

**Macao Polytechnic University**  
**Faculty of Applied Sciences**  
**Master of Science in Big Data and Internet of Things**

**Module Outline**

**Academic Year 2022/2023 Semester 1**

<b>Learning Module</b>	Research Methodology			<b>Class Code</b>	COMP6123
<b>Pre-requisite(s)</b>	Nil				
<b>Medium of Instruction</b>	English			<b>Credit</b>	3
<b>Lecture Hours</b>	45 hrs	<b>Lab/Practice Hours</b>	0 hrs	<b>Total Hours</b>	45 hrs
<b>Instructor</b>	Dennis Wong		<b>E-mail</b>	cwong@mpu.edu.mo	
<b>Office</b>	N46B, Wui Chi, Main Campus		<b>Telephone</b>	8599-6875	

**Description**

The learning module will review research philosophies, investigate practical research methodology, and discuss documentation and transferrable skill. Particularly, it would be important to apply the understanding of the nature of knowledge and research to applied science such as those in computing technology and engineering. In the module, we shall discuss research methodologies, research design, ethnics, and techniques pertaining to data collection and analysis. It also covers the devise of research proposals, risk management and various management skill.

**Learning Outcomes**

After completing the learning module, students will be able to:

1. Design and execute an advanced research project following an ethical and professional research methodology; (ET1fl, ET4fl, ET5fl, EA3fl, EP4fl)
2. Contrast and assess various types of research philosophies and methodologies; (ET3fl)
3. Identify the distinct research activities required over the research project cycle; (ET3fl, ET4fl)
4. Assess the research progress and risks involved at different stages over the course of project; (ET4fl, ET6fl)
5. Analyse and describe the technical and socio-economic contexts under which the research is performed; (ET2fl, ET5fl, ET6fl)
6. Identify the roles and responsibilities of individuals in a research team, and play an active role either as a member or a team leader; (EP4fl)

7. Discuss the contemporary developments and applications in Big-Data and IoT. (SM2fl, SM3fl, EP2fl, EP3fl)

## **Content**

1. Ethics (6 hours)
  - 1.1 Elaborate ethics and integrity
  - 1.2 Understand human subject issues
  - 1.3 Discuss unethical issues in research, including plagiarism and self-plagiarism
  - 1.4 Discuss different scenarios using case studies
2. Research Theoretical Rationale (3 hours)
  - 2.1 What is research?
  - 2.2 Understand the basic research models: the research onion, and the wheel of science
  - 2.3 Discuss different research philosophy (the worldviews) – positivism, interpretivism, etc.
  - 2.4 Outline the concepts of ontology and epistemology
3. Research Methodology (3 hours)
  - 3.1 Interpret the research onion
  - 3.2 Understand quantitative and qualitative research
  - 3.3 Interpret the wheel of science
4. Technical writing (9 hours)
  - 4.1 What is scientific writing?
  - 4.2 Tools for scientific writing
  - 4.3 Structure of a thesis
  - 4.4 Structure of an academic paper
5. Literature Review (3 hours)
  - 5.1 Roles of literature review or survey
  - 5.2 Why the need for literature review?
  - 5.3 How to carry out a literature review
  - 5.4 A session at MPI library on available search tools
6. Research Cycle (6 hours)
  - 6.1 Research problem formulation – why the need for this?
  - 6.2 What are the criteria for selecting a problem?
  - 6.3 Causation, independent and dependent variables
  - 6.4 Evaluating problems
7. Scientific Approach (6 hours)
  - 7.1 Problems and objectives identification
  - 7.2 Research oriented or problem-solving problems
  - 7.3 Availability of resources and feasibility
  - 7.4 Data collection

8. Writing Research Proposals (6 hours)
  - 8.1 Thesis research proposals
  - 8.2 Research grant applications
  - 8.3 How to write good research proposals?
  - 8.4 What is an effective academic presentation?
9. Scientific Approach: Analysing Data and Interpreting Results (3 hours)
  - 9.1 Review of basic statistics
  - 9.2 Functions of hypothesis testing
  - 9.3 Evaluating results and drawing conclusion

### **Teaching Method**

Lectures, case studies, group discussion

### **Attendance**

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

### **Assessment**

The learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.

<b>Item</b>	<b>Description</b>	<b>AHEP3 LO</b>	<b>Percentage</b>
1. Assignments	Knowledge assessment	EA3fl, ET3fl,ET4fl	35%
2. Test	Knowledge assessment	SM2fl, SM3fl,ET2fl	25%
3. Project	Knowledge assessment	SM2fl, SM3fl,EP2fl,EP3fl,EP4fl, ET1fl,ET2fl, ET4fl,ET5fl, ET6fl	40%
<b>Total Percentage:</b>			<b>100%</b>

### **Teaching Material(s)**

#### **Textbook(s)**

There is no official text for this module. Module notes are distributed in classes.

## **Reference**

### **Reference book(s)**

1. Ethridge D. (2004) Research Methodology in Applied Economics, 2nd Ed.
2. Trochim W. M. K., Connelly J. P., Arora K. (2015) The Research Methods Essential Knowledge Base, 2nd Ed., Wadsworth Publishing.
3. Walliman N. (2011) Operating Research Methods - The Basics, Routledge (Taylor & Francis Group).
4. Deb D., Dey R., Balas V. E. (2019) Engineering Research Methodology - A Practical Insight for Researchers, Springer Nature Singapore.
5. O'Leary Z. (2017) The Essential Guide to Doing Your Research Project, 3rd Ed., SAGE Publications Ltd.

### **Website(s)**

1. The European Code of Conduct for Research Integrity.  
[http://www.esf.org/fileadmin/Public\\_documents/Publications/Code\\_Conduct\\_ResearchIntegrity.pdf](http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf)
2. The grammar according to West.  
<https://faculty.math.illinois.edu/~west/grammar.html>
3. Learn LaTeX in 30 minutes.  
[https://www.overleaf.com/learn/latex/Learn\\_LaTeX\\_in\\_30\\_minutes](https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes)