KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY (KNUST)

COLLEGE OF SCIENCE

FACULTY OF PHYSICAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

PROGRAM: BSc. COMPUTER SCIENCE

CLASS: COMPUTER SCIENCE 4

COURSE TITLE: COMPUTER NETWORKS

COURSE CODE: CSM 478

COURSE CREDITS	Teaching Hours	Practical Hours	Course credits
	2	1	3

ACADEMIC YEAR & SEMESTER – 2020 / 2021 SECOND SEMESTER

COURSE OUTLINE

Lecturer: Dr. Frimpong Twum **Phone No.**: 024 784 2668

Location: Aboagye Menyeh Complex Block – FF 10 **Email**: twumf@yahoo.co.uk

A. COURSE DESCRIPTION:

This course introduces students to computer networking concepts, with emphasis on Network Architectures, Network Design and Network Protocols. In addition, the course equips students with the knowledge and skills that can be applied towards preparation for an entry level professional networking certification such as CCNA for those interested in a computer networking career. The course is presented from a hands-on practical oriented approach to learning computer networking. Topics includes Types of Networks (LAN, WAN, etc), LAN Characteristics, LAN Topologies, WAN Characteristics, Switching, Bridging, Layered Network Architectures (OSI model, TCP/IP model), Addressing (MAC ADDRESSING, PORT ADDRESSING, IP ADDRESSING), DNS, Network Cabling, Packets Forwarding, Routing, Internetworking Devices, Subnetting, Socket Programming and Client-Server computing, Network Design and Implementation using CISCO Packet Tracer. etc.

B. PREREQUISITE: CSM 477 – DATA COMMUNICATIONS

C. COURSE OBJECTIVES:

On completion of this course, a learner should be able to.

- Understand the fundamental concepts of computer networking and its relationship with data communications.
- Describe the various types of computer networks (LAN, WAN, etc.)

- Demonstrate knowledge of LAN characteristics including Topologies, Transmission Modes, Transmission Methods, Access Methods, and Protocols
- Identify the different networking devices (Hub, Bridge, Switch, Router, & Gateway)
- Explain the function(s) of each networking device in a computer network
- Demonstrate knowledge of Collision Domain(s) and Broadcast Domain(s)
- Demonstrate knowledge of different Network Cabling and Interfaces
- Demonstrate knowledge of the layers of the Open Standard Interconnect (OSI) model
- Demonstrate knowledge of the functions of the layers of the TCP/IP model
- Demonstrate knowledge of IP Addressing and how IPv4 Addressing works
- Demonstrate knowledge of the concept of Subnetting and VLSM
- Apply the knowledge gained to design an enterprise computer network
- Implement the network design using a computer network simulation software such as CISCO Packet Tracer.

KEY TEXTBOOKS:

- Hands-On Networking Fundamentals by Michael Palmer, Cengage Learning
- Data Communications and Networking by Behrouz A. Forouzan, 4th Edition
- CISCO Self Study: CCNA Study Guide (640-801) by Todd Lammle

WEEKLY SCHEME OF LECTURES LECTURE VENUE – ABOAGYE MENYEH COMPLEX BLOCK (ROOM SF 7)		
Week	**Topic**	**Key Text Chapter(s)**
1	**Introductory Concepts** • Fundamental concepts of computer networking and its relationship with data communications. ➢ Introduction to Networking ➢ What is Computer Network ➢ Components of Data Communication ➢ Benefits of Computer Networks ➢ Risks of Network Computing ➢ Types of Line Configuration ➢ Metric for assessing network effectiveness ➢ Data Representation and Number Systems	Chapters 1 **Data Communications and Networking by Behrouz A. Forouzan**
2 & 3	**Introductory Concepts (ctnue)** • **Describe** the various types of computer networks (LAN, WAN, etc.) ➢ Local Area Networking (LAN) Communication ➢ Wide Area Networking (WAN) Communication ➢ Enterprise Network ➢ Communications Media	Chapters 1 & 2 **Hands-On Networking Fundamentals by Michael Palmer**
3	**LAN characteristics including:** ➢ LAN Topologies ➢ LAN Transmission Modes ➢ LAN Transmission Methods ➢ LAN Access Methods ➢ LAN Protocols	Chapters 1 & 2 **Hands-On Networking Fundamentals by Michael Palmer**

4 & 5	**Network Devices and Devices Function(s) in Network** • **Network Devices** ➢ Network Interface Card (NIC) ➢ Hub ➢ Switch ➢ Bridge ➢ Ruters ➢ Gateway • Switching and Switching Tables ➢ Collision Domain(s) ➢ Broadcast Domain(s)	Chapters 1 **CISCO Self Study: CCNA Study Guide (640-801)**
6	**Network Models** • **The OSI Reference Model** ➢ Physical Layer ➢ Data Link Layer ➢ Network Layer ➢ Transport Layer ➢ Session Layer ➢ Presentation Layer ➢ Application Layer • The TCP/IP Protocol Suite ➢ Network Access Layer ➢ Internet Layer ➢ Host-to-Host Transport Layer ➢ Application Layer	Chapters 2 **CISCO Self Study: CCNA Study Guide (640-801)** Chapters 2 **Data Communications and Networking by Behrouz A. Forouzan** Chapters 2 **Hands-On Networking Fundamentals by Michael Palmer**
7	**Mid- Semester Exams**	N/A
8	**IP Addressing** • **Types of IP Addresses** ➢ IPv4, IPv6 ➢ IPv4 Address Classification ➢ IPv4 Address Ranges ➢ Masking o Boundary Level/Fixed Length Mask ➢ IPv4 Reserved Addresses o Private/Non-Routable Addresses o Special Addresses ➢ IPv4 Public/Routable Addresses ➢ Network Prefix & Host Prefix • **Network Map** • **Routing and Routing Tables** • **IPv6 Addresses** **LINK FOR STUDY MATERIAL** **IP Addressing and Subnetting for New Users** https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html **Understanding IP Addressing: Everything you ever wanted to know** https://pages.di.unipi.it/ricci/501302.pdf	Chapters 3 **Hands-On Networking Fundamentals by Michael Palmer** Chapters 3 **CISCO Self Study: CCNA Study Guide (640-801)** Chapters 19 **Data Communications and Networking by Behrouz A. Forouzan**

9	**Subnetting** • What is Subnetting? • Why Subnetting? • Subnetting IPv4 Classes A, B, & C IP Address • Non-Boundary Level Mask • Hierarchical IPv4 Addressing Scheme • Classless Inter-Domain Routing (CIDR) notation and impact on on IP Network Routing Tables • Variable Length Subnet Mask (VLSM) • Network Wiring Diagram using CISCO Packet Tracer Simulation Software **LINK FOR STUDY MATERIAL** **IP Addressing and Subnetting for New Users** https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html **Understanding IP Addressing: Everything you ever wanted to know** https://pages.di.unipi.it/ricci/501302.pdf **Download and Install CISCO Packet Tracer** **https://www.filehorse.com/download-cisco-packet-tracer-64/**	Chapters 3 **Hands-On Networking Fundamentals by Michael Palmer** Chapters 3 **CISCO Self Study: CCNA Study Guide (640-801)** Chapters 19 **Data Communications and Networking by Behrouz A. Forouzan**
10	**Variable Lengths Subnet Mask (VLSM)** • What is Variable Length Subnet Mask (VLSM) • How VLSM works • Network Wiring Diagram • Network Wiring Diagram using CISCO Packet Tracer Simulation Software **LINK FOR STUDY MATERIAL** **IP Addressing and Subnetting for New Users** https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html **Understanding IP Addressing: Everything you ever wanted to know** https://pages.di.unipi.it/ricci/501302.pdf **Download and Install CISCO Packet Tracer** **https://www.filehorse.com/download-cisco-packet-tracer-64/**	Chapters 3 **CISCO Self Study: CCNA Study Guide (640-801)**

Teaching Approach:

Instructions will take the form of lectures, tutorials, problem solving, case studies and lab sessions with regular assignments.

Assessment:

Mid-semester exam: 15%
Quiz/Assignments/Lab Sessions: 15%
Final Examination: 70%

Recommended Reding Links:

CISCO Packet Tracer Tutorials
https://www.computer-pdf.com/tutorials-introduction-to-cisco-packet-tracer

CCNA LAB MANUAL
https://sjce.ac.in/wp-content/uploads/2018/01/CCNA-lab-Manual.pdf