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| ICT 4255 | **Computer Networking** | **3.00** |

Prerequisite: None. Contact Hour: 4 hours/week.

***Objective:***

The objective of this course is to equip learners with basic and advanced concepts of computer networking through different components of computer networks, topologies, various protocols, modern technologies and their applications and challenges in building networks and solutions to those.

***Outcome: At the end of this course, learners will be able to***

* explain the computer networking industry's technological developments.
* describe the Network's main technological components.
* analyze the difficulties in creating networks and their remedies.

***Contents:***

Internetworking; Introduction to TCP/IP; Subnetting, Variable Length Subnet Masks (VLSMs), and Troubleshooting TCP/IP; Cisco’s Internetworking Operating System (IOS) and Security Device Manager (SDM); Managing a Cisco Internetwork; IP Routing; Enhanced IGRP (EIGRP) and Open Shortest Path First (OSPF); Layer 2 Switching and Spanning Tree Protocol (STP); Virtual LANs (VLANs); Security; Network Address Translation (NAT); Cisco’s Wireless Technologies; Internet Protocol Version 6 (IPv6); Wide Area Networks.

**Course Outcomes:**

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| CO No. | CO Statement | Corresponding PO(s)\* | Domains and Taxonomy Level(s)\*\* | Delivery Method(s) and Activity(-ies) | Assessment Tool(s) |
| 1 | Recognize the computer networking industry's technological developments. | PO(1) | C1 | e.g., Lectures, Homework | e.g.,Written exams; viva voce; presentation; assignment |
| 2 | Describe the Network's main technological components. | PO(1) | C1 |  |  |
| 3 | Analyze the difficulties in creating networks and their remedies. | PO(1) | C4 |  |  |

**Mapping of Knowledge Profile, Complex Engineering Problem Solving and Complex Engineering Activities:**

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| COs | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | P1 | P2 | P3 | P4 | P5 | P6 | P7 | A1 | A2 | A3 | A4 | A5 |
| CO1 |  |  |  | √ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  | √ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  | √ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Lecture Plan:**

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| Lec# | Lecture Topics | Teaching-learning Strategy(-ies) | Assessment Strategy(-ies) | Corresponding CO(s) |
| 1 | **Internetworking**  Internetworking Basics, Internetworking Models, The OSI Reference Model, Ethernet Networking, Ethernet Cabling, Data Encapsulation, The Cisco Three-Layer Hierarchical Model. | Lecture, Exercise | Q/A (Class Performance) | CO1 |
| 2 | **Introduction to TCP/IP**  TCP/IP and the DoD Model, IP Addressing, Broadcast Addresses. | Lecture, Exercise | Q/A (Class Performance), Assignment | CO1, CO2 |
| 3 | **Subnetting, Variable Length Subnet Masks (VLSMs), and Troubleshooting TCP/IP**  Subnetting Basics, Variable Length Subnet Masks (VLSMs), Summarization, Troubleshooting IP Addressing. | Lecture, Exercise | Q/A (Class Performance), Quiz | CO1, CO2 |
| 4 | **Cisco’s Internetworking Operating System (IOS) and Security Device Manager (SDM)**  The IOS User Interface, Command-Line Interface (CLI), Router and Switch Administrative Configurations, Router Interfaces, Viewing, Saving, and Erasing Configurations, Cisco’s Security Device Manager (SDM). | Lecture, Exercise | Q/A (Class Performance) | CO3 |
| 5 | **Managing a Cisco Internetwork**  The Internal Components of a Cisco Router, The Router Boot Sequence, Managing Configuration Register, Backing Up and Restoring the Cisco IOS, Backing Up and Restoring the Cisco Configuration, Using Cisco Discovery Protocol (CDP), Using Telnet, Resolving Hostnames, Checking Network Connectivity and Troubleshooting. | Lecture, Exercise | Q/A (Class Performance) | CO3 |
| 6 | **IP Routing**  Routing Basics, The IP Routing Process, Configuring IP Routing in Our Network, Dynamic Routing, Distance-Vector Routing Protocols, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Verifying Your Configurations. | Lecture, Exercise | Q/A (Class Performance), Assignment | CO2 |
| 7 | **Enhanced IGRP (EIGRP) and Open Shortest Path First (OSPF)**  EIGRP Features and Operation, Using EIGRP to Support Large Networks, Configuring EIGRP, Load Balancing with EIGRP, Verifying EIGRP, Open Shortest Path First (OSPF) Basics, Configuring OSPF, Verifying OSPF Configuration, OSPF DR and BDR Elections, OSPF and Loopback Interfaces, Troubleshooting OSPF, Configuring EIGRP and OSPF Summary Routes. | Lecture, Exercise | Q/A (Class Performance) | CO2 |
| 8 | **Layer 2 Switching and Spanning Tree Protocol (STP)**  Before Layer 2 Switching, Switching Services, Spanning Tree Protocol (STP), Configuring Catalyst Switches, Cisco Network Assistant. | Lecture, Exercise | Q/A (Class Performance), Quiz | CO2 |
| 9 | **Virtual LANs (VLANs)**  VLAN Basics, VLAN Memberships, Identifying VLANs, VLAN Trunking Protocol (VTP), Routing between VLANs, Configuring VLANs, Configuring VTP, Telephony: Configuring Voice VLANs, Using the CNA to Configure VLANs and Inter-VLAN Routing. | Lecture, Exercise | Q/A (Class Performance) | CO3 |
| 10 | **Security**  Perimeter, Firewall, and Internal Routers, Recognizing Security Threats, Mitigating Security Threats, Introduction to Access Lists, Standard Access Lists, Extended Access Lists, Advanced Access Lists, Monitoring Access Lists, Configuring Access Lists Using SDM. | Lecture, Exercise | Q/A (Class Performance) | CO1 |
| 11 | **Network Address Translation (NAT)**  When Do We Use NAT?, Types of Network Address Translation, NAT Names, How NAT Works, Testing and Troubleshooting NAT,  Configuring NAT on Our Internetwork, Configuring NAT Using SDM. | Lecture, Exercise | Q/A (Class Performance) | CO3 |
| 12 | **Cisco’s Wireless Technologies**  Introduction to Wireless Technology, Cisco’s Unified Wireless Solution, Configuring Our Wireless Internetwork. | Lecture, Exercise | Q/A (Class Performance), Assignment | CO1, CO3 |
| 13 | **Internet Protocol Version 6 (IPv6)**  Why Do We Need IPv6?, The Benefits and Uses of IPv6, IPv6 Addressing and Expressions, How IPv6 Works in an Internetwork, IPv6 Routing Protocols, Migrating to IPv6, Configuring IPv6 on Our Internetwork. | Lecture, Exercise | Q/A (Class Performance) | CO2 |
| 14 | **Wide Area Networks**  Introduction to Wide Area Networks, Cable and DSL, Cabling the Serial Wide Area Network, High-Level Data-Link Control (HDLC) Protocol, Point-to-Point Protocol (PPP),Frame Relay, Using SDM for WAN Connections, Virtual Private Networks. | Lecture, Exercise | Q/A (Class Performance), Quiz | CO3 |

**Textbook:**

1. CCNA: Cisco® Certified Network Associate Study Guide – Todd Lammle, Wiley Publishing, Inc.

**Reference Book:**

1. Introduction to data communication and networking - Behrouz Forouzan, Tata McGraw Hill Publishing Company Ltd.
2. Data and Computer Communications - William Stallings, PHI.
3. Data Communications - Prakash C Gupta, PH.I
4. Computer Networks, A systems approach - Peterson L.L. &Davie B.S., Harcourt Asia.
5. An Engineering Approach to Computer Networking - Keshav S., AWL.
6. Computer Networks - Andrew S. Tanenbaum, PHI.