

**COURSE ELT2320: NETWORK MEDIA & DEVICES****Level:** Intermediate**Theme:** Computer Networking Systems**Prerequisite:** None**Description:** Students develop an understanding of different connectivity strategies for linking computers and other devices in a local area network (LAN). They acquire knowledge of industry standards for network cables and gain practical experience through installing cabling, connectors and other hardware components.**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in the Computer Networking Systems theme. Schools have the option of delivering courses within this theme in conjunction with one or more Project courses from the Career Transitions theme if they wish to extend learning and/or address other vendor-specific technologies.

Access to a computer work centre equipped with networking hardware, software, tools and consumable supplies, and to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is given to safe processes for the installation of network cabling and connectors and to an understanding of how topology, cabling and connectors need to coexist in a network environment. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Supporting Courses:** ELT1010: Electro-assembly 1, ELT1060: Digital Technology 1, ELT2070: Computer Technology, INF2010: Workstation Operations, INF2190: Telecommunications 1

**COURSE ELT2320: NETWORK MEDIA & DEVICES (continued)**

**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• identify and describe the characteristics, standard names and applications for common network media and connectors</li> <li>• identify and explain the purpose, features and basic operation of network hardware components</li> <li>• demonstrate knowledge of cabling tools; and demonstrate ability to install network cabling, connectors and hardware components</li> <li>• demonstrate established laboratory procedures and safe work practices</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• a teacher-directed evaluation designed to determine knowledge of:                             <ul style="list-style-type: none"> <li>– the characteristics and uses of major types of network cables and common media connectors</li> <li>– the characteristics and uses of major types of wireless network devices</li> <li>– cable identifiers for an Ethernet network as defined by the Institute of Electrical and Electronics Engineers (IEEE) standards</li> <li>– categories for networking cable as defined by the Electronics Industries Association and the Telecommunications Industries Association (EIA/TIA)</li> </ul> </li> </ul>	20
	<ul style="list-style-type: none"> <li>• a presentation or project demonstrating the functionality and performance of:                             <ul style="list-style-type: none"> <li>– basic hardware components, including network interface card (NIC), hub, repeater, switch, bridge, router, gateway, wireless access point and modem</li> <li>– different types of power fault-tolerance equipment</li> </ul> </li> </ul>	20
	<ul style="list-style-type: none"> <li>• a series of projects that demonstrate adherence to codes/regulations and safe practices for compliant installation; i.e.:                             <ul style="list-style-type: none"> <li>– crimping and testing an Ethernet cable</li> <li>– safely installing                                     <ul style="list-style-type: none"> <li>• jacks and outlets</li> <li>• cable and structured cable runs</li> <li>• patch panels and patch cords</li> </ul> </li> <li>– utilizing basic test equipment and analyzers for continuity, proper grounding and correct cable termination</li> <li>– choosing an appropriate cable type and connector to add a new client to an existing network</li> <li>– installing and configuring one or more network components</li> </ul> </li> </ul>	50
	<ul style="list-style-type: none"> <li>• observed performance in following:                             <ul style="list-style-type: none"> <li>– established laboratory procedures</li> <li>– safe procedures for the installation of cabling, connectors and hardware components</li> </ul> </li> </ul>	5

**COURSE ELT2320: NETWORK MEDIA & DEVICES (continued)**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• identify and describe career paths and employment opportunities in network infrastructure design and installation</li>   <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• a project or report identifying technical and professional career opportunities in network infrastructure design and installation, and related training requirements/qualifications</li> </ul> <p><i>Assessment Tools</i>  <i>Assessment Checklist: Network Media &amp; Devices (ELT2320–1)</i>  <i>Assessment Checklist: Laboratory Procedures and Safety Practices, ELTPSP</i></p> <p><i>Standard</i>  <i>Performance rating of 2 on each criterion</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal interaction during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p style="text-align: center;">5</p>          <p>Integrated throughout</p>

Concept	Specific Outcomes	Notes
<p>Network Media and Connectors</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify and describe the structural components and uses of major types of network cables: <ul style="list-style-type: none"> <li>– coaxial (thick and thin)</li> <li>– twisted pair (unshielded and shielded)</li> <li>– fibre-optic</li> </ul> </li> <li>• identify and describe the characteristics and uses of common media connectors; e.g.: <ul style="list-style-type: none"> <li>– Registered Jack 11 (RJ-11)</li> <li>– Registered Jack 45 (RJ-45)</li> <li>– Attachment Unit Interface (AUI)</li> <li>– British Naval Connector (BNC)</li> <li>– Small Computer System Interface (SCSI)</li> <li>– Single Mode Fibre-Optic Connector (SC-type and ST-type)</li> </ul> </li> </ul>	<p>Match common types of cable with their attributes and applications. Students should be able to choose the best media for a specific situation. Focus attention on:</p> <ul style="list-style-type: none"> <li>• structural components</li> <li>• topology</li> <li>• advantages/disadvantages</li> <li>• applications.</li> </ul>

**COURSE ELT2320: NETWORK MEDIA & DEVICES (continued)**

Concept	Specific Outcomes	Notes
<p>Network Media and Connectors (continued)</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify Institute of Electrical and Electronics Engineers (IEEE) standards for Ethernet cabling; i.e.:               <ul style="list-style-type: none"> <li>– bandwidth/speed</li> <li>– transmission mode</li> <li>– maximum segment length</li> <li>– cable type</li> </ul> </li> <li>• identify and describe categories for unshielded twisted pair (UTP) cable defined by the Electronics Industries Association and the Telecommunications Industries Association (EIA/TIA)</li> <li>• describe the media and function of network backbones and segments</li> <li>• explain the relationship between media type, connector and topology in a network environment</li> <li>• choose an appropriate cable type and connector to add a client, given a practical network scenario.</li> </ul>	<p>Students should be able to identify 802.3 Ethernet standards for:</p> <ul style="list-style-type: none"> <li>• 10Base2</li> <li>• 10Base5</li> <li>• 10BaseF</li> <li>• 10BaseT</li> <li>• 100Base FX</li> <li>• 100 BaseT</li> <li>• 1000Basex.</li> </ul> <p>Particular emphasis should be placed on Categories 3, 4 and 5.</p> <p>Discuss potential applications of Category 6 UTP cable for Gigabit Ethernet networks.</p>
<p>Hardware Components</p>	<ul style="list-style-type: none"> <li>• explain the purpose of hardware components in:               <ul style="list-style-type: none"> <li>– connecting network devices</li> <li>– boosting data signals</li> <li>– determining data flow</li> </ul> </li> <li>• demonstrate an understanding of the features, functionality and performance of basic hardware components; i.e.:               <ul style="list-style-type: none"> <li>– network interface card (NIC)</li> <li>– hub</li> <li>– repeater</li> <li>– switch</li> <li>– bridge</li> <li>– router</li> <li>– gateway</li> <li>– wireless access point</li> <li>– modem</li> </ul> </li> </ul>	<p>Hardware components are typically used to connect:</p> <ul style="list-style-type: none"> <li>• devices to networks</li> <li>• networks to other networks.</li> </ul> <p>Identify different types of NICs and NIC connectors. Compare and contrast the function of bridges, switches and routers.</p> <p>Investigate functionality and applications of:</p> <ul style="list-style-type: none"> <li>• Integrated Services Digital Network (ISDN) adapters</li> <li>• system-area network cards.</li> </ul>

**COURSE ELT2320: NETWORK MEDIA & DEVICES (continued)**

Concept	Specific Outcomes	Notes
<p>Hardware Components (continued)</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• identify layers of the Open System Interconnection (OSI) reference model at which specific hardware components operate</li> <li>• describe the features and functionality of power fault-tolerance hardware; i.e.:               <ul style="list-style-type: none"> <li>– surge suppressor</li> <li>– power (line) conditioner</li> <li>– uninterruptible power supply (UPS)</li> </ul> </li> <li>• choose an appropriate hardware component to use or replace an existing device, given a practical network scenario</li> <li>• physically install a network interface card (NIC) and verify that the NIC is operational.</li> </ul>	<p>ELT2330: OSI Model provides an opportunity for more extensive study of the OSI model.</p> <p>Discuss damages that may occur as a result of typical power line problems; e.g.:</p> <ul style="list-style-type: none"> <li>• surges and spikes</li> <li>• sags and brownouts</li> <li>• oscillation.</li> </ul> <p>Recommend a hardware solution for a small company.</p>
<p>Cabling Tools and Procedures</p>	<ul style="list-style-type: none"> <li>• demonstrate correct use of cabling tools; e.g.:               <ul style="list-style-type: none"> <li>– wire crimper</li> <li>– punch down tool</li> </ul> </li> <li>• demonstrate appropriate use of basic test equipment; e.g.:               <ul style="list-style-type: none"> <li>– media testers/certifiers</li> <li>– crossover cable</li> <li>– tone generator and probe (fox and hound)</li> <li>– optical testers</li> </ul> </li> <li>• demonstrate proper sequence of steps to crimp and test Ethernet cable</li> <li>• select the appropriate cabling tool and test equipment, given a practical cabling task.</li> </ul>	<p>Follow wiring specifications and sequences established through EIA/TIA 568 standards.</p> <p>Demonstrate correct use of cabling tools to strip cables and attach connectors.</p> <p>Explain the concept of termination and the use of terminating resistors.</p>

**COURSE ELT2320: NETWORK MEDIA & DEVICES (continued)**

Concept	Specific Outcomes	Notes
Compliant Installation	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• demonstrate procedures for compliant installation of:               <ul style="list-style-type: none"> <li>– jacks and outlets</li> <li>– cable and structured cable runs</li> <li>– patch panels and patch cords</li> </ul> </li> <li>• demonstrate appropriate use of test equipment in checking for:               <ul style="list-style-type: none"> <li>– continuity</li> <li>– proper grounding</li> <li>– correct cable termination</li> </ul> </li> <li>• create a proposal for a new or refit cabling project</li> <li>• design, build and troubleshoot a small Ethernet network.</li> </ul>	<p>Apply EIA/TIA standards and recommendations for structured and backbone cabling.</p> <p>Physical aspects of installing structured cabling include:</p> <ul style="list-style-type: none"> <li>• planning the installation</li> <li>• pulling and connecting cables</li> <li>• testing cable runs and tracing cables.</li> </ul> <p>Discuss strategies for integrating old and new cabling systems.</p> <p>Emphasize relationships among topology, cabling and connectors in a network environment.</p>
Career Paths	<ul style="list-style-type: none"> <li>• research technical and professional career opportunities in network infrastructure design and installation</li> <li>• place network infrastructure design and installation job titles in a progressive sequence</li> <li>• identify training requirements and qualifications associated with one or more employment opportunities</li> <li>• write a detailed job description for one or more network infrastructure design and/or installation positions.</li> </ul>	<p>Plan for individual/group research and presentations that address:</p> <ul style="list-style-type: none"> <li>• job description</li> <li>• employment market</li> <li>• education/training</li> <li>• salary range.</li> </ul> <p>Research available network industry certification tracks.</p>