

1.	Name of Course					Linux Network Architecture				
2.	Course Code					CMMD4543				
3.	Name(s) of academic staff									
4.	Rationale for the inclusion of the course/module in the programme					Major The Internet is recognized as a network that is fundamentally changing social, political, and economic structures, and in many ways obviating geographic boundaries. The design and control of such a network require an understanding of how networking behaviour and protocols can be implemented within the operating system. The module provides an overview of the implementation of networking protocols in the Linux kernel.				
5.	Semester and Year offered					1/4				
6.	Total Student Learning Time (SLT)		Face to Face				Total Guided and Independent Learning			
	L = Lecture T = Tutorial P = Practical O= Others		L	T	P	O	Independent study=84 hours			
			28	14	/	84	Total =126			
7.	Credit Value					3				
8.	Prerequisite (if any)					none				
9.	Objectives: The module is designed to provide the students with the basics required to implement network functionality in the Linux kernel. The module enables the students to deepen their understanding of network specific processes in an operating system. The module introduces the key components and mechanisms of the Linux kernel and the designs of communication systems.									
10.	Learning outcomes: By the end of the subject, students should be able to: - Recognize the components of the Linux kernel that are important for the Linux network architecture. - Recognize the general architecture of communication systems and the functionality of protocols and protocol instances. - Demonstrate Various ways of viewing the kernel—as an enhanced machine, a resource manager, and a library - Demonstrate how to represent and manage network packets in the Linux kernel - Demonstrate How the kernel deals with networks and implements TCP/IP - Demonstrate technical knowledge on SLIP, PPP, and PPP-over-Ethernet protocols and how the ATM and Bluetooth network technologies are supported in Linux.									
11.	Transferable Skills: - Implement network functionality in the Linux kernel. - Network Analysis and problem solving skills - Technical writing skills - Oral/Written Communication skills - Teamwork skills									

12.	Teaching-learning and assessment strategy A variety of teaching and learning strategies are used throughout the course, including: • Classroom lessons. Lectures and Power Point presentations • Tutorials • brainstorming • Lecturer-led problem-solving sessions • collaborative and co-operative learning; • Independent study. Assessment strategies include the following: • Performance Assessment (Project, Assigned exercises) • Lecturer Observation • Quizzes, tests, and examinations																																			
13.	Synopsis: The module provides an overview of the implementation of networking protocols in the Linux kernel and how networking behavior and protocols can be implemented within the Linux operating system. It begins with the kernel's network device drivers, continuing with link-layer protocols such as PPP, then and finally giving a description of all core protocols of the TCP/IP protocol family. In this context, the module will cover Additional supplementary protocols such as RSVP.																																			
14.	Mode of Delivery: • Classroom lessons. Lectures and Presentations • Tutorial sessions: Practice exercises																																			
15.	Assessment Methods and Types: The assessment for this course will be based on the following: <table><tr><td></td><td>Coursework</td><td>40%</td></tr><tr><td>• Midterm test</td><td>15%</td><td></td></tr><tr><td>• Quizzes and Assignments</td><td>10%</td><td></td></tr><tr><td>• Project</td><td>15%</td><td></td></tr><tr><td></td><td>Final Examination</td><td><u>60%</u></td></tr><tr><td></td><td></td><td>100%</td></tr></table>													Coursework	40%	• Midterm test	15%		• Quizzes and Assignments	10%		• Project	15%			Final Examination	<u>60%</u>			100%						
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16.	Mapping of the course/module to the Programme Aims <table><tr><td>A1</td><td>A2</td><td>A3</td><td>A4</td><td>A5</td><td>A6</td><td>A7</td><td>A8</td><td>A9</td></tr><tr><td>4</td><td>4</td><td>4</td><td>1</td><td>5</td><td>1</td><td>1</td><td>2</td><td>0</td></tr></table>												A1	A2	A3	A4	A5	A6	A7	A8	A9	4	4	4	1	5	1	1	2	0						
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18.	Content outline of the course/module and the SLT per topic <table><tr><td></td><td></td><td colspan="8">SLT</td></tr><tr><td></td><td>Details</td><td>L</td><td>T</td><td>Indep.</td><td>Total</td></tr><tr><td>Topic 1</td><td>Introduction • The Linux Operating System • Why Use Linux </td><td>2</td><td>1</td><td>6</td><td>9</td></tr></table>														SLT									Details	L	T	Indep.	Total	Topic 1	Introduction • The Linux Operating System • Why Use Linux	2	1	6	9		
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Bachelor of Computer Sciences (Hons) in Computer Networking

	Topic 2	The Kernel Structure • Monolithic Architectures and Microkernels • Activities in the Linux Kernel • Locking—Atomic Operations • Kernel Modules • Device Drivers • Memory Management in the Kernel • Timing in the Linux Kernel • The Proc File System • Versioning	4	2	12	18
	Topic 3	Architecture of Network Implementation • The Architecture of Communication Systems • Managing Network Packets in the Kernel • Network Devices	6	3	18	27
	Topic 4	The Serial-Line Internet Protocol (SLIP) • Overview • Slip Implementation in the Linux Kernel	2	1	6	9
	Topic 5	The Point-to-Point Protocol (PPP) • Overview • PPP Configuration in Linux • PPP Implementation in the Linux Kernel • Implementing the PPP Daemon • PPP over Ethernet	4	2	12	18
	Topic 6	Asynchronous Transfer Mode—ATM • Introduction • Implementing ATM in Linux • Configuration	4	2	12	18
	Topic 7	Bluetooth in Linux • Host Controller Interface (HCI) • L2CAP • Other Protocols	2	1	6	9
	Topic 8	Network Layer Overview - The Internet Protocol V4 - Address Resolution Protocol (ARP) • IP Routing • IP Multicast for Group Communication • Using Traffic Control to Support Quality of Service (QoS)	4	2	12	18
	Total SLT		28	14	84	126
19.	Main references supporting the course: 1. Wolfgang Mauerer, “Professional Linux Kernel Architecture”. Wrox, 2008					
	Additional references supporting the course: 1. Klaus Wehrle, Frank Pahlke, Hartmut Ritter, Daniel Muller, Marc Bechler, “Linux Network Architecture”. Prentice Hall, 2005 2. Christian Benvenuti. “Understanding Linux Network Internals”, O'Reilly Media, 2005. 3. Charles M. Kozierok. “The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference”, No Starch Press, 2005.					
20.	Other additional information All materials will be available to the students online.					