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| **Department/Faculty:** | Computer Science/ Computing | **Page:** | 1 of 7 | |
| **Course code:** | SECR 2043 | **Academic Session/Semester:** | | 2024/2025 01 |
| **Course name:** | OPERATING SYSTEMS | **Pre/co requisite:** | |  |
| **Credit hours:** | 3 |

**COURSE OUTLINE**

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| **Course synopsis** | This course covers introduction to [operating systems,](about:blank) which serve as an interface between computer hardware and the user. The operating system manages and coordinates processes and shares limited computer resources. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronisation, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding of the general concepts that underlie of an operating system. | | | |
| **Course coordinator** |  | | | |
| **Section** | **Course Lecturers** | **Office** | **Telephone** | **E-mail** |
| 1, 2, 5 | Dr. Farkhana Binti Muchtar | N28-438-05 | 601156907016 | farkhana@utm.my |
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**Mapping of the Course Learning Outcomes (CLO) to the Programme Learning Outcomes (PLO), Teaching & Learning (T&L) methods and Assessment methods:**

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| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **CLO** | **PLO**  **CODE** | **Weig ht**  **(%)** | **\*Taxonomies and \*\*generic skills** | **T&L**  **methods** | **Assessment methods\*\*\*** |
| CLO1 | ***Comprehend*** *the relationship of various operating system mechanisms in handling concurrent processing.* | KW | 25 | *A2, C2* | Lecture, Active  Learning | L1, Q1, MT |
| CLO2 | ***Explain*** *how the memory is allocated to*  *processes using different allocation schemes.* | KW | 25 | *A2, C4* | Lecture, Active  Learning | Q2, Q3, MT, F |
| CLO3 | ***Understand*** *the fundamentals of file*  *management and* ***differentiate*** *file mapping schemes to secondary storage* | KW | 25 | *A2, C4* | Lecture, Active  Learning | F |
| CLO4 | ***Ability*** *to program OS-related operations or services and deliver ideas effectively to*  *achieve common goals.* | KW | 10 | C3 | Lab | L2, L3, PR |
| CLO5 | ***Ability*** *to lead and work effectively in a team to achieve common goals.* | TW | 15 | *TS1, TS4* | Project-based  learning | GR |
| Refer \* Taxonomies of Learning and \*\* UTM’s Graduate Attributes for measurement of outcomes achievement. \*\*\* T – Test; Q – Quiz; HW – Homework; L – Lab, GR – Group Project; PR – Personal Report; F – Final Exam etc. | | | | | | |

**Details on Innovative T&L practices:**

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| P | Prepared by: |  |  | Certified by:   |  |  | | --- | --- | | Name: | Prof. Dr. Md Asri Bin Ngadi (Director) | | Signature: |  | | Date: |  | |
|  | Name: | Farkhana Binti Muchtar (Course Coordinator) |  |
|  | Signature: |  |  |
|  | Date: | 14/10/2024 |  |

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| **No.** | **Type** | **Implementation** |
| 1. | Active learning | Conducted through in-class activities. |
| 2. | Project-based learning | They are conducted through a given set of case studies. Students in a group of 3 (max.) are required to create animation/simulation of algorithms in the case study with relation to the related techniques introduced in the course. |

**Weekly Schedule:**

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| **WEEK**  **DATE** | **TOPICS** | ***NOTES*** |
| **PART 1: OVERVIEW** | | |
| **Week 1** | **Chapter 1: Introduction**  1.What Operating Systems Do?  2.Computer-System Organization  3.Computer-System Architecture  4.Operating-System Structure  5.Operating-System Operations  6.Process Management  7.Memory Management  8.Storage Management  9.Protection and Security  10.Types and Categories of Operating Systems 11.Computing Environments |  |
| **Week 2** | **Chapter 2: Operating-System Structures** 1.Operating-System Services  2.System Calls  3.Type of System Calls  4.System Programs  5.Operating-System Structure  6.System Boot |  |
| **PART 2A: PROCESS MANAGEMENT** | | |
| **Week 3** | **Chapter 3: Processes (UNIX)**  1.Process Concepts  2.Process Scheduling  3.Operation on Processes  4.Inter-process Communication | QUIZ 1 Chapter 1 Lab 1: UNIX |
| **Week 4** | **Chapter 4: Thread**  1.Overview  2.Multicore Programming | Lab 2: fork |
| **Week 5** | **Chapter 5: Process Scheduling**  1.Basic Concepts  2.Scheduling  3.Scheduling Criteria  4.Scheduling Algorithms |  |
| **Week 6** | **Chapter 6: Process Synchronization** 1.Background | QUIZ 2 Chapter 3 and 4 |

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|  | 2.The Critical-Section Problem  3.Peterson’s Solution  4.Synchronization Hardware  5.Mutex Locks  6.Semaphores | Group Project Commence |
| **PART 2B: PROCESS COORDINATION** | | |
| **Week 7** | **Chapter 7: Deadlocks**  1.System Model  2.Deadlock Characterization  3.Methods for Handling Deadlocks 4.Deadlock Prevention  5.Deadlock Avoidance  6.Deadlock Detection  7.Recovery from Deadlock | Mid Test – Chapter 5 and Chapter 6 |
| **Week 8** | ***MID-SEMESTER BREAK*** |  |
| **PART 3: MEMORY MANAGEMENT** | | |
| **Week 9** | **Chapter 8: Memory-Management Strategies** 1.Background  2.Swapping  3.Memory Allocation |  |
| **Week 10** | **Chapter 8: Memory-Management Strategies** 4.Segmentation  5.Paging |  |
| **Week 11** | **Chapter 9: Virtual-Memory Management** 1.Background  2.Demand Paging  3.Page Replacement  4.Thrashing |  |
| **PART 4: STORAGE MANAGEMENT** | | |
| **Week 12** | **Chapter 10: File System**  1.File Concepts  2.Directory and Disk Structure  3.Protection | Lab 3 :  Unix file  management |
| **Week 13** | **Chapter 11: Implementing File-Systems** 1.File-System Structure  2.File-System Implementation  3.Allocation Methods  4.Free-Space Management |  |
| **Week 14** | **Chapter 12: Mass-Storage Structure** 1.Overview  2.Disk Structure  3.Disk Scheduling  4.Raid Structure | *Project*  *presentation* |

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| **Week 15** | ***Project Report submission*** |  |
| **Week 16** | ***REVISION WEEK*** |  |
| **Week 16** | **Final Examination** | Final Exam Chapters 7,8,9,11 and 12 |

**Transferable skills (generic skills learned in course of study which can be useful and utilised in other settings):**

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| --- |
| Thinking skills. |

**Student learning time (SLT) details:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Distribution  of student  Learning Time (SLT) Course  content outline | Teaching and Learning Activities | | | | | | TOTAL SLT |
| Guided Learning  (Face to Face) | | | | Guided Learning Non-Face to Face | Independent  Learning  Non-Face to face |
| **CLO** | **L** | **T** | **P** | **O** |
| CLO1 | 10 | 1 |  |  |  | 7.5 | 18.5 |
| CLO2 | 10 | 3 | 1 |  |  | 25.2 | 39.2 |
| CLO3 | 8 | 2 | 0.5 |  |  | 22.8 | 33.3 |
| CLO4 | 2 |  | 1 |  |  | 5 | 8 |
| CLO5 | 2 |  | 1 |  |  | 5 | 8 |
| **Total SLT** | **32** | **6** | **3.5** |  |  | **65.5** | **107** |

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| Continuous Assessment | | PLO | Percentage | Total SLT |
| 1 | Lab 1 (CLO4) **(QIU – 5%)** | PS | 5 | 1.5 |

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| 2 | Lab 2 (CLO4) **(QIU – 5%)** | PS | 5 | 1.5 |
| 3 | Lab 3 (CLO4) **(QIU – 5%)** | PS | 5 | 1.5 |
| 4 | Quiz 1 (CLO1) **(QIU– 5%)** | KW | 5 | 0.5 |
| 5 | Quiz 2 (CLO1) **(QIU– 5%)** | KW | 5 | 0.5 |
| 5 | Mid Test (CLO2) **(UTM 25%)** | KW | 10 | 1.5 |
| 6 | Project (Demo – CLO4) **(QIU -5%)** | CS1 | 10 | 1.5 |
| 7 | Project (Report – CLO5) **(QIU – 10%)** | CS1 | 10 | 1.5 |
|  | |  |  | **10.00** |
| Final Assessment | |  | Percentage | Total SLT |
| 1 | Final Examination (CLO2) **(UTM – 35%)** | KW | 10 | 0.5 |
|  | **(QIU – 40%, UTM – 60%)** |  |  | **3.0** |
| **Grand Total SLT** | | | | **120** |

**Learning resources:**

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| **Main references/Textbook:**  *Silbershatz, Galvin, and Gagne, “Operating Systems Concepts, 9th Edition, 2013, John Wiley & Sons.*  **Additional references:**  *1.William Stallings, Operating Systems: Internals and Design Principles, 6th Edition, 2008, Prentice-Hall.*  *2.McHoes, A.M. and Flynn, I.M., Understanding Operating System, 6th Edition, Course Technology, Cengage Learning,*  *2011.*  *3.H.M. Deitel, Operating Systems, 3rd Edition, Pearson Prentice Hall*  *4.Tanenbaum, Operating System: Design and Implementation, Prentice-Hall.*  *5.D M Dhamdhere, Operating System – A Concept-Based Approach. 2006, Mc Graw-Hill.*  **Online:**  *http://elearning.utm.my* |

**Academic honesty and plagiarism:**

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| Assignments are individual tasks, not group activities (UNLESS EXPLICITLY INDICATED AS GROUP ACTIVITIES). Copying work (texts, lab results, etc.) from other students/groups or sources is prohibited. Brief quotations are allowed and then only if indicated as such. Existing texts should be reformulated with your own words to explain what you have read. You are returning existing texts, and acknowledging the source as a reference is unacceptable. Be warned: students who submit copied work will obtain a zero markfor the assignment and exams, and the Faculty may take disciplinary steps. It is also unacceptable to do somebody else’s work, lend it to them, or make your work available to them to copy. |

**Other additional information (Course policy, any specific instruction etc.):**

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| 1.Attendance is compulsory and will be taken in every lecture session. Students with **less than 80%**of total attendance **CANNOT** sit for the final exam.  2.Students must always behave and follow the University’s dressing regulations and etiquette.  3.Exercises and tutorials will be given in class; some may be taken for assessment. Students who do not do the exercise will lose the coursework marks for the exercise.  4.Assignments must be submitted on the due dates. Some points will be deducted for late submissions. Assignments submitted **three days after**the due date will not be accepted.  5.Makeup exams will not be given, except to students who are sick and submit medical certificates confirmed by UTM panel doctors. Makeup exams can only be given **within one week**of the initial date of the exam.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | | **PLO1** | | | **PLO3** | **PLO4** |  | | **No.** | **Assesments** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **Total** | | **1** | **Lab 1** |  |  |  | 5 |  | **5** | | **2** | **Lab 2** |  |  |  | 5 |  | **5** | | **3** | **Lab 3** |  |  |  | 5 |  | **5** | | **4** | **Project Demo** |  |  |  |  | 5 | **5** | | **5** | **Project report** |  |  |  |  | 10 | **10** | | **7** | **Quiz 1** | 5 |  |  |  |  | **5** | | **8** | **Quiz 2** | 5 |  |  |  |  | **5** | | **9** | **Mid Test** | 10 | 15 |  |  |  | **25** | | **10** | **Final Exam** |  | 10 | 25 |  |  | **35** | | **Total** | | **20** | **20** | **25** | **15** | **15** | **100** |   **Additional Notes:**  All Labs **NOT** includes in Quiz or Test.  Quiz 1 – Chapter 1 (Multiple Choice Questions, 20 questions) by QIU  Quiz 2 – Chapter 3 and 4 (Multiple Choice Questions, 20 questions) by QIU  Mid Test – Chapter 5 and Chapter 6 (Structured Questions) by UTM  Final Test – Chapters 7,8,9,11 and 12 |

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