FACULTY OF APPLIED SCIENCES

MASTER OF SCIENCE IN SPORTS TECHNOLOGY AND INNOVATION

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	COMP6147		
Learning Module	Intelligent Rehabilitation Sports Engineering		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Dr. Lu, Hsuan-Yu	Email	hylu@mpu.edu.mo
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MODULE DESCRIPTION

This module covers the application of intelligent technology in the field of sports and rehabilitation. Students will learn about wearable sensors, motion tracking technology, and intelligent assistive devices, focusing on their principles and methods. The module includes the design and development of intelligent rehabilitation equipment, biomechanical analysis, and the design of exercise evaluation and training programs. Through theoretical lectures and practical exercises, students will master the basic principles and research skills of intelligent rehabilitation and sports training systems to enhance the effectiveness and efficiency of AI-based approach.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Take the knowledge in addressing the issue related to sport training and rehabilitation (AHEP4-M1, AHEP4-M2, AHEP4-M3).
M2.	Review and discuss technologies related to the multidisciplinary field (AHEP4-M4).
M3.	Leverage the advanced knowledge in wearable sensor/AR/VR technology to meet the needs in clinical applications (AHEP4-M5).
M4.	Synthesis and project in the form of report document and presentation (AHEP4-M2, AHEP4-M17).

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs		M1	M2	M3	M4
P1.	Acquire essential knowledge in specific fields of sports science, including sports physiology and biomechanics, enabling a comprehensive understanding and evaluation of sports technology solutions to complex problems.	✓	✓		
P2.	Demonstrate a deep understanding of the principles, concepts and advancements in sports technology, encompassing exercise training, sports performance analysis, injury prevention, and rehabilitation.	✓			
P3.	Develop proficiency in applying data science and artificial intelligence techniques and tools such as data analysis, statistical inference, data visualization, and predictive modelling, to sports-related data for actionable insights.			✓	
P4.	Design and integrate innovative sports technologies effectively, considering their potential impact to the environment and the society while providing solutions to complex user, societal, and business needs.		✓		
P5.	Evaluate and select sports technology solutions, taking into account factors such as user requirements, societal implications, safety, privacy issues, and ethical considerations.		✓	✓	
P6.	Develop a global vision on the critical development and new application of sports technology.		✓		✓
P7.	Collaborate in interdisciplinary teams to address complex sports technology challenges, leveraging diverse perspectives and expertise and be able to critically evaluate team and their own performance.			✓	
P8.	Communicate technically and effectively in both speaking and writing to both technical and non-technical audiences.				✓
P9.	Have a positive attitude towards society and the environment.				✓
P10.	Uphold high moral standards, professionalism, and a commitment to excellence in life-long learning.				✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Overview of Rehabilitation	6 hours
	1.1 Clinical assessment	
	1.2 Rehabilitation approach in PT, OT	
3-5	2. Kinesiology	9 hours
	2.1 Anatomy, physiology, and biomechanics	

	2.2 Therapy in rehabilitation	
	2.3 Athlete training	
6-8	3. Quantified assessment using motion technique	9 hours
	3.1 Motion measurement: marker-based method	
	3.2 Motion measurement: image-based method	
	3.3 Muscle firing measurement: EMG system	
9-11	4. Wearable sensor	9 hours
	4.1 Principle of the joint angle method based on IMU data	
	4.2 Movement recognition	
	4.3 3D motions reconstruction	
12-13	5. AR/VR technology	6 hours
	5.1 Case study: Telerehabilitation system using RGB-D sensor	
	5.2 Case study: Treadmill training system using AR/VR technology	
14-15	Student Presentation	6 hours

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	**M1**	**M2**	**M3**	**M4**
T1. Lectures and tutorials	✓	✓	✓	✓
T2. Case studies	✓	✓	✓	
T3. Project	✓	✓		✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Master's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	AHEP4 LOs	ILOs to be Assessed
A1. Test	25%	AHEP4-M1, AHEP-M2, AHEP4-M3, AHEP4-M4, AHEP4-M5	M1, M2, M3
A2. Assignments	35%	AHEP4-M1, AHEP-M2, AHEP4-M3, AHEP4-M4	M1, M2
A3. Project	40%	AHEP4-M1, AHEP-M2, AHEP4-M3, AHEP4-M4, AHEP4-M5, AHEP4-M17	M1, M2, M3, M4

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework will fail the module even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination will fail the module even if the overall score for the module is 50 or above.

REQUIRED READINGS

There is no official required reading for this module. Module notes are distributed in the class.

REFERENCES

1. Paul Allard, Aurelio Cappozzo and Arne Lundberg (1998), Three-Dimensional Analysis of Human Locomotion, John Wiley & Son Ltd.
2. Greene, SL Roberts (2015), Kinesiology-E-Book: Movement in the Context of Activity, Elsevier.
3. Raymond Tong, Balasankar Ganesan (2025) Digital Technology in Public Health and Rehabilitation Care, Elsevier.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.