



FACULTY OF APPLIED SCIENCES
DOCTOR OF PHILOSOPHY IN COMPUTER APPLIED TECHNOLOGY
LEARNING MODULE OUTLINE

| | | | |
|-----------------------|---------------------------------------|---------------|-------------------|
| Academic Year | 2025/2026 | Semester | 1 |
| Module Code | COMP8121 | | |
| Learning Module | Research Methodology and Ethics | | |
| Pre-requisite(s) | Nil | | |
| Medium of Instruction | English | | |
| Credits | 3 | Contact Hours | 45 |
| Instructor | Xiaochen Yuan | Email | xcyuan@mpu.edu.mo |
| Office | A313, Chi Un Building, Main Campus | Office Phone | 8599 6434 |

MODULE DESCRIPTION

This module introduces the systematic investigation that attempts to establish facts on a scientific basis. The investigation involves discovery, interpretation, development, and execution of methods that are generic in nature, yet highly applicable to research in computer applied technology. Topics covered include review of a published article, literature review, identifying a research problem, reliability, validity, data collection, simulation, optimization, graphical modelling, research ethics, and research methods specific to computer applied technology. In particular, practical research methodology, documentation, and transferrable skill, especially for the computer applied technology, will be investigated. Furthermore, it is also important to formulate ways to write research proposals and academic papers.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

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

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|-----|---|
| M1. | Carry out critical review of the literature on a selected area of research interest in computer applied technology, to ground students' research in existing knowledge and identify new avenues for investigation. (AHEP4-M4) |
| M2. | Design and carry out an advanced research project following a professional methodology. (AHEP4-M1, AHEP4-M2, AHEP4-M3) |
| M3. | Identify the distinct research activities required over the research project cycle, and conduct good quality research in computer applied technology. (AHEP4-M1, AHEP4-M2, AHEP4-M3, AHEP4-M5, AHEP4-M7) |
| M4. | Acquire the important issues about research ethics, including the responsibility for research, integrity of academic research, ethical vetting, and scientific misconduct. (AHEP4-M5, AHEP4-M7) |
| M5. | Articulate and harmonise ideas both in written and oral communications. (AHEP4-M17) |



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

| PILOs | M1 | M2 | M3 | M4 | M5 |
|--|----|----|----|----|----|
| 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. | | ✓ | ✓ | | |
| 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. Introduction to Research | 6 |
| | 1.1 Concepts of research | |
| | 1.2 The need for research | |
| | 1.3 Types of research | |
| | 1.4 Steps in conducting research | |
| 3-5 | 2. Research in Computer Applied Technology | 9 |
| | 2.1 Qualities of a Computer Scientist / Engineer | |
| | 2.2 Meaning of Research in Computer Applied Technology | |
| | 2.3 Objectives of Research | |



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|-------|--|---|
| | 2.4 Motivations in Research | |
| | 2.5 Types of Research | |
| | 2.6 Research Approach | |
| | 2.7 Significance of Research | |
| | 2.8 Level of Research | |
| | 2.9 Research Process | |
| | 2.10 Critical Thinking in Research | |
| 6-7 | 3. Literature Review | 6 |
| | 3.1 Roles of literature review or survey | |
| | 3.2 Why the need for literature review? | |
| | 3.3 How to carry out a literature review | |
| 8-9 | 4. Technical Writing | 6 |
| | 4.1 Categories of Academic Writing | |
| | 4.2 Thesis Writing | |
| | 4.3 Journal Articles Writing | |
| | 4.4 Conference Papers Writing | |
| | 4.5 Research Proposals | |
| 10-12 | 5. Science Research Writing | 9 |
| | 5.1 How to Write an Introduction | |
| | 5.2 Writing about Methodology & Results | |
| | 5.3 Writing the Discussion & Conclusion & Abstract | |
| 13-14 | 6. Professional Ethics | 6 |
| | 6.1 Honor System | |
| | 6.2 Research Integrity | |
| | 6.3 Research Misconduct | |
| | 6.4 Self-Plagiarism | |
| | 6.5 Responsible Conduct in Research (RCR) | |
| 15 | 7. Research Topics | 3 |
| | 7.1 Introduction to related research topics | |



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. Presentations / Group discussions | ✓ | ✓ | ✓ | ✓ | ✓ |

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 (Literature Survey) | 20% | AHEP4-M4 | M1 |
| A2. Assignment (Project Proposal) | 15% | AHEP4-M1, AHEP4-M2, AHEP4-M3, AHEP4-M5, AHEP4-M7, AHEP4-M17 | M2, M3, M5 |
| A3. Test (Knowledge assessment on research ethics) | 15% | AHEP4-M5, AHEP4-M7 | M4 |
| A4. Project (Overall knowledge assessment) | 50% | AHEP4-M1, AHEP4-M2, AHEP4-M3, AHEP4-M4, AHEP4-M5, AHEP4-M7, AHEP4-M17 | M1, M2, M3, M4, M5 |

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

Reference book(s)

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

Website(s)

5. IET Rules of Conduct, <https://www.theiet.org/about/governance/rules-of-conduct>.
6. ACM Code of Ethics, <https://www.acm.org/about/code-of-ethics>.
7. IEEE Computer Society SE Code of Ethics, <http://www.computer.org/cms/Computer.org/Publications/code-of-ethics.pdf>.
8. NAS Responsible Conduct in Research, http://w.astro.berkeley.edu/~kalas/labs/documents/On_being_a_scientist.pdf.
9. S. Rajasekar et al, Research Methodology, <http://arxiv.org/pdf/physics/0601009.pdf>.

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/.