technology in Sports and Performance Analysis
Objectives	This subject aims to enable students to 1. Understand the principle and process involved in sports product design and engineering, from concept development to final production; 2. Gain practical skills to apply design thinking and interdisciplinary methods to solve complex problems in sports equipment and product development; 3. Learn current trends and emerging technologies in sports product design, focusing on sustainability, performance enhancement, and user-centered design.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate knowledge and proficiency in the application of design and engineering principles to sports product development. b. Develop and prototype sports products through correct practice of material selection, manufacturing techniques, and ergonomic considerations. c. Analyze and evaluate sports products in domains of performance, safety, and user satisfaction. d. Critically assess the utility of emerging technologies in sports product design and engineering.
Contribution to Programme Outcomes (Refer to Part I Section 10)	▪ Program Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach, Practice and Measure) ▪ Program Outcome 3: Demonstrate an ability to design a system, component, or process relevant to BME to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. (Teach and Practice) ▪ Programme Outcome 6: Demonstrate an ability to evaluate research and professional literature, and understand the principles and practice of conducting research in clinical and industrial environments relevant to BME. (Practice and Measure) ▪ Programme Outcome 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice. (Practice)
Subject Synopsis/ Indicative Syllabus	▪ **Introduction to Sports Product Design** o Overview of the history and evolution of sports-related product design o Key principles of design: form, function, and aesthetics. ▪ **Design Thinking and Methodology**

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Introduction to design thinking and user-centered design.
Research methods: understanding user needs and market trends.
Ideation techniques: brainstorming, sketching, and concept development.

Material Science in Sports Equipment

Properties of materials used in sports equipment
Applications of various materials in sports products

Ergonomics and Human Factors

Introduction to ergonomics in design: designing for comfort and usability.
Understanding human factors and their impact on product design.
Case studies of ergonomic design in sports products

Engineering Aspects of Product Development

Design processes and methodologies
Prototyping techniques and manufacturing processes
Emerging technologies in sports product development

Practical Application and Project Work

Hands-on projects: designing and testing sports products
Testing and evaluation of sports equipment
Safety considerations in product design

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<tr><td>Teaching/Learning Methodology</td><td>
Lectures and individual written assignments.
<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>d</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. Case study</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Practice</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>d</td><td></td><td></td></tr>
<tr><td>1. Assignment</td><td>10%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Case study (presentation/report)</td><td>20%</td><td>✓</td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Practice</td><td>30%</td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>4. Final examination</td><td>40%</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:

Assignments and the final examination will assess students' acquisition of the fundamental knowledge, principles, and basic concepts related to sports product design.
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	Case studies will evaluate the student's ability to integrate theoretical knowledge with real-world scenarios and examine their problem-solving skills and their understanding of industry practices. The practice session is arranged to help the students gain hands-on experiences, practical skills, and a collaborative mindset through tests.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	24 Hrs.
	▪ Case study	6 Hrs.
	▪ Practice session	9 Hrs.
	Other student study efforts:	
	▪ Self-study	48 Hrs.
	▪ Assignments	30 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	▪ Ashby, M. F., Shercliff, H. R., & Cebon, D. (2013). Materials: Engineering, Science, Processing and Design (3rd ed.). Butterworth-Heinemann. ▪ Brash, N. (2011). Sports and Sporting Equipment (The Technology Behind). Smart Apple Media. ▪ Baxter, M. (2018). Product Design: Practical Methods for the Systematic Development of New Products. CRC Press. ▪ Fuss F, Subic A, Strangwood M, Mehta R. (2015). Routledge Handbook of Sports Technology and Engineering (1st Edition). Routledge.	
Date of Last Major Revision	29 August 2024	
Date of Last Minor Revision	29 August 2024	