

1.	Name of Course/Module	Data Communications and Networking
2.	Course Code	TCE2311
3.	Status of Subject	Core for B. Sc Bioinformatics
4.	MQF Level/Stage	Bachelor Degree – MQF Level 6
5.	Version (state the date of the last Senate approval)	June 2012
6.	Requirement for Registration	None
7.	Name(s) of academic/teaching staff	Fathin Fakhriah Abdul Aziz Lew Sook Ling Lilian Wang Yee Kiaw
8.	Semester and Year offered	Trimester 2 (Beta Level)
9.	Objective of the course/module in the programme :	
	To provide students with concepts of data communications and networking. (ii) To understand the fundamentals of Communication Architecture, Protocols and Local Area Networks. (iii) To expose the various types of network in terms of the technologies, hardware, and usage.	
10.	Learning Outcomes :	
	At the completion of the subject, students should be able to:	
	LO1: Demonstrate understanding about various data communication transmission media, interface and modulation techniques. (Affective, Level 3)	
	LO2: Understand the link layer data transmission techniques and protocols. (Cognitive, Level 2)	
	LO3: Explain the basic building blocks of a Local Area Network. (Cognitive, Level 2)	
	LO4: Describe the network models, standards, protocols, and concepts of frequency spectrum and bandwidth. (Cognitive, Level 1)	
11.	Synopsis:	
	The course will expose the students to the overall understanding and knowledge in basic data communications and networking. The major area of studies include physical interface, transmission medium, data integrity and security, data compression, improving data communication efficiency, data encoding and modulation, architecture and protocol, LAN, internetworking and digital switching system.	
	Kursus ini akan mendedahkan pelajar-pelajar kepada pemahaman keseluruhan dan pengetahuan dalam asas komunikasi data dan rangkaian perhubungan. Topik-topik utama di dalam lingkungan pelajaran termasuk ruang interface fizikal, perantara penghantaran, integriti data dan kawalan, pemampatan data, memperbaiki data kecekapan perhubungan, data encoding dan modulasi, seni bina dan protokol, rangkaian data tempatan, internetworking dan sistem “switch” digital.	
12.	Mapping of Subject to Programme Outcomes :	
	Programme Outcomes	% of Contribution
	PO1: Apply soft skills in work and career related activities	25.00

	PO2: Demonstrate knowledge and understanding of fundamental concepts, principles and best practices	75.00	
13.	Assessment Methods and Types :		
	Method and Type	Description/Details	Percentage
	Test		30%
	Quizzes		10%
	Final Exam		60%
14.	Details of Subject		
	Topics	Mode of Delivery	
		Lecture	Tutorial
	1. Overview of Data communication Networking Network models Data Communications, Networks, Protocols and Standards, Layered Tasks, Internet Model, Functions of Layers, OSI Model, Layers in the OSI Model, Addressing	3	2
	2. Data and Signals Analog and Digital Signals, Composite Signals, Frequency Spectrum and Bandwidth, Data Rate Limits (Nyquist Bit Rate, Shannon Capacity), Performance (Throughput, Latency, Propagation Time, Transmission Time, Queuing Time, Bandwidth-Delay Product), Transmission Impairment, More about signals (Throughput, Propagation, Propagation time, Wavelength)	3	2
	3. Digital Transmission Line Coding (Unipolar Encoding, Polar Encoding (NRZ, RZ, Manchester, Differential Manchester)), Bipolar Encoding (AMI), Other Line Coding Schemes (2B1Q, MLT-3), Block Coding, Sampling (Pulse Amplitude Modulation, Pulse Code Modulation), Transmission Mode (Parallel, Serial (Synchronous, Asynchronous, Isochronous))	3	2
	4. Analog Transmission Modulation of Digital Data, Digital to Analog Conversion, Digital to Analog Modulation (Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Amplitude Modulation), Analog to Analog Modulation (Amplitude Modulation, Frequency Modulation, Phase Modulation)	3	2
	5. Multiplexing And Spreading Multiplexing, Analog Multiplexing (FDM, WDM), Digital Multiplexing (TDM), Spread Spectrum (Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum)	3	2
6. Transmission Media Guided (Twisted-Pair Cable, Coaxial Cable, Fibre-Optic Cable), Unguided (Radio Wave, Microwave, Infrared)	3	2	

	7. Error Detection and Correction Types of Errors (Single-Bit Errors, Burst Error), Error Detection: Redundancy method (Parity Check, Cyclic Redundancy Check, Checksum), Error Correction: Hamming Code	3	2
	8. Data Link Control Flow Control and Error Control, Stop-and-Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, HDLC	3	2
	9. Multiple Access Multiple Access Protocols, Random Access Method (MA, CSMA, CSMA/CD, CDMA/CA), Controlled-Access Method (Reservation, Polling, Token Passing), Channelization Protocols (FDMA, TDMA, CDMA), Point-to-Point Protocol (PPP), Link Control Protocol, PAP, CHAP, NCP	3	2
	10. Wired LANs Ethernet, Traditional Ethernet, Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet, Fast Ethernet, Gigabit Ethernet	3	2
	11. Wireless LANs IEEE 802.11, Bluetooth	3	2
	12. Connecting LANs Connecting Devices (Repeaters, Hubs, Bridges, Transparent Bridges (Spanning Tree)), Dynamic Algorithm, Source Routing Bridges, Backbone Networks (Bus Backbones, Star Backbone, Star Backbone), Connecting Remote LANs, Virtual LANs	3	2
	13. Virtual Circuit Networks: Frame Relay and ATM Virtual Circuit Switching, Permanent Virtual Circuit, Switched Virtual Circuit, Frame Relay, Asynchronous Transfer Mode	3	2
	Total	39	26
15.	Laboratory		
16.	Total Student Learning Time (SLT)	Face to Face (Hour)	Total Guided and Independent Learning
	Lecture	39	39
	Tutorials	26	26
	Laboratory/Practical		
	Presentation		
	Assignment		
	Mid Term Test	2	10
	Final Exam	2	20
	Quizzes	2 times	2
	Sub Total	69	97
	Total SLT	$166/40 = 4.15 \Rightarrow 4$	
17.	Credit Value	4	

18.	Reading Materials :	
	Textbook	Reference Materials
	<ol style="list-style-type: none"> 1. Forouzan, Behrouz A. Data Communications and Networking. 4th Edition. McGraw-Hill, 2007 	<ol style="list-style-type: none"> 1. Beyda, William J. Data Communications: From Basics to Broadband. 2005 4th edition. Prentice Hall. 2. Stallings, William. Data & Computer Communications. 2004 7th edition. Prentice Hall. 3. Halsal, Fred. Data Communications, Computer Networks and Open Systems. 4th edition. Addison-Wesley. 1995 4. Tanenbaum, Andrew S. Computer Networks. 4th edition. 2006 Prentice Hall. 5. Shay, William A. Understanding Data Communications and Networks. 2nd edition. 1993 Thomson Publishing.
19.	Appendix (to be compiled when submitting the complete syllabus for the programme) : <ol style="list-style-type: none"> 1. Mission and Vision of the University and Faculty 2. Mapping of Programme Objectives to Vision and Mission of Faculty and University 3. Mapping of Programme Outcome to Programme Objectives 4. Programme Objective and Outcomes (Measurement and Descriptions) 	