



## COURSE OUTLINE: CST104 - HARDWARE NETWORKS

Prepared: Mark Allemang

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	CST104: PC HARDWARE AND NETWORKING
<b>Program Number: Name</b>	2090: COMPUTER PROGRAMMER 2091: COMPUTER - PROG/ANAL
<b>Department:</b>	COMPUTER STUDIES
<b>Semesters/Terms:</b>	21W
<b>Course Description:</b>	This course provides an overview of computer hardware and networking. The hardware components of a typical computer system will be studied as well as the system level software such as the operating system and device drivers. The essentials of networking will be studied and the student will build a network both wired and wireless and share resources across it. Experiments with network communication encryption will be performed. Topics in Microcontroller computing will be studied as well as Network communication applications. Topics in mobile and cloud computing will also be covered time permitting.
<b>Total Credits:</b>	4
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	75
<b>Prerequisites:</b>	CSO104
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>2090 - COMPUTER PROGRAMMER</b> VLO 2 Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. VLO 13 Contribute to the integration of network communications into software solutions by adhering to protocol standards.
<b>Essential Employability Skills (EES) addressed in this course:</b>	EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.
<b>Course Evaluation:</b>	Passing Grade: 50%, D  A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	Grade Definition Grade Point Equivalent

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.



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A+ 90 - 100% 4.00  
A 80 - 89%  
B 70 - 79% 3.00  
C 60 - 69% 2.00  
D 50 - 59% 1.00  
F (Fail) 49% and below 0.00

CR (Credit) Credit for diploma requirements has been awarded.  
S Satisfactory achievement in field /clinical placement or non-graded subject area.  
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.  
X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.  
NR Grade not reported to Registrar's office.  
W Student has withdrawn from the course without academic penalty.

**Books and Required Resources:**

USB Memory Stick  
An EMPTY USB memory stick of at least 8GB is required.

**Course Outcomes and Learning Objectives:**

Course Outcome 1	Learning Objectives for Course Outcome 1
1. Identify and describe the basic function of all major components found inside a typical computer.	Identify and describe the uses of various PC cases and power supplies 1.1 Describe the nature of electricity and power including ohms law. 1.2 State the purpose and characteristics of a PC power supply. 1.3 Identify PC ports and cables 1.4 Identify various input/output devices and motherboard components 1.5 Explain a subsystem such as RAID and identify its objectives 1.6 Install and configure a typical Windows operating system using appropriate media
Course Outcome 2	Learning Objectives for Course Outcome 2
2. Connect and configure various peripheral devices	2.1 Describe the nature of various types of devices such as printers, scanners, cameras, mobile devices. 2.2 Identify the various interface types used with these devices such as USB, Fire Wire Bluetooth, WIFI, RS232. 2.3 Configure the devices and their interfaces
Course Outcome 3	Learning Objectives for Course Outcome 3
3. Connect and configure mobile devices	3.1 Describe the nature of a typical mobile device such as a smartphone or tablet. 3.2 Configure the device to function in a networked environment
Course Outcome 4	Learning Objectives for Course Outcome 4
4. Describe networks in general and begin building a telecommunications vocabulary.	4.1 List and describe the elements common to all networks. 4.2 define and distinguish LAN, WAN, CAN, MAN 4.3 List and describe the 7 layers of the OSI model and 4.4 Compare them to the 4 layers of the TCP/IP model

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	<p>4.5 Identify various protocols at each layer and describe their purpose</p> <p>4.6 Identify the method of addressing at various layers and the associated protocol data units</p> <p>4.7 Describe physical topologies (bus,ring,star etc.), and associated media access control methods (logical topology)</p> <p>4.8 Differentiate simplex, full/half duplex</p> <p>4.0 Differentiate multi-access vs point-to-point links</p>
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
5. Describe the operation of protocols and devices at the OSI Data link layer and explain how they support communications	<p>5.1 Explain the role of Data Link layer protocols in data transmission.</p> <p>5.2 Describe how the Data Link layer prepares data for transmission on network media.</p> <p>5.3 Identify the common logical network topologies</p> <p>5.4 Explain the purpose of encapsulating packets into frames</p> <p>5.5 Describe the Layer 2 frame structure and identify generic fields.</p> <p>5.6 Explain the role of the frame header and trailer fields, including addressing, type of protocol, and Frame Check Sequence.</p> <p>5.7 Describe the devices that operate at the data link layer including bridges, switches and the NIC.</p> <p>5.8 differentiate broadcast domains and collision domains</p> <p>5.9 compare various network standards (DMX, MIDI, CANBUS) and their characteristics at the Data link layer</p>
<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
6. Describe the features of the Network layer protocols and services and explain the fundamental concepts of routing	<p>6.1 Identify the role of the Network layer as it describes communication from one end device to another end device.</p> <p>6.2 Examine the most common Network layer protocol the Internet Protocol (IP), and its features for providing connectionless and best-effort service</p> <p>6.3 Describe the principles used to guide the division, or grouping, of devices into networks.</p> <p>6.4 Describe the hierarchical addressing of hosts and how this allows communication between networks.</p> <p>6.5 Understand the fundamentals of routes, next-hop addresses, and packet forwarding to a destination network.</p> <p>6.6 utilize switches and TRUNK ports to build VLANs and use a router to carry traffic between them</p>
<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>
7. Calculate, and apply subnet masks and IP addresses to fulfill given requirements	<p>7.1 Explain the structure IP addressing and demonstrate the ability to convert between 8-bit binary and decimal numbers.</p> <p>7.2 Given an IPv4 address, classify by type and describe how it is used in the network.</p> <p>7.3 Explain how addresses are assigned to networks by ISPs and within networks by administrators.</p> <p>7.4 Determine the network portion of the host address and explain the role of the subnet mask in dividing networks.</p> <p>7.5 Given IPv4 addressing information and design criteria,</p>

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	calculate the appropriate addressing components. 7.6 Use common testing utilities to verify and test connectivity and operational status of the IP protocol stack on a device.
<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>
8. List the features of the Transport layer protocols and services	8.1 Explain the need for the Transport layer. 8.2 Identify the role of the Transport layer as it provides the end-to-end transfer of data between applications. 8.3 Describe the role of two TCP/IP Transport layer protocols: TCP and UDP. 8.4 Explain the key functions of the Transport layer, including reliability, port addressing, and segmentation. 8.5 Identify when it is appropriate to use TCP or UDP and provide examples of applications that use each protocol.
<b>Course Outcome 9</b>	<b>Learning Objectives for Course Outcome 9</b>
9. Describe & utilize the Application Layer & its protocols.	9.1 Describe how the functions of the three upper OSI model layers provide network services to end user applications. 9.2 Define how people use the Application Layer to communicate across the telecommunication network. 9.3 Identify the function of well-known TCP/IP applications, such as the World Wide Web and email, and their related services (HTTP, DNS, SMB, DHCP, SMTP, SNMP, and Telnet). 9.4 Explain how protocols ensure services running on one kind of device can send to and receive data from many different network devices.
<b>Course Outcome 10</b>	<b>Learning Objectives for Course Outcome 10</b>
10. Describe the nature of Encryption/Decryption and implement secure communications	10.1 Describe the nature of cryptography 10.2 Describe a hash and where it is used in cryptography 10.3 Distinguish between secret key vs public/private key encryption 10.4 Send a secure message across a communications channel 10.5 Describe how a firewall is used to secure a network 10.6 Explore other topics in security such as digital signatures and VPNs.
<b>Course Outcome 11</b>	<b>Learning Objectives for Course Outcome 11</b>
11. Explore wireless communication	11.1 Identify the media access method used by WIFI networks 11.2 Describe the various security mechanisms in wireless communications including those in Enterprise and personal systems 11.3 Configure wireless access to a typical wireless router including a PSK security mechanism
<b>Course Outcome 12</b>	<b>Learning Objectives for Course Outcome 12</b>
12. Describe the nature of cloud computing and the various methods used to implement it (time permitting)	12.1 Describe the meaning of software as a service, platform as a service and Infrastructure as a service. 12.2 Given a particular computing requirement, recommend the appropriate solution 12.3 Work within a cloud environment such as Google

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		Drive/apps or Microsoft Onedrive						
	<b>Course Outcome 13</b>	<b>Learning Objectives for Course Outcome 13</b>						
	13. Implement digital input/output and analog input using a Microcontroller.	13.1 Read the status of Switches and other digital input devices using a microcontroller. 13.2 Control the state of output devices such as LEDs or motors using a microcontroller. 13.3 Measure the value of an analog input and transmit it to a host computer.						
<b>Evaluation Process and Grading System:</b>	<table><tr><th>Evaluation Type</th><th>Evaluation Weight</th></tr><tr><td>Assignments</td><td>50%</td></tr><tr><td>Tests</td><td>50%</td></tr></table>		Evaluation Type	Evaluation Weight	Assignments	50%	Tests	50%
Evaluation Type	Evaluation Weight							
Assignments	50%							
Tests	50%							
<b>Date:</b>	July 22, 2020							
<b>Addendum:</b>	Please refer to the course outline addendum on the Learning Management System for further information.							

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