

**PROG C7017: Operating Systems and  
Virtualization**

Module Details	
Module Code:	PROG C7017
Full Title:	Operating Systems and Virtualization <b>APPROVED</b>
Valid From::	Semester 1 - 2019/20 ( June 2019 )
Language of Instruction:	English
Duration:	2 Semesters
Credits::	10
Module Owner::	Elizabeth Rooney
Departments:	Unknown
Module Description:	<p>This module aims to provide a theoretical understanding of process management, memory management, file systems, computer security and to develop the student's shell problem-solving skills.</p> <p>The aim of this module is to provide students with the required knowledge and skills to successfully plan, install, configure and manage virtualization software to meet a variety of computing needs. In addition, students are required to produce a project plan and technical documentation for work produced.</p>

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	Module Learning Outcome Description
MLO1	Explain how an operating system manages processes and computer hardware.
MLO2	Compare and contrast different memory management algorithms.
MLO3	Explain how different file storage schemes in major operating systems are implemented.
MLO4	Analyse the main goals of computer security and preventive measures against threats.
MLO5	Manipulate the main features and capabilities of bash shell scripting.
MLO6	Demonstrate an understanding of the terminology, architecture, virtualization software and technologies used in business today.
MLO7	Design, install and configure a virtualized solution for a real world scenario using appropriate tools.
MLO8	Manage, maintain and secure the virtualized solution using the command line and scripting tools.
Pre-requisite learning	
<b>Module Recommendations</b> <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	

Module Indicative Content
<b>Memory Management</b> Memory leaks, Memory Access, Logical address, Physical address, Fixed Partitioning, Dynamic Partitioning, Paging, Segmentation, Virtual Memory, Translation Lookaside Buffer.
<b>Process Management</b> Process, Interrupt, System Call, Process states, Process Scheduling Algorithms, Thread, Race Conditions, Mutual Exclusion, Deadlock.
<b>File System Management</b> Storage Devices, Sector, Block, Device Driver, Master Boot Record, File Access Methods, File Storage Schemes, Free Space Management Schemes, FAT, NTFS, EXT.
<b>Security</b> Confidentiality, Integrity, Availability, Authentication, Packet Sniffers, Probes, Spyware and Malware, Anti-viral software, Firewalls, Cryptography.
<b>Shell Scripting</b> Environmental, user defined variables, Script Parameters, Input Redirection, Mathematical Operators, Boolean expressions, String Manipulation, Loops, Scheduling tasks.
<b>Introduction to Virtualization Technologies</b> Overview of Virtualization and Virtualization Software.
<b>Virtualization Infrastructure, Technology and Terminology</b> Virtualization Infrastructure Diagram, Technology and Terminology Explanation.
<b>Installation and Configuration of Virtualization Solution</b> Installation and Configuration of Virtual Machines, Storage and Networking.
<b>Management and Maintenance of Virtualization Solution</b> Management and Maintenance of Virtualization solution using command line and GUI.
<b>Security of Virtualization Environment</b> Security of host computer; Virtual Machines; Configuration Files, and Virtual Machine Data.
<b>Implementing High Availability</b> High Availability (load balancing and failover clusters).

Module Assessment	
Assessment Breakdown	%
Course Work	100.00%
Module Special Regulation	

## Assessments

Full Time On Campus			
Course Work			
Assessment Type	Continuous Assessment	% of Total Mark	15
Marks Out Of	100	Pass Mark	40
Timing	Every Second Week	Learning Outcome	5
Duration in minutes	0		
Assessment Description On-going lab quizzes			
Assessment Type	Class Test	% of Total Mark	10
Marks Out Of	100	Pass Mark	40
Timing	Week 8	Learning Outcome	1,2,3,4
Duration in minutes	60		
Assessment Description Closed book test examining lecture material.			
Assessment Type	Class Test	% of Total Mark	25
Marks Out Of	100	Pass Mark	40
Timing	Week 13	Learning Outcome	1,2,3,4,5
Duration in minutes	120		
Assessment Description Formal Test - Examining all of the learning outcomes from delivery period 1			
Assessment Type	Continuous Assessment	% of Total Mark	15
Marks Out Of	100	Pass Mark	40
Timing	Every Second Week	Learning Outcome	6,7,8
Duration in minutes	0		
Assessment Description Students will be required to complete weekly lab tasks based on real world scenarios. Students will also be expected to document their weekly tasks including problems and solutions, using a WIKI.			
Assessment Type	Short Answer Questions	% of Total Mark	10
Marks Out Of	100	Pass Mark	40
Timing	Week 25	Learning Outcome	6,8
Duration in minutes	60		
Assessment Description Individual Written Tests to assess students understanding of the theory and concepts delivered.			
Assessment Type	Short Answer Questions	% of Total Mark	10
Marks Out Of	100	Pass Mark	40
Timing	Week 28	Learning Outcome	6,8
Duration in minutes	60		
Assessment Description Individual Written Tests to assess students understanding of the theory and concepts delivered.			
Assessment Type	Open-book Examination	% of Total Mark	15
Marks Out Of	100	Pass Mark	40
Timing	Week 30	Learning Outcome	6,7,8
Duration in minutes	120		
Assessment Description Individual Practical Lab Test which will test students ability to solve problems in an exam based setting.			
No Project			
No Practical			
No Final Examination			

## Part Time On Campus

Course Work			
<b>Assessment Type</b>	Continuous Assessment	<b>% of Total Mark</b>	15
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Every Second Week	<b>Learning Outcome</b>	5
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> On-going lab quizzes			
<b>Assessment Type</b>	Class Test	<b>% of Total Mark</b>	10
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Week 8	<b>Learning Outcome</b>	1,2,3,4
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> Closed book test examining lecture material.			
<b>Assessment Type</b>	Class Test	<b>% of Total Mark</b>	25
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Week 13	<b>Learning Outcome</b>	1,2,3,4,5
<b>Duration in minutes</b>	60		
<b>Assessment Description</b> Formal Test - Examining all of the learning outcomes from delivery period 1			
<b>Assessment Type</b>	Continuous Assessment	<b>% of Total Mark</b>	15
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Every Second Week	<b>Learning Outcome</b>	6,7,8
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> Students will be required to complete weekly lab tasks based on real world scenarios. Students will also be expected to document their weekly tasks including problems and solutions, using a WIKI.			
<b>Assessment Type</b>	Short Answer Questions	<b>% of Total Mark</b>	10
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Week 25	<b>Learning Outcome</b>	6,8
<b>Duration in minutes</b>	60		
<b>Assessment Description</b> Individual Written Tests to assess students understanding of the theory and concepts delivered.			
<b>Assessment Type</b>	Short Answer Questions	<b>% of Total Mark</b>	10
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Week 28	<b>Learning Outcome</b>	6,8
<b>Duration in minutes</b>	60		
<b>Assessment Description</b> Individual Written Tests to assess students understanding of the theory and concepts delivered.			
<b>Assessment Type</b>	Open-book Examination	<b>% of Total Mark</b>	15
<b>Marks Out Of</b>	100	<b>Pass Mark</b>	40
<b>Timing</b>	Week 30	<b>Learning Outcome</b>	6,7,8
<b>Duration in minutes</b>	120		
<b>Assessment Description</b> Individual Practical Lab Test which will test students ability to solve problems in an exam based setting.			
No Project			
No Practical			
No Final Examination			

## Module Workload

### Workload: Full Time On Campus

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecture	Contact	Student-centred lectures, 2 hours/ week during delivery period 1 (semester 1) in which theories are introduced and developed. This splits into 1 hour lecture and 1 additional hour lab in semester 2	Every Week	2.00	2
Practical	Contact	Interactive lab based practicals, 2 hours/ week	Every Week	2.00	2
Independent Study	Non Contact	No Description	Every Week	2.00	2
Directed Reading	Non Contact	No Description	Every Week	2.00	2
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	4.00

### Workload: Part Time On Campus

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Practical	Contact	Interactive lab based practicals, 2 hours/ week.	Every Week	2.00	2
Lecture	Contact	Student-centred lectures, 2 hours/ week during delivery period 1 (semester 1) in which theories are introduced and developed. This splits into 1 hour lecture and 1 additional hour lab in semester 2	Every Week	2.00	2
Independent Study	Non Contact	No Description	Every Week	2.00	2
Directed Reading	Non Contact	No Description	Every Week	2.00	2
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	4.00

## Module Resources

### Recommended Book Resources

Ted Simpson, Jason Novak. (2018), Hands-On Virtual Computing, 3. [ISBN: 9781337101936].  
Leandro Carvalho, Charbel Nemnom, Patrick Lownds. (2017), Windows Server Hyper-V Cookbook - Second Edition, [ISBN: 9781785884313].  
Wiley. (2017), Mastering Windows Server Hyper-V, [ISBN: 978-111928618].  
Greg Tomsho. (2017), Guide to Operating Systems, 5th Edition, Cengage, [ISBN: 9781305107649].  
William Stallings. (2018), Operating Systems: Internals and Design Principles, 9th. Pearson Education Limited, [ISBN: 1292214295].

### Supplementary Book Resources

Silberschatz, Galvin & Gagne. (2018), Operating System Concepts, 10th. John Wiley & Sons, Inc., [ISBN: 978-1-118-063].  
S. Tanenbaum. (2006), Operating Systems: Design and Implementation, Prentice Hall, [ISBN: 0-13-142938-8].

### Recommended Article/Paper Resources

Dell Server Virtualization Technologies,  
<https://www.dell.com/learn/us/en/555/virtual-data-center>  
HowStuffWorks,  
<https://computer.howstuffworks.com/operating-system.htm>

### Other Resources

Website, Microsoft Technet,  
<https://docs.microsoft.com/en-us/windows-server/virtualization/virtualization>  
Website, VMWare,  
<https://www.vmware.com/>  
Website, Xen Server,  
<https://xenserver.org/>