**FACULTY OF APPLIED SCIENCES**

**BACHELOR OF SCIENCE IN ARTIFICIAL INTELLIGENCE**

**LEARNING MODULE OUTLINE**

| Academic Year | 2025/2026 | Semester | 2 |
|---|---|---|---|
| Module Code | COMP2116 | | |
| Learning Module | Software Engineering | | |
| Pre-requisite(s) | Nil | | |
| Medium of Instruction | English | | |
| Credits | 3 | Contact Hours | 45 hrs |
| Instructor | Dr. Amang Kim | Email | amang@mpu.edu.mo |
| Office | A320 | Office Phone | 8599.6455 |

**MODULE DESCRIPTION**

…

**MODULE INTENDED LEARNING OUTCOMES (ILOS)**

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

| | |
|---|---|
| M1. | Classify the problems typically encountered in each aspect of software engineering and apply alternative processes, tools and technologies for overcoming those problems (C3). |
| M2. | Identify the various types of work activities that occur and the types of work products that are generated in each phase of the software lifecycle (C4, C15). |
| M3. | Apply various software engineering process models, and identify the strengths and weaknesses of each one (C5, C16). |
| M4. | Make use of the software design processes in order to deliver a product meeting the requirements of users (C9). |
| M5. | Illustrate software development standards and processes including those for requirements, design, construction, testing, project management and quality assurance (C10, C14). |
| M6. | Plan software process improvement models and the importance to the profession of applying and improving one's software engineering competencies and practices (C16, C17, C18). |

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

| PILOs | M1 | M2 | M3 | M4 | M5 | M6 |
|---|---|---|---|---|---|---|
| P1. Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems on common platforms, including the Internet platform; | | | | | | |
| P2. Acquire essential knowledge in specific fields of artificial intelligence, including machine learning, computer vision and natural language processing; | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| P3. | Apply necessary mathematical techniques to model, analyse and devise solutions to complex problems; | | | | | | |
| P4. | Work independently to develop an understanding of, and the knowledge and skills associated with the general support and mitigation of security risks of computer systems and networks; | | ✓ | | | | |
| P5. | Design and implement both relational and non-relational data stores, with an emphasis on how to organise, maintain, retrieve and analyse information; | | | ✓ | | | |
| P6. | Distinguish the fundamental and operational issues of computer systems and artificial intelligence applications, with considerations of user, business, ethical, societal and environmental needs; | | | | ✓ | | |
| P7. | Evaluate, prepare and communicate effectively on technical information to both technical and non-technical audience; | ✓ | | | | | |
| P8. | Work as an effective member of a team in the analysis, design and development of software systems, with recognition of requirement to support equality, diversity and inclusion; | | | | | ✓ | |
| P9. | Use project planning, risk management and quality management techniques in solutions to complex problems; | | | | | | |
| P10. | Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own. | | | | | | |

**MODULE SCHEDULE, COVERAGE AND STUDY LOAD**

| Week | Content Coverage | Contact Hours |
|---|---|---|
| 1-2 | 1. Introduction to software engineering & process | 6 |
| | 1.1. Professional software development | |
| | 1.2. Software process models | |
| | 1.3. Process activities | |
| | 1.4. Process improvement | |
| 3-4 | 2. Requirements engineering | 6 |
| | 2.1. The software requirements document | |
| | 2.2. Requirements specification | |
| | 2.3. Requirements elicitation and analysis | |
| | 2.4. Requirements management | |
| 5-6 | 3. System modelling | 4.5 |

| | | |
|---|---|---|
| | 3.1. Context models | |
| | 3.2. Interaction models | |
| | 3.3. Behavioral models | |
| | 3.4. Model-driven engineering | |
| 6-7 | 4. Architectural design | 4.5 |
| | 4.1. Architectural design decisions | |
| | 4.2. Architectural views | |
| | 4.3. Architectural patterns | |
| 8 | 5. Design and implementation | 3 |
| | 5.1. Object-oriented design using UML | |
| | 5.2. Implementation issues | |
| | 5.3. Open source development | |
| 9 | 6. Software Evolution | 3 |
| | 6.1. Evolution processes | |
| | 6.2. Program evolution dynamics | |
| | 6.3. Software maintenance | |
| | 6.4. Legacy system management | |
| 10 | 7. Agile software development | 3 |
| | 7.1. Agile method & Capability Maturity Model (CMM / CMMI) | |
| | 7.2. Agile development techniques | |
| | 7.3. Agile project management | |
| | 7.4. Continuous Development (CD): Beyond Agile process | |
| 11-12 | 8. Project planning | 6 |
| | 8.1. Software pricing | |
| | 8.2. Plan-driven development | |
| | 8.3. Project scheduling | |
| | 8.4. Agile planning | |
| 13 | 9. Software Development Practice | 3 |
| | 9.1. Software development in Internet era | |

| | 9.2. Case study: Com2uS mobile game development | |
|---|---|---|
| | 9.3. Group Activity: SW development startups | |
| 14-15 | 10. Quality management | 6 |
| | 10.1. Software quality | |
| | 10.2. Software standards | |
| | 10.3. Review and inspections | |
| | 10.4 Software measurement and metrics | |

**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 | M6 |
|---|---|---|---|---|---|---|
| T1.  Lectures | ✓ | | ✓ | | | |
| T2.  In-class exercises (group activity) | | ✓ | | | | ✓ |
| T3.  Test & Exam | ✓ | | ✓ | ✓ | ✓ | |
| T4.  Final project | | | | ✓ | | ✓ |

**ATTENDANCE**

Attendance requirements are governed by the Academic Regulations Governing Bachelor'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.  In-class assessments | 10% | C3, C5, C10 | M1, M3 |
| A2.  Group Activity | 20% | C4, C16, C17, C18 | M2, M6 |
| A3.  Final Project | 15% | C9, C15, C16, C17, C18 | M4, M6 |

| A4. Test | 15% | C3, C9, C14 | M1, M4, M5 |
|---|---|---|---|
| A5. Final Exam | 40% | C3, C5, C9, C14 | M1, 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.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

**REQUIRED READINGS**

1.  David C. Kung (2024), Software Engineering, 2nd Edition, McGraw Hill, New York, NY.

2.  Ian Sommerville (2015), Software Engineering, 10th Edition, Pearson, Boston, MA.

**REFERENCES**

1.  S.-K. Kim (2014), **Com2uS: mobile game pioneer,** *International Journal of Teaching and Case Studies* **5:**2, pp. 189-196.

2.  S.-K. Kim (2014), **Com2uS Mobile Game Development,** *Journal of Information Technology Case and Application Research* **16:**3-4, pp. 155-167.

3.  M. Iansiti and A. MacCormack (1997), **Developing Products on Internet Time,** *Harvard Business Review,* **Sep.-Oct Issue,** pp. 108-117 [Access] https://hbr.org/1997/09/developing-products-on-internet-time

4.  M. Shahin, M. Ali Babar and L. Zhu (2017), **Continuous Integration, Delivery and Deployment: A Systematic Review on Approaches, Tools, Challenges and Practices,** *IEEE Access* **5**, pp. 3909-3943.

5.  S.-K. Kim (2023), **Strategic Decision Spectrum for Software Engineering,** *IEEE Proceedings of IEEM,* pp. 1708-1712.

6.  S.-K. Kim (2025), **Innovative Software Development and Project Management Framework for Technology Startups,** *Journal of Advances in Information Technology* **16:**10, pp. 1442-1448.

**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/.