



## UNIVERSITI TEKNOLOGI MARA

### SCHEME OF WORK

**COURSE NAME** : INTRODUCTION TO DATA COMMUNICATION AND  
: NETWORKING  
**COURSE CODE** : ITT300

### COURSE DESCRIPTION

This course provides a foundation and fundamentals of data communications and computer networking technologies such as the concepts, models, protocols and standards, data conversion, transmission medium and error detection during data transmission. Students will also be exposed to the essentials of Local Area Networks (LAN).

### COURSE LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Clarify major concepts and theories in data communication and computer networking area. (PLO1, C2)
2. Show the operation and application in data communication and computer networking area. (PLO2, P2)
3. Demonstrate in group the usage of software and network tools in data communication and computer networking area. (PLO5, A3)

### REFERENCES

1. Forouzan, Behrouz A., *Data Communications and Networking*, Fourth Edition, McGraw Hill, 2014.
2. FitzGerald, Dennis, Durcikova, *Business Data Communications and Networking*, 12<sup>th</sup> Edition, John Wiley, 2018.
3. William Stallings, *Data and Computer Communication*, 8th Edition, Prentice Hall, 2016.
4. Curt M. White, *Data Communications and Computer Networks: A Business User's Approach*, 8<sup>th</sup> Edition, Cengage Learning, 2015.
5. Prakash C. Gupta, *Data Communication and Computer Networks*, 2nd Edition, PHI Learning Private Limited, 2014.

## ASSESSMENT

<b>Course Work</b>	:	<b>50%</b>
Test (2)	:	20%
Quiz (2)	:	10%
Assignment		
Lab Exercise		5%
Group Project	:	15%
<b>Final Exam</b>	:	<b>50%</b>
<b>Total</b>	:	<b>100%</b>

Week	Topic	Hours	Remarks
1	<b>TOPIC 1: INTRODUCTION</b> <ul style="list-style-type: none"> <li>Data Communications <ul style="list-style-type: none"> <li>Components and Effectiveness</li> <li>Data Flow</li> </ul> </li> <li>Computer Networks <ul style="list-style-type: none"> <li>Network criteria</li> <li>Physical Structures</li> </ul> </li> <li>Network Types <ul style="list-style-type: none"> <li>LAN, MAN, WAN, Switching</li> </ul> </li> <li>Protocols and Standards</li> </ul>	4	(Blended Learning mode – 2 hours)
2	<b>TOPIC 2: NETWORK MODEL</b> <ul style="list-style-type: none"> <li>Concept of Layers</li> <li>The OSI Model <ul style="list-style-type: none"> <li>Function of Layers</li> </ul> </li> </ul> <i>(excluding process encapsulation, de-capsulation)</i> <ul style="list-style-type: none"> <li>The Internet Model (TCP/IP Model)</li> <li>Four Levels of Addressing in TCP/IP Model</li> </ul> <i>(excluding detail process of addressing)</i>	4	(Blended Learning mode – 2 hours)
3	<b>TOPIC 3: DATA AND SIGNAL</b> <ul style="list-style-type: none"> <li>Types of Information</li> <li>Analog Signals <ul style="list-style-type: none"> <li>Characteristics of Sine Wave</li> <li>Time and Frequency Domain</li> <li>Bandwidth and Frequency Spectrum</li> </ul> </li> <li>Digital Signals</li> <li>Data Rate Limits</li> <li>Broadband &amp; Baseband Transmission (<i>theory only</i>)</li> <li>Transmission Impairment (<i>calculation of SNR only</i>)</li> </ul> <i>(excluding SNRdB, Distortion and Noise calculation)</i> <ul style="list-style-type: none"> <li>Network Performance (<i>theory Only</i>)</li> </ul> <i>(excluding all calculation)</i>	4	

4	<p><b>TOPIC 4: DATA ENCODING</b></p> <ul style="list-style-type: none"> <li>Digital-To-Digital Encoding <ul style="list-style-type: none"> <li>Signal Element and Data Element</li> <li>Line Coding Scheme – Unipolar and Polar (<i>Polar – only NRZ-L and Manchester</i>)</li> </ul> </li> <li>(<b>excluding</b> RZ, NRZ-I, Differential Manchester and Bipolar)</li> <li>Digital-To-Analog Encoding <ul style="list-style-type: none"> <li>Signal Rate and Bit Rate (<i>only basic formula and calculation</i>)</li> <li>Types of Modulation - ASK, FSK and PSK (<b>excluding</b> for QAM)</li> <li>Constellation Diagram (<i>Bit and Di-bit only</i>)</li> </ul> </li> </ul>	4	<p><b>LAB ACTIVITY (5%)</b></p> <p><b>QUIZ 1 (5%)</b> <b>Chap. 1 &amp; 2</b></p>
5	<p><b>TOPIC 5: MULTIPLEXING</b></p> <ul style="list-style-type: none"> <li>Frequency Division Multiplexing (FDM) (<i>including application of FDM</i>)</li> <li>(<b>excluding</b> Analog Hierarchy)</li> <li>Wavelength Division Multiplexing (WDM) (<i>the differences between WDM and FDM only</i>)</li> <li>(<i>including application of WDM</i>)</li> <li>Synchronous Time Division Multiplexing (<i>including the diagram and the calculation of frame size, frame rate, frame duration, bit rate and bit duration</i>)</li> <li>(<b>excluding</b> Digital Hierarchy)</li> <li>Empty Slots</li> <li>Data Rate Management</li> <li>Statistical Time Division Multiplexing (<i>including application of TDM</i>)</li> <li>Data Rate Management</li> <li>(<b>excluding</b> Inverse Multiplexing and Spread Spectrum)</li> </ul>	4	<p><b>(Blended Learning Mode – 2 hours)</b></p>

6	<p><b>TOPIC 5: MULTIPLEXING</b></p> <ul style="list-style-type: none"> <li>Frequency Division Multiplexing (FDM) <i>(including application of FDM)</i> <b>(excluding Analog Hierarchy)</b></li> <li>Wavelength Division Multiplexing (WDM) <i>(the differences between WDM and FDM only)</i> <i>(including application of WDM)</i></li> <li>Synchronous Time Division Multiplexing <i>(including the diagram and the calculation of frame size, frame rate, frame duration, bit rate and bit duration)</i> <b>(excluding Digital Hierarchy)</b></li> <li>Empty Slots</li> <li>Data Rate Management</li> <li>Statistical Time Division Multiplexing <i>(including application of TDM)</i></li> <li>Data Rate Management <b>(excluding Inverse Multiplexing and Spread Spectrum)</b></li> </ul>	4	
7	<p><b>TOPIC 6: TRANSMISSION MEDIA</b></p> <ul style="list-style-type: none"> <li>Guided Media – Category, Connectors, Composition and Application <ul style="list-style-type: none"> <li>Twisted-Pair Cable</li> <li>Coaxial Cable</li> <li>Fibre Optic</li> </ul> </li> <li><b>(excluding Nature of Light and Propagation Modes)</b></li> <li>Unguided Media <ul style="list-style-type: none"> <li>Electromagnetic Spectrum</li> <li>Types of Propagation and Bands</li> <li>Three Waves – Radio Wave, Microwave and Infrared</li> </ul> </li> </ul>	4	<p><b>TEST 1 (10%)</b> <b>Chap. 3, 4 &amp; 5</b> <b>18/10/2019</b> <b>Dewan Titiwangsa</b> <b>8-10 pm</b></p>
8	<p><b>TOPIC 7: ACCESS METHOD</b></p> <ul style="list-style-type: none"> <li>Random Access Method</li> <li>CSMA <i>(including three Persistence Strategy with a diagram)</i> <b>(excluding ALOHA, CSMA/CD and CSMA/CA)</b> <b>(excluding all the flowcharts and calculations)</b></li> <li>Controlled Access Method <ul style="list-style-type: none"> <li>Polling and Token Passing</li> </ul> </li> <li><b>(excluding Reservation)</b></li> </ul>	4	<p><b>(Blended Learning mode – 2 hours)</b></p> <p><b>GROUP PROJECT (15%)</b></p>

9	<p><b>TOPIC 8: ERROR DETECTION</b></p> <ul style="list-style-type: none"> <li>• Types of Errors</li> <li>• Redundancy Concept</li> <li>• Modular Arithmetic</li> <li>• Block Coding Method <ul style="list-style-type: none"> <li>• Process of Error Detection</li> </ul> </li> </ul> <p>(<b>excluding</b> <i>Process of Error Correction</i>)</p> <ul style="list-style-type: none"> <li>• Hamming Distance</li> </ul> <p>(<b>excluding</b> <i>Hamming Codes</i>)</p> <ul style="list-style-type: none"> <li>• Linear Block Coding <ul style="list-style-type: none"> <li>• Simple Parity Checking</li> <li>• Two-Dimensional Parity Checking</li> </ul> </li> </ul> <p>(<i>only definition and how to derive row and column parity</i>)</p> <ul style="list-style-type: none"> <li>• Cyclic Coding <ul style="list-style-type: none"> <li>• CRC Division Process (<i>binary only</i>)</li> <li>• Polynomials Representation (<i>conversion from binary</i>)</li> </ul> </li> <li>• Checksum <ul style="list-style-type: none"> <li>• Binary</li> <li>• Hexadecimal</li> </ul> </li> </ul>	4	
10	<p><b>TOPIC 8: ERROR DETECTION</b></p> <ul style="list-style-type: none"> <li>• Types of Errors</li> <li>• Redundancy Concept</li> <li>• Modular Arithmetic</li> <li>• Block Coding Method <ul style="list-style-type: none"> <li>• Process of Error Detection</li> </ul> </li> </ul> <p>(<b>excluding</b> <i>Process of Error Correction</i>)</p> <ul style="list-style-type: none"> <li>• Hamming Distance</li> </ul> <p>(<b>excluding</b> <i>Hamming Codes</i>)</p> <ul style="list-style-type: none"> <li>• Linear Block Coding <ul style="list-style-type: none"> <li>• Simple Parity Checking</li> <li>• Two-Dimensional Parity Checking</li> </ul> </li> </ul> <p>(<i>only definition and how to derive row and column parity</i>)</p> <ul style="list-style-type: none"> <li>• Cyclic Coding <ul style="list-style-type: none"> <li>• CRC Division Process (<i>binary only</i>)</li> <li>• Polynomials Representation (<i>conversion from binary</i>)</li> </ul> </li> <li>• Checksum <ul style="list-style-type: none"> <li>• Binary</li> <li>• Hexadecimal</li> </ul> </li> </ul>	4	

11	<p><b>TOPIC 9: LOCAL AREA NETWORK</b></p> <ul style="list-style-type: none"> <li>Standard Ethernet <ul style="list-style-type: none"> <li>MAC Sublayer &amp; Physical Layer</li> <li>Addressing (<i>Unicast, Multicast, Broadcast</i>)</li> <li>Physical Layer Implementation</li> </ul> <i>(explanation about all the layers by using a table only)</i>  <i>(<b>excluding</b> a diagram)</i> </li> <li>Standard Ethernet Evolution</li> <li>Fast Ethernet <ul style="list-style-type: none"> <li>MAC Sublayer &amp; Physical Layer</li> <li>Physical Layer Implementation</li> </ul> <i>(explanation about all the layers by using a table only)</i>  <i>(<b>excluding</b> a diagram)</i> </li> <li>Gigabit Ethernet <ul style="list-style-type: none"> <li>MAC Sublayer &amp; Physical Layer</li> <li>Physical Layer Implementation</li> </ul> <i>(explanation about all the layers by using a table only)</i>  <i>(<b>excluding</b> a diagram)</i> </li> <li>Ten-Gigabit Ethernet <ul style="list-style-type: none"> <li>MAC Sublayer &amp; Physical Layer</li> <li>Physical Layer Implementation</li> </ul> <i>(explanation about all the layers by using a table only)</i>  <i>(<b>excluding</b> a diagram)</i> </li> </ul>	4	<p><b>QUIZ 2</b> <b>(5%)</b> <b>Chap. 6,</b> <b>7 &amp; 8</b></p>
12	<p><b>TOPIC 9: LOCAL AREA NETWORK</b></p> <ul style="list-style-type: none"> <li>Wireless Ethernet – IEEE 802.11 <ul style="list-style-type: none"> <li>Architecture and Station Types</li> <li>MAC Sublayer (<i>DCF and PCF</i>)</li> <li>Frame Format</li> </ul> <i>(<b>excluding</b> Subfields in FC field)</i> <ul style="list-style-type: none"> <li>Frame Types</li> <li>Addressing Mechanism</li> </ul> <i>(<b>excluding</b> Hidden Station, Exposed Station and Physical Layers)</i> </li> <li>Bluetooth <ul style="list-style-type: none"> <li>Architecture</li> <li>Bluetooth Layers</li> <li>Single and multiple secondary communication</li> </ul> </li> <li>Connecting Devices <ul style="list-style-type: none"> <li>Hub</li> <li>Repeater</li> <li>Bridge</li> </ul> <i>(<b>excluding</b> Loop Problem and Spanning Tree Algorithm)</i> <ul style="list-style-type: none"> <li>Router</li> <li>Gateway</li> </ul> </li> <li>Virtual LANs (<i>basic concept only</i>)</li> </ul>	4	<p><b>SUBMIT</b> <b>GROUP</b> <b>PROJECT</b></p>

13	<b>TOPIC 10: LOGICAL ADDRESSING</b> <ul style="list-style-type: none"><li>• IPv4 Addressing<ul style="list-style-type: none"><li>• Address Space</li><li>• Address Notation (Binary &amp; Dotted-Decimal)</li><li>• Classful and Classless Addressing</li></ul></li><li>• Subnetting</li></ul> <i>(only calculation for two levels of subnetting)</i> <i>(<b>excluding</b> calculation for three level of subnetting)</i> <i>(<b>excluding</b> Network Address Translation)</i>	4	
14	<b>TOPIC 10: LOGICAL ADDRESSING</b> <ul style="list-style-type: none"><li>• IPv4 Addressing<ul style="list-style-type: none"><li>• Address Space</li><li>• Address Notation (Binary &amp; Dotted-Decimal)</li><li>• Classful and Classless Addressing</li></ul></li><li>• Subnetting</li></ul> <i>(only calculation for two levels of subnetting)</i> <i>(<b>excluding</b> calculation for three level of subnetting)</i> <i>(<b>excluding</b> Network Address Translation)</i>	4	<b>TEST 2 (10%) Chap. 9 &amp; 10 13/12/2019 Dewan Titiwangsa 3-5 pm</b>