

**COURSE NET2010: DIGITAL TECHNOLOGY 2**

**Level:** Intermediate

**Prerequisite:** NET1010: Digital Technology 1

**Description:** Students demonstrate knowledge of digital principles, by using small-scale transistor–transistor logic (TTL) and complementary metal-oxide semiconductor (CMOS) integrated technology.

**Parameters:** Access to a digital logic trainer, an oscilloscope, function generation and resource materials.

**Supporting Course:** ELT2010: Electro-assembly 2

**Outcomes:** The student will:

**1. identify and interface components with TTL and CMOS small-scale integrated circuit (IC) families**

- 1.1 explain the difference between various gate applications, counters and registers
- 1.2 distinguish the difference among various numbering systems and binary codes including:
  - 1.2.1 binary
  - 1.2.2 octal
  - 1.2.3 hexadecimal
  - 1.2.4 binary coded decimal (BCD)
  - 1.2.5 American standard code for information interchange (ASCII)

**2. identify components and construct a prototype of typical small-scale and complex logic networks using TTL and CMOS families of ICs**

- 2.1 use emulation software on a design problem
- 2.2 demonstrate the use of boolean algebra to analyze a logic circuit
- 2.3 demonstrate how to prototype and troubleshoot the following fundamental logic gates in typical and complex logic networks:
  - 2.3.1 AND
  - 2.3.2 NAND
  - 2.3.3 NOR
  - 2.3.4 XNOR
  - 2.3.5 OR, Registers
  - 2.3.6 F/F counters
  - 2.3.7 simple comparators
- 2.4 use a printed circuit (PC) board to fabricate a digital circuitry project; e.g., digital dice, sound generator decision maker, electronic scoreboard, IC tester
- 2.5 use PC board software to lay out a digital circuit
- 2.6 solve, construct and experiment with real-world problems using combination and sequential logic design for applications; e.g., traffic lights, aircraft landing gear, motor controls
- 2.7 prototype the solution for a logic problem using a breadboard and develop a truth table

**3. demonstrate established laboratory procedures and safe work practices**

- 3.1 explain and demonstrate how to avoid electrostatic discharges around IC chips, using static mats and grounding straps
- 3.2 demonstrate an understanding of grounding, voltage and current rating of various IC families

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2020: WORKSTATION TECHNOLOGY & OPERATIONS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students learn computer work station operations, including computer architecture, peripherals, configurations, operating system environments and platforms, utility software, diagnostic and protection software, hard drive file updating and maintenance, support resource application and troubleshooting activities.

**Parameters:** Access to an appropriate computer work station, a storage medium, utility software, the Internet and support materials.

**Outcomes:** The student will:

### **1. disassemble/assemble a working computer and perform basic troubleshooting procedures**

- 1.1 assemble a computer from given computer parts including:
  - 1.1.1 set the system configuration switches
  - 1.1.2 install computer operating system
  - 1.1.3 install monitor/keyboard
  - 1.1.4 test computer
- 1.2 demonstrate basic computer troubleshooting techniques by:
  - 1.2.1 using a system board flowchart to locate a system board fault
  - 1.2.2 listing symptoms of hard drive failure
- 1.3 explain the use of debug, error check and format/reformat of a hard drive

### **2. identify and explain computer system components**

- 2.1 research the history of computers, processors and various operating systems
- 2.2 describe the environmental, social, economic and political contribution that computers have made to our social fabric
- 2.3 define basic computer terms
- 2.4 identify and describe parts of a computer
- 2.5 explain the different sizes and types of expansion boards
- 2.6 identify and compare ports
- 2.7 identify adapter cards
- 2.8 explain memory expansion methods
- 2.9 explain the operation of various hard drive types; e.g., platter, solid state
- 2.10 name the types of displays
- 2.11 define and describe various purposes of software; e.g., system, application

### **3. identify the fundamentals of using operating systems**

- 3.1 identify differences between operating systems, e.g., Mac, Windows, Linux, and describe operating system revision levels including graphical user interface (GUI), system requirements, application and hardware compatibility
- 3.2 identify names, purposes and characteristics of the primary operating system components including registry, virtual memory and file system
- 3.3 describe features of operating system interfaces

- 3.4 identify the names, locations, purposes and characteristics of operating system files
- 3.5 identify concepts and procedures for creating, viewing and managing disks, directories and files in operating systems
- 4. install, configure, optimize and upgrade operating systems**
  - 4.1 determine what permission level is required for performing the task
  - 4.2 analyze system requirements for upgrading operating systems
  - 4.3 install and/or add a device driver for appropriate peripheral (signed or unsigned) including:
    - 4.3.1 verify installation of the driver; e.g., device manager, functionality
  - 4.4 identify procedures and utilities used to optimize operating systems; e.g., virtual memory, hard drives, temporary files, service, startup, applications
- 5. identify tools, diagnostic procedures and troubleshooting techniques for operating systems**
  - 5.1 identify basic boot sequences, methods and utilities for recovering operating systems
  - 5.2 identify and apply diagnostic procedures and troubleshooting techniques including:
    - 5.2.1 identify the problem
    - 5.2.2 analyze the problem; e.g., potential causes and initial determination of software and/or hardware problem
    - 5.2.3 test related components including connections, hardware/software configurations, device manager, and consult vendor documentation
    - 5.2.4 evaluate results and take additional steps, if needed; e.g., consultation, alternate resources, manuals
    - 5.2.5 document activities and outcomes
  - 5.3 recognize and resolve common operational issues; e.g., bluescreen (PC), force quit (Mac), system lockup
  - 5.4 recognize common error messages, codes and their function
  - 5.5 identify the names, locations, purposes and characteristics of operating system utilities
- 6. perform preventive maintenance on operating systems using common utilities; e.g., software updates, service packs, scheduled backups, restore and restore points**
- 7. apply consistent and appropriate work station routines**
  - 7.1 describe grounding methods when working on computers and use personal grounding systems; e.g., ankle and wrist straps
  - 7.2 describe the aspects and importance of safety and environmental issues
  - 7.3 identify potential safety hazards and take preventive action
  - 7.4 use material safety data sheets (MSDS) or equivalent documentation and appropriate equipment documentation
  - 7.5 use appropriate repair tools
  - 7.6 describe methods to handle environmental and human accidents including incident reporting; e.g. electrical, chemical, physical
  - 7.7 identify potential hazards and implement proper safety procedures including electrostatic sensitive device (ESD) precautions and procedures, a safe work environment and equipment handling
  - 7.8 identify proper disposal procedures for batteries, display devices and chemical solvents and containers
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems

- 8.2 demonstrate personal management skills to:
  - 8.2.1 demonstrate positive attitudes and behaviours
  - 8.2.2 be responsible
  - 8.2.3 be adaptable
  - 8.2.4 learn continuously
  - 8.2.5 work safely
- 8.3 demonstrate teamwork skills to:
  - 8.3.1 work with others
  - 8.3.2 participate in projects and tasks
- 9. identify possible life roles related to the skills and content of this cluster**
  - 9.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 9.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE NET2030: NETWORK STRUCTURES**

**Level:** Intermediate

**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. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is given to network infrastructure, concepts and 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  
NET1010: Digital Technology 1  
NET2020: Workstation Technology & Operations  
NET2110: Telecommunications 1

**Outcomes:** The student will:

- 1. describe and explain the evolution of computer/Internet networks and the general structure and function of peer-to-peer and server-based networks, local area networks and wide area networks**
  - 1.1 summarize the history of networking, from the telegraph to modern computer technology
  - 1.2 describe the evolution of standards for data transmission, from Morse code to the American standard code for information interchange (ASCII)
  - 1.3 create a time line of specific milestones in the history of computer networking
  - 1.4 identify emerging networking technologies and their impact on global communications
  - 1.5 describe a computer network and solutions provided by computer networking including:
    - 1.5.1 file sharing
    - 1.5.2 hardware sharing
    - 1.5.3 program sharing

- 1.5.4 user communication
- 1.5.5 new methodologies
- 1.6 give examples of resources commonly shared within a network environment
- 1.7 describe the structure, purpose and function of peer-to-peer and server-based networks
- 1.8 compare and contrast peer-to-peer and server-based networks with respect to:
  - 1.8.1 number of work stations
  - 1.8.2 relative cost
  - 1.8.3 security
  - 1.8.4 administration
  - 1.8.5 data backup
- 1.9 describe and compare the structure, purpose and function of local area networks (LANs), metropolitan area networks (MANs) and wide area networks (WANs)
- 1.10 create schematic diagrams for the physical layout of LANs, MANs and WANs
- 1.11 describe and give examples of how networks may be categorized; e.g., topology, protocol, architecture, media
- 2. describe and demonstrate basic principles of data transmission in a computer network**
  - 2.1 describe characteristics of digital and analog signalling
  - 2.2 explain concepts and technical terms associated with data signalling and transmission including:
    - 2.2.1 propagation, modulation and encoding
    - 2.2.2 baseband and broadband signalling
    - 2.2.3 transmission speed and bandwidth
    - 2.2.4 attenuation, reflection and noise
    - 2.2.5 dispersion, jitter and latency
    - 2.2.6 data collision
  - 2.3 describe and illustrate the structure of data packets and frames
  - 2.4 explain applications of packet-sniffing software to capture and analyze data packets and frames
  - 2.5 convert binary and hexadecimal numbers to decimal numbers
  - 2.6 identify problems and solutions related to data collision in a shared media environment
- 3. describe and compare the features of bus, star, ring, mesh, wireless and hybrid topologies, Ethernet, token ring, fibre distributed data interface (FDDI) and wireless transmission methods**
  - 3.1 describe and compare the unique characteristics, advantages and disadvantages of common physical network topologies; e.g., bus, star, ring, mesh, wireless, hybrid and new topologies
  - 3.2 explain the function of network segments and backbones
  - 3.3 create schematic diagrams for the physical layout of bus, star, ring, mesh, wireless, hybrid and new topologies
  - 3.4 describe the architecture of an Ethernet network with respect to:
    - 3.4.1 physical topology
    - 3.4.2 access strategy
    - 3.4.3 carrier sense multiple access with collision detection (CSMA/CD)
    - 3.4.4 media and hardware devices
    - 3.4.5 Institute of Electrical and Electronics Engineers (IEEE) standards
  - 3.5 describe and compare the main features of token ring, FDDI, LocalTalk and wireless networks with respect to:
    - 3.5.1 topology
    - 3.5.2 methodology and access strategy
    - 3.5.3 media type
    - 3.5.4 speed
  - 3.6 select an appropriate topology and network architecture, and design a network to address user needs, given a particular set of network requirements

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE NET2040: NETWORK MEDIA & DEVICES**

**Level:** Intermediate

**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 computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access 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 Course:** NET2020: Workstation Technology & Operations

**Outcomes:** The student will:

**1. identify and describe the characteristics, standard names and applications for common network media and connectors**

- 1.1 identify and describe the structural components and uses of major types of network cables including:
  - 1.1.1 coaxial; e.g., thick, thin
  - 1.1.2 twisted pair; e.g., unshielded, shielded
  - 1.1.3 fibre optic
- 1.2 identify and describe the characteristics and uses of common media connectors including:
  - 1.2.1 registered jack 11 (RJ-11)
  - 1.2.2 registered jack 45 (RJ-45)
  - 1.2.3 attachment unit interface (AUI)
  - 1.2.4 British naval connector (BNC)
  - 1.2.5 small computer system interface (SCSI)
  - 1.2.6 single mode fibre optic connector; e.g., SC-type, ST-type

- 1.3 identify Institute of Electrical and Electronics Engineers (IEEE) standards for Ethernet cabling including:
    - 1.3.1 bandwidth/speed
    - 1.3.2 transmission mode
    - 1.3.3 maximum segment length
    - 1.3.4 cable type
  - 1.4 identify and describe categories for unshielded twisted pair cable defined by the Electronics Industries Alliance and the Telecommunications Industry Association
  - 1.5 describe the media and function of network backbones and segments
  - 1.6 explain the relationship between media type, connector and topology in a network environment
  - 1.7 choose an appropriate cable type and connector to add a client, given a practical network scenario
- 2. identify and explain the purpose, features and basic operation of network hardware components**
- 2.1 explain the purpose of hardware components in:
    - 2.1.1 connecting network devices
    - 2.1.2 boosting data signals
    - 2.1.3 determining data flow
  - 2.2 demonstrate an understanding of the features, functionality and performance of basic hardware components including:
    - 2.2.1 network interface card (NIC)
    - 2.2.2 hub
    - 2.2.3 repeater
    - 2.2.4 switch
    - 2.2.5 bridge
    - 2.2.6 router
    - 2.2.7 gateway
    - 2.2.8 wireless access point
    - 2.2.9 modem
    - 2.2.10 new network technologies
  - 2.3 describe the features and functionality of power fault-tolerance hardware including:
    - 2.3.1 surge suppressor
    - 2.3.2 power line conditioner
    - 2.3.3 uninterruptible power supply
  - 2.4 choose an appropriate hardware component to use or replace an existing device, given a practical network scenario
  - 2.5 physically install a NIC and verify that the NIC is operational including:
    - 2.5.1 Ethernet
    - 2.5.2 Bluetooth
    - 2.5.3 wireless
    - 2.5.4 new technologies
- 3. demonstrate knowledge of cabling tools and procedures**
- 3.1 demonstrate correct use of cabling tools including:
    - 3.1.1 wire crimper
    - 3.1.2 punch down tool

- 3.2 demonstrate appropriate use of basic test equipment including:
  - 3.2.1 media testers/certifiers
  - 3.2.2 crossover cable
  - 3.2.3 tone generator and probe; e.g., fox and hound
  - 3.2.4 optical testers
- 3.3 demonstrate the proper sequence of steps to crimp and test Ethernet cable
- 3.4 select the appropriate cabling tool and test equipment, given a practical cabling task
- 4. demonstrate ability to install network cabling, connectors and hardware components**
  - 4.1 demonstrate procedures for the compliant installation of:
    - 4.1.1 jacks and outlets
    - 4.1.2 cable and structured cable runs
    - 4.1.3 patch panels and patch cords
    - 4.1.4 network cards
    - 4.1.5 wired or wireless connections
  - 4.2 demonstrate appropriate use of test equipment in checking for:
    - 4.2.1 continuity
    - 4.2.2 proper grounding
    - 4.2.3 correct cable termination
  - 4.3 create a proposal for a new or refit cabling project
  - 4.4 design, build and troubleshoot a small Ethernet network at the physical layer
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE NET2050: OPEN SYSTEM INTERCONNECTION**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop knowledge of the Open System Interconnection (OSI) reference model and its use as a conceptual framework for analyzing network communication tasks. They examine the OSI reference model characteristics, the functions of each of its seven layers and how data moves between layers of the reference model when computers establish a network connection.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Primary focus should be placed on the physical, data link, network and transport layers of the OSI reference model, and on the real-world protocols and networking devices that operate at each of these layers. 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.

**Outcomes:** The student will:

**1. describe the general purpose and structure of the OSI reference model as a conceptual framework for network communication**

- 1.1 explain the purpose of the OSI reference model as a blueprint for designing, implementing and operating network hardware and software
- 1.2 identify the functions of each of the seven layers of the OSI reference model
- 1.3 explain and diagram data transfer between layers of the OSI reference model
- 1.4 explain processes of data encapsulation and de-encapsulation in the OSI reference model
- 1.5 describe the process of data packet delivery and the function of a data frame
- 1.6 match network components and connectivity devices to the layers of the OSI reference model at which they operate
- 1.7 analyze networking tasks with respect to the OSI reference model

**2. explain and illustrate how hardware components, network protocols and encapsulation defined in lower layers of the OSI reference model move data across the network; i.e., physical layer data link layer, network layer, transport layer**

- 2.1 identify physical layer components and their function including:
  - 2.1.1 cabling
  - 2.1.2 connectors
  - 2.1.3 network interface cards
  - 2.1.4 repeaters
  - 2.1.5 hubs
- 2.2 describe data signalling at the physical layer
- 2.3 identify Ethernet standards for media type and maximum segment length
- 2.4 demonstrate ability to:
  - 2.4.1 select appropriate cables and connectors
  - 2.4.2 select, install and configure a network adapter
  - 2.4.3 terminate an Ethernet network
  - 2.4.4 test for connectivity
- 2.5 given specific user requirements, do the following:
  - 2.5.1 design physical layer topology and components for a small Ethernet network
  - 2.5.2 create a plan for cabling based on Ethernet standards
- 2.6 identify data link layer devices and their function; e.g., bridges, switches
- 2.7 explain the effects of segmentation in switched networks
- 2.8 identify data link sublayers and their function including:
  - 2.8.1 Logical Link Control (LLC) sublayer
  - 2.8.2 Media Access Control (MAC) sublayer
- 2.9 outline Institute of Electrical and Electronics Engineers (IEEE) standards for the data link layer
- 2.10 describe connectionless and connection-oriented services associated with the LLC sublayer
- 2.11 explain the nature and limitations of physical addressing associated with the MAC sublayer
- 2.12 explain applications of framing in the transport of data packets
- 2.13 describe and illustrate the structure of a data frame
- 2.14 explain the function of frame addressing and frame relay in the transport of data packets
- 2.15 identify network layer devices and their function including a:
  - 2.15.1 router
  - 2.15.2 brouter
- 2.16 explain the process of routing and the function of:
  - 2.16.1 routing metrics
  - 2.16.2 routing tables
- 2.17 distinguish between:
  - 2.17.1 static and dynamic routing
  - 2.17.2 routable and nonroutable protocols
- 2.18 identify common routing protocols and their function including:
  - 2.18.1 Open Shortest Path First (OSPF)
  - 2.18.2 Routing Information Protocol (RIP)
  - 2.18.3 Novell Netware Link Services Protocol (NLSP)
- 2.19 compare physical addressing associated with the data link layer and logical addressing associated with the network layer
- 2.20 identify logical addressing protocols and their functions including:
  - 2.20.1 Internet Protocol (IP)
  - 2.20.2 Internetwork Packet Exchange (IPX)
  - 2.20.3 new protocols for the Internet and other devices

- 2.21 identify and explain types of error checking performed at the transport layer including:
  - 2.21.1 cyclic redundancy checks
  - 2.21.2 parity bits
  - 2.21.3 checksum calculations
- 2.22 provide a rationale for flow control, and identify hardware and software solutions implemented at the transport layer
- 2.23 explain name resolution functions performed at the transport layer
- 2.24 identify common transport layer protocols and their function including:
  - 2.24.1 Transmission Control Protocol (TCP)
  - 2.24.2 User Datagram Protocol (UDP)
  - 2.24.3 Sequenced Packet Exchange (SPX)
  - 2.24.4 Apple Talk Transaction Protocol/Name Binding Protocol (ATP/NBP)
  - 2.24.5 Network Basic Input/Output System/NetBIOS enhanced user interface (NetBIOS/NetBEUI)
  - 2.24.6 new technologies and their associated protocols
- 3. explain the function of upper layers of the OSI reference model in providing client support; i.e., session layer, presentation layer, application layer**
  - 3.1 identify modes of communication associated with the session layer including:
    - 3.1.1 simplex
    - 3.1.2 half-duplex
    - 3.1.3 full-duplex
  - 3.2 describe data compression and encryption processes associated with the presentation layer
  - 3.3 identify file formats that serve as standards for the presentation layer
  - 3.4 describe network services provided by the application layer including:
    - 3.4.1 message handling
    - 3.4.2 file transfer
    - 3.4.3 database queries
  - 3.5 identify upper layer application protocols and their function including:
    - 3.5.1 Simple Mail Transfer Protocol (SMTP)
    - 3.5.2 File Transfer Protocol (FTP)
    - 3.5.3 Simple Network Management Protocol (SNMP)
- 4. demonstrate established laboratory procedures and safe work practices**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2060: NETWORK PROTOCOLS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students acquire basic knowledge of upper-layer protocol suites that permit the networking of computers. They examine reasons for the extensive use of the Transmission Control Protocol/Internet Protocol (TCP/IP) in computer networks, and develop knowledge and skills relevant to installing, configuring and maintaining a TCP/IP client on a network.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on developing knowledge of TCP/IP and its suite of protocols. 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.

**Outcomes:** The student will:

- 1. describe and compare standard networking protocol suites with respect to function and addressing requirements, interoperability and naming conventions**
  - 1.1 describe the nature and purpose of a protocol and a protocol suite/stack within the context of computer networking
  - 1.2 describe and compare standard networking protocol suites including:
    - 1.2.1 TCP/IP
    - 1.2.2 Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX)
    - 1.2.3 NetBIOS extended user interface (NetBEUI)
    - 1.2.4 AppleTalk with respect to: function, routing, addressing requirements, interoperability, naming conventions, advantages and limitations
  - 1.3 match communication tasks performed within TCP/IP, IPX/SPX, NetBEUI and AppleTalk to communication tasks defined at different layers of the Open System Interconnection (OSI) reference model
  - 1.4 identify criteria involved in selecting a network protocol
  - 1.5 investigate emerging technologies and protocols

- 2. identify and explain reasons for the extensive use of the TCP/IP suite in computer networks, and identify and explain major protocols that operate within the TCP/IP suite**
  - 2.1 describe the general characteristics and features of the TCP/IP suite
  - 2.2 compare and contrast the TCP/IP suite with the OSI reference model
  - 2.3 provide reasons for the extensive use of the TCP/IP suite including:
    - 2.3.1 universal interconnectivity
    - 2.3.2 conformity with the OSI reference model
    - 2.3.3 modularity
    - 2.3.4 Internet addressing
    - 2.3.5 interoperability
  - 2.4 identify the basic function of protocols operating within the TCP/IP suite including:
    - 2.4.1 TCP
    - 2.4.2 User Datagram Protocol (UDP)
    - 2.4.3 Ip
    - 2.4.4 Address Resolution Protocol (ARP)
    - 2.4.5 File Transfer Protocol (FTP)
    - 2.4.6 Simple Mail Transfer Protocol (SMTP)
    - 2.4.7 Post Office Protocol (POP)
    - 2.4.8 Internet Message Access Protocol (IMAP)
    - 2.4.9 Internet Control Message Protocol (ICMP)
    - 2.4.10 Routing Information Protocol (RIP)
    - 2.4.11 Open Shortest Path First (OSPF)
    - 2.4.12 Hypertext Transfer Protocol (HTTP)
  - 2.5 match TCP/IP protocols to the layers of the OSI reference model on which they operate
  - 2.6 compare and contrast TCP and UDP segment formats
  - 2.7 investigate emergent technologies and protocols
- 3. demonstrate basic knowledge of logical addressing and the use of subnets and subnet masks to maximize address utilization**
  - 3.1 describe and illustrate conventions for IP addressing; e.g., structure and components, characteristics of Class A, B and C addresses
  - 3.2 convert between binary and decimal notation
  - 3.3 explain the purpose of subnetting and default gateways
  - 3.4 describe and compare classful and classless approaches to subnetting
  - 3.5 provide a rationale for implementing Classless Inter-domain Routing
  - 3.6 demonstrate processes for subnetting a Class A, B or C address into a given number of subnetworks
  - 3.7 determine the subnet mask for a subnetted network
  - 3.8 describe and compare static and dynamic approaches to IP addressing, and applications of dynamic host configuration protocol
  - 3.9 describe the concept of address resolution, and applications of ARP including:
    - 3.9.1 prepare a diagram on how ARP is used in address resolution
    - 3.9.2 describe gratuitous and proxy ARP
    - 3.9.3 interpret an ARP cache
  - 3.10 describe the concept of TCP and UDP port numbers including:
    - 3.10.1 define the function of a port
    - 3.10.2 identify the range of port numbers
    - 3.10.3 explain the function of well-known TCP/UDP ports
    - 3.10.4 investigate emergent technologies and protocols

- 4. demonstrate ability to install and configure TCP/IP on a user work station and validate, troubleshoot and manage a network connection using TCP/IP utilities**
  - 4.1 identify criteria involved in:
    - 4.1.1 planning a network
    - 4.1.2 selecting a network protocol
  - 4.2 plan and construct a small peer-to-peer or server-based network
  - 4.3 install and configure a device for TCP/IP that:
    - 4.3.1 identifies options for obtaining IP addresses
    - 4.3.2 assigns a static IP address
    - 4.3.3 assigns a subnet mask to an IP address
  - 4.4 validate, troubleshoot and manage a network connection through the use of appropriate TCP/IP utilities including:
    - 4.4.1 Simple Network Management Protocol (SNMP)
    - 4.4.2 Packet Internet Groper (PING)
    - 4.4.3 Internet Protocol configuration (IPCONFIG)
    - 4.4.4 traceroute (TRACERT)
    - 4.4.5 network statistics (NETSTAT)
- 5. demonstrate established laboratory procedures and safe work practices**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2070: LOCAL AREA NETWORKS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students extend their understanding of technologies used in a local area network (LAN) and examine specifications for an Ethernet LAN. They develop knowledge of a general strategy for network design and apply the strategy to design, implement and troubleshoot a small LAN.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on the Institute of Electrical and Electronics Engineers (IEEE) standards for cabling, and on safe procedures for preparing and connecting network media and devices. 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.

**Outcomes:** The student will:

**1. describe and explain the nature and evolution of LAN technologies and the specific features that differentiate one LAN from another**

- 1.1 describe the general structure and purpose of a LAN
- 1.2 describe and compare past and present LAN technologies, with attention to their respective topologies, protocols and media including:
  - 1.2.1 attached resource computer network (ARCnet)
  - 1.2.2 LocalTalk
  - 1.2.3 Ethernet
  - 1.2.4 token ring
  - 1.2.5 fibre distributed data interface (FDDI)
  - 1.2.6 asynchronous transfer mode (ATM)
  - 1.2.7 wireless LAN (WLAN)
- 1.3 describe new and/or emerging LAN technologies with respect to:
  - 1.3.1 physical characteristics and potential data capacities
  - 1.3.2 new applications and end-user benefits
  - 1.3.3 historical and/or business perspectives that drive development and adoption

- 2. explain and demonstrate characteristics of an Ethernet LAN and strategies for improving network performance**
  - 2.1 describe basic characteristics of a LAN including:
    - 2.1.1 topology or physical layout
    - 2.1.2 use of carrier sense multiple access with collision detection (CSMA/CD)
    - 2.1.3 specifications for LANs
  - 2.2 identify and describe cabling and hardware devices that support data delivery across LAN including:
    - 2.2.1 cabling specifications and options
    - 2.2.2 data flow through hubs, repeaters, bridges and switches
    - 2.2.3 network interface card functions and options
    - 2.2.4 the function of terminating resistors
  - 2.3 identify data transmission issues in LAN networking environments including:
    - 2.3.1 latency and bandwidth
    - 2.3.2 contention
    - 2.3.3 congestion and collision
    - 2.3.4 attenuation
  - 2.4 explain the concept of segmentation and strategies used to design a collision domain by:
    - 2.4.1 describing segmentation of a collision domain by bridges, switches and routers
    - 2.4.2 illustrating the 5-4-3 rule used in 10Base-T networks
    - 2.4.3 designing and illustrating a small Ethernet collision domain network
  - 2.5 explain applications of bridge and switch technology by:
    - 2.5.1 illustrating the function of learning bridges and the spanning tree protocol
    - 2.5.2 explaining the function of switches at the data link layer and network layers
    - 2.5.3 identifying different types of switching architecture including store-and-forward and cut-through data transport, and half-duplex and full-duplex network access
- 3. describe the characteristics, function and benefits of a virtual local area network (VLAN)**
  - 3.1 describe the structure and function of a VLAN
  - 3.2 identify the benefits offered by a VLAN and specific circumstances in which a VLAN might be implemented
  - 3.3 describe capabilities and functions of the following different types of VLANs:
    - 3.3.1 port-based
    - 3.3.2 address-based
    - 3.3.3 protocol-based
  - 3.4 illustrate/diagram a simple VLAN configuration
- 4. design and implement a small LAN**
  - 4.1 outline a general strategy for network design that:
    - 4.1.1 considers the purpose of the network
    - 4.1.2 determines the overall size of the network
    - 4.1.3 selects a network topology
    - 4.1.4 determines the type of file system to be used
    - 4.1.5 selects network and client operating systems
    - 4.1.6 establishes a naming scheme and name conventions
    - 4.1.7 determines the level and type of fault-tolerance
    - 4.1.8 establishes the type and level of security required
  - 4.2 design and implement a small Ethernet LAN suitable for home or office that adheres to the IEEE standards, given a specific set of network requirements including:
    - 4.2.1 select an appropriate topology and architecture
    - 4.2.2 recommend a hardware and connectivity solution

- 4.2.3 implement the solution by following safe procedures for connecting cabling and hardware devices
- 4.2.4 test the installation
- 5. analyze and troubleshoot basic problems related to LAN design and implementation**
  - 5.1 describe and compare proactive and reactive approaches to troubleshooting
  - 5.2 outline a general strategy for troubleshooting network problems that:
    - 5.2.1 establishes the symptoms
    - 5.2.2 identifies the affected area
    - 5.2.3 establishes what has changed
    - 5.2.4 selects the most probable cause
    - 5.2.5 implements a solution
    - 5.2.6 tests the results
    - 5.2.7 recognizes the potential effects of the solution
    - 5.2.8 documents the solution
  - 5.3 identify common network problems related to:
    - 5.3.1 physical topology
    - 5.3.2 client connectivity
    - 5.3.3 wiring and infrastructure
  - 5.4 identify sources of support for troubleshooting including:
    - 5.4.1 hardware/software manuals and help files
    - 5.4.2 the manufacturer's Web site
    - 5.4.3 technical support via telephone/e-mail
    - 5.4.4 use the levels of the OSI model as a troubleshooting guide to isolate the source of the problem
  - 5.5 analyze and determine the cause of a LAN implementation problem
- 6. demonstrate established laboratory procedures and safe work practices**
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. identify possible life roles related to the skills and content of this cluster**
  - 8.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 8.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE NET2080: LAPTOPS & PERIPHERALS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop an understanding of laptops, portable devices, printers and scanners. 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 computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on Institute of Electrical and Electronics Engineers (IEEE) standards for cabling, and on safe procedures for preparing and connecting network media and devices. 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 Course:** NET2020: Workstation Technology & Operations

**Outcomes:** The student will:

- 1. identify the fundamental principles of using laptops and portable devices**
  - 1.1 identify names, purposes and characteristics of laptop-specific devices/hardware
  - 1.2 identify and distinguish between mobile and desktop motherboards and processors including throttling, power management and Wi-Fi
- 2. install, configure, optimize and upgrade laptops and portable devices**
  - 2.1 configure power management options
  - 2.2 demonstrate the safe removal of laptop-specific hardware such as peripherals, hot-swappable devices and non-hot-swappable devices
- 3. identify tools, basic diagnostic procedures and troubleshooting techniques for laptops and portable devices**
- 4. identify and apply common preventive maintenance techniques for laptops and portable devices; e.g., cooling devices, hardware and video cleaning materials, operating environments including temperature and air quality, storage, transportation and shipping**

- 5. identify the fundamental principles of using printers and scanners**
  - 5.1 identify differences between types of printer and scanner technologies; e.g., laser, inkjet, thermal, solid ink, impact
  - 5.2 identify names, purposes and characteristics of printer and scanner components; e.g., memory, driver, firmware, consumables such as toner, ink cartridge and paper
  - 5.3 identify the names, purposes and characteristics of interfaces used by printers and scanners including port and cable types
- 6. identify basic concepts of installing, configuring, optimizing and upgrading printers and scanners**
  - 6.1 install and configure printers/scanners
  - 6.2 optimize printer performance including:
    - 6.2.1 printer settings; e.g., tray switching
    - 6.2.2 print spool settings
    - 6.2.3 device calibration
    - 6.2.4 media types
    - 6.2.5 paper orientation
- 7. identify tools, basic diagnostic procedures and troubleshooting techniques for printers and scanners**
  - 7.1 gather information about printer/scanner problems
  - 7.2 review and analyze collected data
  - 7.3 identify solutions to identified printer/scanner problems
- 8. demonstrate established laboratory procedures and safe work practices**
- 9. demonstrate basic competencies**
  - 9.1 demonstrate fundamental skills to:
    - 9.1.1 communicate
    - 9.1.2 manage information
    - 9.1.3 use numbers
    - 9.1.4 think and solve problems
  - 9.2 demonstrate personal management skills to:
    - 9.2.1 demonstrate positive attitudes and behaviours
    - 9.2.2 be responsible
    - 9.2.3 be adaptable
    - 9.2.4 learn continuously
    - 9.2.5 work safely
  - 9.3 demonstrate teamwork skills to:
    - 9.3.1 work with others
    - 9.3.2 participate in projects and tasks
- 10. identify possible life roles related to the skills and content of this cluster**
  - 10.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 10.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE NET2110: TELECOMMUNICATIONS 1**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students learn how to select and use various wired and wireless telecommunication systems. By using the Internet, they investigate how communication principles, bandwidth, telecommunication infrastructure and wave spectrum affect telecommunication systems.

**Parameters:** Access to an appropriate computer work station, utility software, the Internet and support materials.

**Outcomes:** The student will:

- 1. use selected communication systems, protocols and techniques to transfer messages, do online activities and manage research**
  - 1.1 outline basic elements of a communication system
  - 1.2 describe the development of wired, wireless and Web-based communication systems
  - 1.3 identify key components of wired, wireless and Web-based telecommunication systems
  - 1.4 identify examples of how telecommunication systems are merging and connecting to improve service to various client groups
- 2. describe the principles of wired, wireless and Web-based communication systems and how telecommunication systems are affected by bandwidth and wave spectrum**
  - 2.1 describe how computers send and receive various types of information/data; e.g., voice, data, documents, visuals, multimedia
  - 2.2 identify and describe telecommunication transmission systems in terms of bandwidth and wave spectrum including:
    - 2.2.1 wired; e.g., twisted pair telephone cable, coaxial cable, special data cables, fibre optics
    - 2.2.2 wireless; e.g., radar/microwave, radio, satellite data links
    - 2.2.3 digital versus analog
  - 2.3 describe various types of transmission systems including:
    - 2.3.1 type of information that can be transmitted; e.g., voice, pictures
    - 2.3.2 present installation base
    - 2.3.3 user cost
- 3. compare and contrast key elements of a telecommunication infrastructure**
  - 3.1 identify key elements of an effective telecommunication infrastructure including:
    - 3.1.1 information and interactive applications/services; e.g., entertainment, education, cultural products, social services, business services, learning management systems
    - 3.1.2 transmission systems; e.g., links with/among homes, businesses, governments/education and institutions
    - 3.1.3 software applications; e.g., enable the operation of computers, manipulation of data, protection of data, transmission and reception of data and access to communication networks and their information such as social networks or learning management systems

- 3.1.4 standards and protocols that allow access to, or secure the contents of, information and networks
- 3.1.5 people/expertise needed to create the information, technology, equipment, peripherals, software and services, to provide the information, to construct the facilities and to educate others on its use and benefits
- 3.2 evaluate one or more telecommunication initiatives in terms of the key elements of an information technology infrastructure within one or more of the following areas:
  - 3.2.1 personal; e.g., personal networks, interests, learning
  - 3.2.2 electronic commerce; e.g., allows consumers/businesses to interact such as 1–800 numbers, electronic data interchange, data exchange
  - 3.2.3 health care; e.g., remote diagnostics, patient information sharing, training
  - 3.2.4 research
  - 3.2.5 education and training; e.g., distance learning/course delivery via learning management systems
  - 3.2.6 libraries; e.g., online
  - 3.2.7 government services; e.g., federal, provincial
  - 3.2.8 information services; e.g., information about government services, reports
  - 3.2.9 technology-based process/procedures, filing income taxes electronically, electronic submissions of contract bids/tendering, teleconferencing
  - 3.2.10 law enforcement services; e.g., international/national sharing of criminal data, teleconferenced parole hearings
  - 3.2.11 labour force development; e.g., flexible, readily upgraded training programs
  - 3.2.12 environmental monitoring
- 4. demonstrate established laboratory procedures and safe work practices**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2910: NET PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other CTS courses through contexts that are personally relevant.

**Parameters:** Intermediate project courses must connect with a minimum of two CTS courses, one of which must be at the intermediate level and be in the same occupational area as the project course. The other CTS course(s) can be at any level from any occupational area.

Project courses cannot be connected to other project courses or practicum courses.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

- 1. identify the connection between this project course and two or more CTS courses**
  - 1.1 identify the outcome(s) from each identified CTS course that support the project and/or performance deliverables
  - 1.2 explain how these outcomes are being connected to the project and/or performance deliverables
- 2. propose the project and/or performance**
  - 2.1 identify the project and/or performance by:
    - 2.1.1 preparing a plan
    - 2.1.2 clarifying the purposes
    - 2.1.3 defining the deliverables
    - 2.1.4 specifying time lines
    - 2.1.5 explaining terminology, tools and processes
    - 2.1.6 defining resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance, indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set

- 3.4 evaluate the project and/or performance, indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2920: NET PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other CTS courses through contexts that are personally relevant.

**Parameters:** Intermediate project courses must connect with a minimum of two CTS courses, one of which must be at the intermediate level and be in the same occupational area as the project course. The other CTS course(s) can be at any level from any occupational area.

Project courses cannot be connected to other project courses or practicum courses.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

- 1. identify the connection between this project course and two or more CTS courses**
  - 1.1 identify the outcome(s) from each identified CTS course that support the project and/or performance deliverables
  - 1.2 explain how these outcomes are being connected to the project and/or performance deliverables
- 2. propose the project and/or performance**
  - 2.1 identify the project and/or performance by:
    - 2.1.1 preparing a plan
    - 2.1.2 clarifying the purposes
    - 2.1.3 defining the deliverables
    - 2.1.4 specifying time lines
    - 2.1.5 explaining terminology, tools and processes
    - 2.1.6 defining resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance, indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set

- 3.4 evaluate the project and/or performance, indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2950: NET INTERMEDIATE PRACTICUM**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students apply prior learning and demonstrate the attitudes, skills and knowledge required by an external organization to achieve a credential/credentials or an articulation.

**Parameters:** This practicum course, which may be delivered on- or off-campus, should be accessed only by students continuing to work toward attaining a recognized credential/credentials or an articulation offered by an external organization. This course must be connected to at least one CTS course from the same occupational area and cannot be used in conjunction with any advanced (3XXX) level course. A practicum course cannot be delivered as a stand-alone course, cannot be combined with a CTS project course and cannot be used in conjunction with the Registered Apprenticeship Program or the Green Certificate Program.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities, as required by the organization granting the credential(s) or articulation**
  - 1.1 identify regulations and regulatory bodies related to the credential(s) or articulation
  - 1.2 describe personal roles and responsibilities, including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities/expectations
    - 1.2.3 code of ethics and/or conduct
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
  - 1.4 demonstrate basic employability skills and perform assigned tasks and responsibilities related to the credential(s) or articulation
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate application of the attitudes, skills and knowledge developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate adherence to workplace legislation related to health and safety
  - 2.4 evaluate the performance requirements of an individual who is trained, experienced and employed in a related occupation in terms of:
    - 2.4.1 training and certification
    - 2.4.2 interpersonal skills
    - 2.4.3 technical skills
    - 2.4.4 ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities