FACULTY OF APPLIED SCIENCES

DOCTOR OF PHILOSOPHY IN COMPUTER APPLIED TECHNOLOGY

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	COMP8122		
Learning Module	Selected Topics in Big Data and Smart Society		
Pre-requisite(s)	--		
Medium of Instruction	English		
Credits	3	Contact Hours	45
Instructor	Dr. Wuman Luo	Email	luowuman@mpu.edu.mo
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MODULE DESCRIPTION

In this module, students will undertake in-depth explorations of selected topics about the interrelation between Big Data and other information-related phenomena in a society driven by smart applications. Upon completing the module, students will be able to identify and access the interdisciplinary issues in various socio-technical environments with respect to smart applications, to adopt intelligent Big Data analytical tools and techniques to deal with these issues, and to situate studies of technological innovation in a broad social and Region-specific context.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

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

M1.	Identify the characteristics and challenges of Big Data in a range of complex application domains. (AHEP4-M2)
M2.	Model and implement efficient Big Data solutions by integrating various advanced technologies. (AHEP4-M3)
M3.	Adapt data sciences (or business analytics) methods and processes to support business decisions. (AHEP-M2, AHEP-M3, AHEP-M16)
M4.	Criticize Big Data related problems in the various perspectives including business, social, cultural and ethical matters. (AHEP-M7)
M5.	Choose the mathematical cores for data sciences and apply the related mathematical models for data science techniques. (AHEP-M1)

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

PILOs	M1	M2	M3	M4	M5
Knowledge and Understanding					
P1. Critically evaluate scientific methodologies and mathematical models in Computing.			✓		✓
P2. Demonstrate the mastery of a body of knowledge spanning a wide range of Computing-related topics.				✓	
P3. Identify, assess, analyse complex problems and relevant issues in information-related phenomena.	✓				✓
P4. Utilize and synthesize a host of Computing-related methodologies to produce innovative solutions over diverse range of settings.		✓			
Skills and Attributes					
P5. Create new knowledge or original research in Computing, both individually and collaboratively in a team.			✓		✓
P6. Plan, design, execute and manage a scholarly research project with professional integrity and risk awareness.				✓	✓
P7. Communicate research findings, both orally to diverse audiences and in writing through publishing research papers of scholarly values.				✓	
P8. Gather and disseminate knowledge at the postgraduate level and beyond.					✓
P9. Demonstrate advanced knowledge, research capability and enthusiasm in high-quality research and development.		✓			
P10. Develop a global vision on knowledge advancement and dissemination.	✓			✓	
P11. Advocate of professionalism in workplaces and the society at-large.					
P12. Communicate technically and effectively both in oral and written form.				✓	

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Big Data Overview	6
	1.1 Module Introduction	
	1.2 Characteristics of Big Data	
	1.3 Data Science and Data Analytics	
3-5	2. Scalable Computing Systems	9
	2.1 Distributed File Systems and Hadoop Architecture	
	2.2 Large-Scale Data Processing with Spark	

6-10	3. Techniques for Data Scientific Thinking	15
	3.1 Association Rules	
	3.2 Similarity, Neighbours and Clusters	
	3.3 Multi-Criteria Decision Making	
	3.4 Streaming Data	
11-15	4. Data Science and Business Strategy	15
	4.1 Business & Social Impact of Big Data	
	4.2 Big Data Strategic Management	
	4.3 Case Studies	

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	M5
T1. Lectures and tutorials	✓	✓	✓	✓	✓
T2. Case studies		✓	✓	✓	
T3. Group discussion				✓	

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Doctoral 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. Assignment (problem solving)	25	AHEP-M1 AHEP-M2 AHEP-M3	M1, M2, M3, M5
A2. Test (Knowledge assessment)	25	AHEP-M1 AHEP-M2 AHEP-M3	M1, M2, M5
A3. Group Project (Literature Survey and Project Proposal)	50	AHEP-M2 AHEP-M3 AHEP-M7 AHEP-M16	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.

REQUIRED READINGS

Lecture notes and slides.

REFERENCES

1. Jeffrey D. Camm James J. Cochran Michael J. Fry author Gale Group. (2017), *Essentials of Business Analytics,* Cengage Learning.

2. Han Jiawei, Kamber Micheline, Pei Jian (2011). *Data Mining: Concepts and Techniques,* Elsevier Science.

3. Dimitris Bertsimas, Allison K. O'Hair, and William R. Pulleyblank (2016), *The Analytics Edge,* Dynamic Ideas.T

4. T. Erl, W Khattak (2016). Big Data Fundamentals: Concepts, Drivers & Techniques, ServiceTech

5. T. White (2015). Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale, O'Reilly

6. M. Guller (2015). Big Data Analytics with Spark, Apress

7. Yu Zheng (2019). Urban Computing, MIT Press

8. Yu Zheng, Xiaofang Zhou (2011). Computing with Spatial Trajectories, Springer

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/.