

## DETAILED COURSE INFORMATION

Approval Reference:

### FACULTY OF INFORMATICS AND COMPUTING

Reminder : The content of this course information cannot be changed without the approval of the Faculty/Centre Academic Committee.

1.	Name of Course/Module : Operating Systems
2.	Course Code : CSF 11703
3.	Name of academic staff : DR WAN NOR SHUHADAH
4.	Programme: Bachelor of Computer Science (Software Development) with honours Bachelor of Computer Science (Computer Network Security) with honours Bachelor of Computer Science (Internet Computing) with honours
5.	Course Category : CORE
6.	Semester and Year offered: SEMESTER 2, YEAR 1
7.	Credit Value: 3
8.	Prerequisite (if any): NONE
9.	Synopsis:  This course examines the important problems in operating system design and implementation. The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for sharing resources (e.g., disks, networks, and processors), providing common services needed by many different programs, and protecting individual programs from interfering with one another. This course will focus on three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.

10.	<p>Programme Learning Outcomes (PLOs) :</p> <p>Upon completion of this programme, student should be able to :</p> <p>PLO1: Acquire and apply knowledge of essential facts, concepts, principles, and theories of Computer Science [MQF1:CS1]</p> <p>PLO2: Applying computing skills in analyzing, modeling, designing, developing, programming and evaluating efficient computing solutions in Computer Science [MQF2:CS3]</p> <p>PLO3: Fulfill obligations and social responsibilities using appropriate social skills [MQF3:G5]</p> <p>PLO4: Practice the value, attitude and professionalism in line with the related code of conduct [MQF4:G5]</p> <p>PLO5: Communicate effectively with peers, clients, superiors and society at large; with appropriate leadership and team work skills [MQF5:G2,G3]</p> <p>PLO6: Utilize scientific skills to analyze algorithms as well as designing optimal solution to Computer Science [MQF6:G4,CS2]</p> <p>PLO7: Manage information and engage in lifelong learning for academic and career development [MQF7:G1]</p> <p>PLO8: Possess managerial and entrepreneurship skills in business and real world perspectives [MQF8:G6]</p>
11.	<p>Course Learning Outcomes (CLOs) :</p> <p>At the end of this course, students will be able to :</p> <p>CLO1: Apply the fundamental concepts and techniques of computer resource management in operating systems. (C3, MQF6)</p> <p>CLO2: Demonstrate setup and configuration of various operating systems. (P5, MQF2)</p> <p>CLO3: Select an operating system to be studied in group projects. (A3, MQF5)</p>

12.	Course Learning outcomes (CLO) and mapping to the PLO/MQFs :								
	MQF	MQF 1	MQF 2	MQF 3	MQF 4	MQF 5	MQF 6	MQF 7	MQF 8
	PLO STANDARD PROGRAM	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
	Apply the fundamental concepts and techniques of computer resource management in operating systems. (C3, MQF6)						/		
	Demonstrate setup and configuration of various operating systems. (P5, MQF2)		/						
	Select an operating system to be studied in group projects. (A3, MQF5)					/			
13.	Transferable Skills: Problem solving and Scientific skills Communication, Leadership and Teamworks								
14.	Content outline of the course/module and the SLT								
CLO	Topic	Face to Face				Self Learning	TLT		
		L=Lecture T = Tutorial P = Practical O = Others ( include Assessments)							
		L	T	P	O				
CLO1	1. Introduction to Operating Systems 1.1 Basic Concepts of Operating Systems  2. Operating System Structure 2.1 Fundamental Components and Structure of Operating Systems and Their Functions  3. Process Concept 3.1 Fundamental Process Concept and Inter-process Communications  4. Multithreaded Programming 4.1 Multicore Programming 4.2 Multi-threading Models  5. Process Scheduling 5.1 Basic Concepts 5.2 Scheduling Criteria 5.3 Scheduling Algorithms	24				48	72		

CLO1	5.4 Multiple Processor Scheduling 5.5 Real-Time CPU Scheduling 5.6 Algorithm Evaluation  6. Synchronization 6.1 Background 6.2 The Critical Section Problem 6.3 Peterson's Solution 6.4 Synchronization Hardware 6.5 Mutex Locks 6.6 Semaphores 6.7 Classic Problems of Synchronization 6.8 Monitors  7. Deadlocks 7.1 Deadlock Characterization 7.2 Methods for Handling Deadlocks 7.3 Deadlock Prevention 7.4 Deadlock Avoidance 7.5 Deadlock Detection 7.6 Recovery from Deadlock  8. Memory Management 8.1 Background 8.2 Swapping 8.3 Contiguous Memory Allocation 8.4 Segmentation 8.5 Paging 8.6 Structure of the Page Table  9. Virtual Memory 9.1 Demand Paging 9.2 Copy-On-Write 9.3 Page Replacement 9.4 Allocation of Frames 9.5 Thrashing							
	CLO1	Test				2	6	8
	CLO1	Final Exam				2.5	7.5	10
	CLO2	10. Storage Management 10.1 File Concepts 10.2 File System Structure 10.3 Overview of Mass-Storage Structure 10.4 Disc Structure 10.5 Overview of IO systems	3		4		13	20
	CLO2	Assignment (1000 words)				2	6	8
	CLO3	Group Project on Existing Operating Systems and Current Technology in Operating Systems				2	6	8
	TOTAL NOTIONAL HOURS		27	0	4	8.5	86.5	126
			39.5					
	CREDIT HOURS		126 / 40 = 3.15					

15.	<p>Main References:</p> <p>Silberschatz, A., Galvin, P.B., and Gange, G. (2014). Operating System Concepts (9th Edition), John Wiley &amp; Sons Inc.</p> <p>Additional references:</p> <p>Related journal articles</p>
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16. Course Assessment Plan:

No	CLO	PLO/MQF LOD	Delivery Method	Assessment Method / Component (the components must align with CLO and PLO mapping)				Special Task and the Related PLO/MQF LOD	Student Learning Time (SLT)	Weightage
				Lab Assignment	Group Project	Test	Final Exam			
1	Apply the fundamental concepts and techniques of computer resource management in operating systems. (C3, MQF6)	PLO6 / MQF6	Lecture	-	-	-	40%	Final examination related to apply the fundamental concepts and techniques of computer resource management in operating systems. that requires student to emphasize the attribute of 'Problem Solving and Scientific Skills' in MQF6.	90 (71%)	2.1
2	Demonstrate setup and configuration of various operating systems. (P5, MQF2)	PLO2 / MQF2	Lecture , Lab Session	15%	-	15%	-	Group Project related to demonstrate setup and configuration of various operating systems. that requires student to emphasize the attribute of 'Practical Skills' in MQF2.	28 (22%)	0.7
3	Select an operating system to be studied in group projects. (A3, MQF5)	PLO5 / MQF5	Lecture , Group Discussion	-	30%	-	-	Test related to select an operating system to be studied in group projects. that requires student to emphasize the attribute of 'Communication, Teamwork, Leadership' in MQF5.	8 (6%)	0.2
<b>TOTAL</b>				15%	30%	15%	40%	-	126	3

\* Fill in the % weightage of each assessment (eg. Examination, Presentation, Assignment etc.)



17. Course Learning Plan :

CLO	Learning Time			Student Learning Time
	Face to Face	Self Learning	Assessment	
CLO 1	24	61.5	4.5	90
CLO 2	7	19	2	28
CLO 3	0	6	2	8
<b>TOTAL</b>	31	86.5	8.5	126

ENDORSEMENT :

<p>Prepared by:</p> <p>Course Coordinator / Lecturer :</p> <p>.....</p> <p>(Signature and Official Stamp)</p> <p>Date:</p>	<p>Checked by :</p> <p>Head of School :</p> <p>.....</p> <p>(Signature and Official Stamp)</p> <p>Date:</p>
<p>Verified (1) by:</p> <p>Deputy Dean (Academic &amp; Graduate) :</p> <p>.....</p> <p>(Signature and Official Stamp)</p> <p>Date:</p>	<p>Verified (2) by:</p> <p>Deputy Director (Academic Development)</p> <p>.....</p> <p>(Signature and Official Stamp)</p> <p>Date:</p>