

COURSE ELT2310: NETWORK STRUCTURES**Level:** Intermediate**Theme:** Computer Networking Systems**Prerequisite:** None**Description:** Students acquire an understanding of network infrastructure and assess the advantages and disadvantages of different types of networks. They also develop knowledge of data transmission principles in a computer network and compare features of different network topologies and transmission methods.**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 network infrastructure and concepts/terminology relevant to network topology and architecture. 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**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"> • describe and explain the evolution of computer networks, and the general structure and function of: <ul style="list-style-type: none"> – peer-to-peer and server-based networks – local area networks and wide area networks 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • a teacher-directed evaluation on: <ul style="list-style-type: none"> – specific milestones in the history of computer networking – the structure and function of: <ul style="list-style-type: none"> • peer-to-peer networks and server-based networks • local area networks (LANs) and wide area networks (WANs) – the sharing of resources within a network environment 	10

COURSE ELT2310: NETWORK STRUCTURES (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • describe and demonstrate basic principles of data transmission in a computer network • describe and compare the features of: <ul style="list-style-type: none"> – bus, star, ring, mesh, wireless and hybrid topologies – Ethernet, token ring, Fibre Distributed Data Interface (FDDI) and wireless transmission methods • demonstrate established laboratory procedures and safe work practices • identify career paths in computer networking 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • a presentation or project demonstrating knowledge of: <ul style="list-style-type: none"> – the characteristics of analog and digital signaling and related technical terms – basic processes for structuring data packets and frames – strategies used to address data collision in a shared media environment 	25
	<ul style="list-style-type: none"> • a presentation or project demonstrating knowledge of: <ul style="list-style-type: none"> – bus, star, ring, mesh, wireless and hybrid topologies with respect to: <ul style="list-style-type: none"> • physical layout • unique characteristics, advantages and disadvantages – the main features of common network architectures, including Ethernet, token ring, Fibre Distributed Data Interface (FDDI) and wireless networks, with respect to: <ul style="list-style-type: none"> • topology • methodology and access strategy • media type • speed • selecting an appropriate topology and network architecture, given a particular set of network requirements 	50
	<ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – safety regulations specific to the networking technologies being used 	5
	<ul style="list-style-type: none"> • a project or report identifying technical and professional career paths in computer networking and related training requirements/qualifications <p><i>Assessment Tools</i> <i>Assessment Checklist: Network Structures (ELT2310–1)</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>	10

COURSE ELT2310: NETWORK STRUCTURES (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>Integrated throughout</p>

Concept	Specific Outcomes	Notes
<p>History of Networks</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> summarize the history of networking, from the telegraph to modern computer technology describe the evolution of standards for data transmission, from Morse code to the American Standard Code for Information Interchange (ASCII) create a timeline of specific milestones in the history of computer networking identify emerging networking technologies and their impact on global communications. 	<p>Relate the evolution of networking devices to the evolution of computers.</p> <p>Milestones should include military and Internet applications.</p> <p>Research one or more recent initiatives or issues in the development of networking technologies.</p>
<p>Network Structure and Function</p>	<ul style="list-style-type: none"> describe a computer network and solutions provided by computer networking; i.e.: <ul style="list-style-type: none"> file sharing hardware sharing program sharing user communication give examples of resources commonly shared within a network environment describe the structure, purpose and function of peer-to-peer and server-based networks 	<p>Discuss and develop a rationale for networking standards.</p> <p>Examine advantages, disadvantages and applications of peer-to-peer and server-based networks.</p>

COURSE ELT2310: NETWORK STRUCTURES (continued)

Concept	Specific Outcomes	Notes
<p>Network Structure and Function (continued)</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • compare and contrast peer-to-peer and server-based networks with respect to: <ul style="list-style-type: none"> – number of workstations – relative cost – security – administration – data backup • describe and compare the structure, purpose and function of local area networks (LANs), metropolitan area networks (MANs) and wide area networks (WANs) • create schematic diagrams for the physical layout of LANs, MANs and WANs • describe and give examples of how networks may be categorized according to: <ul style="list-style-type: none"> – topology – protocol – architecture – media. 	<p>Discuss and give examples of:</p> <ul style="list-style-type: none"> • Workgroup LANs • Departmental LANs • Enterprise networks. <p>Examine the structure of the Internet within the context of LANs, MANs and WANs.</p>
<p>Data Transmission Principles</p>	<ul style="list-style-type: none"> • describe characteristics of digital and analog signaling • explain concepts and technical terms associated with data signaling and transmission; e.g.: <ul style="list-style-type: none"> – propagation, modulation and encoding – baseband and broadband signaling – transmission speed and bandwidth – attenuation, reflection and noise – dispersion, jitter and latency – data collision • describe and illustrate the structure of data packets and frames • explain applications of packet sniffing software to capture and analyze data packets and frames • convert binary and hexadecimal numbers to decimal numbers • identify problems and solutions related to data collision in a shared media environment. 	<p>Examine the significance of bandwidth and differences in media bandwidth.</p> <p>Explain throughput and variables that determine throughput.</p> <p>Discuss where and when collisions occur, and the application of hubs, repeaters and segmentation.</p>

COURSE ELT2310: NETWORK STRUCTURES (continued)

Concept	Specific Outcomes	Notes
<p>Network Topology and Architecture</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • describe and compare the unique characteristics, advantages and disadvantages of common physical network topologies; i.e.: <ul style="list-style-type: none"> – bus – star – ring – mesh – wireless – hybrid • explain the function of network segments and backbones • create schematic diagrams for the physical layout of bus, star, ring, mesh, wireless and hybrid topologies • describe the architecture of an Ethernet network with respect to: <ul style="list-style-type: none"> – physical topology – access strategy – Carrier Sense Multiple Access with Collision Detection (CSMA/CD) – media and hardware devices – Institute of Electrical and Electronics Engineers (IEEE) standards • describe and compare the main features of token ring, Fibre Distributed Data Interface (FDDI), LocalTalk and wireless networks with respect to: <ul style="list-style-type: none"> – topology – methodology and access strategy – media type – speed • select an appropriate topology and network architecture, and design a network to address user needs, given a particular set of network requirements. 	<p>Students should:</p> <ul style="list-style-type: none"> • recognize a logical/physical topology from a description or diagram • identify IEEE 802 and other standards for Ethernet, token ring and FDDI networking technologies. <p>Examine reasons for the extensive use of Ethernet technology.</p> <p>Compare and contrast two Ethernet frame types.</p> <p>Cite reasons why Attached Resource Computer network (ARCnet) has been replaced with other network architectures.</p> <p>Conduct an interview with a network manager or client regarding network design, benefits and issues.</p> <p>Create a questionnaire to gather information when planning or expanding a network.</p>

COURSE ELT2310: NETWORK STRUCTURES (continued)

Concept	Specific Outcomes	Notes
Career Paths	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • research technical and professional career paths and employment opportunities in computer networking • evaluate current employment opportunities based on employment statistics • identify training requirements and qualifications associated with one or more employment opportunities • write a detailed job description for one or more internetworking positions • research trends in computer networking and emerging career opportunities. 	<p>Plan for individual/group research and presentations that address:</p> <ul style="list-style-type: none"> • job description • employment market • education/training • salary range. <p>Arrange/facilitate:</p> <ul style="list-style-type: none"> • information interviews • work study/experience • job shadowing.