



**Department of Information System  
Engineering**

**Ecole Polytechnic University**

**Subject: Network Design & Implementation**

**Course Book – *Fourth Year/ 7<sup>th</sup> Semester***

**A.Prof.'s name: Dr. Reben MS KURDA**

**Academic Year: 2022/2023**

## Course Book

<b>1. Course name</b>	<b>Network Design &amp; Implementation</b>
<b>2. Lecturer in Charge</b>	<b>A.Prof. Dr.Reben KURDA</b>
<b>3. Department/ College</b>	<b>ISE Department / Erbil Technical Engineering-/Erbil Polytechnic University Institute</b>
<b>4. Contact</b>	<b>e-mail: Reben.kurda@epu.edu.iq Tel: 0750 3699627</b>
<b>5. Time (in hours) per week</b>	<b>Theory: 2 Hrs, Hall 1 (Wednesday) Practical: 2 Hrs (Tuesday)</b>
<b>6. Office hours</b>	<b>Sunday From 10:30 AM To 01:00 PM Tuesday From 08:30 AM To 01:00 PM</b>
<b>7. Course code</b>	NDI704
<b>8. Teacher's academic profile</b>	<p>Reben KURDA is an A.Prof. Holding PhD. in Computer Science in University Paris-Sud, Paris-France 2015.</p> <p>He started his academic teaching in 2009 when he joined the work at Koya University as an Assistant Lecturer in the department of Software Engineering.</p> <p>Since November 2019, he is joined his academic teaching at Department Information System Engineering, college Technical Engineering, Ecole Polytechnic University</p> <p>Reben KURDA participated in CCNA Academy courses, he got instructor certificate from Cisco. He teaches several courses like C++, Java, Object oriented programming, Data Structure, Logic, Data Communication, Computer Networking.</p>
<b>9. Keywords</b>	<p>1. <b>Chapter 01 - Networking Fundamentals</b></p> <p>Introduction to TCP/IP Networking Ch 01</p> <p>Ethernet LAN Ch 02</p> <p>Wide Area Networks</p> <p>IPv4 Addressing and Routing Fundamentals</p> <p>TCP/IP Transport and Applications</p>

	<p><b>Chapter 2 - Basic Ethernet LAN Implementation</b></p> <ul style="list-style-type: none"><li>Command Line Essentials</li><li>Ethernet LAN Switching</li><li>Managing Ethernet Switches <b>Report or assignment</b></li><li>Configuring Switch Interfaces <b>Ch 07</b></li></ul> <p><b>Chapter 3 - Designing Ethernet LANs</b></p> <ul style="list-style-type: none"><li>Understanding LAN Design Options</li><li>Implementing and Configuring Ethernet VLANs <b>Ch 08</b></li><li>Understanding Spanning Tree Protocol (STP) <b>Ch 09</b></li><li>Implementing STP <b>Ch 09</b> <b>Layer 2 Switching</b></li></ul> <p><b>Chapter 4 - Understanding IPv4</b> <b>Layer 3 IPv4 &amp; Routing</b></p> <ul style="list-style-type: none"><li>IPv4 Subnetting <b>Ch 11</b></li><li>Analyzing Classful IPv4 Networks <b>Ch 12</b></li><li>Analyzing Subnet Masks <b>Ch 13</b></li><li>Analyzing Existing Subnets <b>Ch 14</b></li></ul> <p><b>Chapter 5 - Implementing IPv4</b> <b>Layer 3 IPv4 &amp; Routing</b> <b>(Second Semester)</b></p> <ul style="list-style-type: none"><li>Working with Cisco Routers <b>Ch 15</b></li><li>Configuring IPv4 Addresses and Static Routes <b>Ch 16</b></li><li>Using Dynamic Routing Protocols <b>Ch 16</b></li><li>Configuring IPv4 Hosts <b>Ch 16</b></li></ul> <p><b>Chapter 6 - IPv4 Design and Troubleshooting</b></p> <ul style="list-style-type: none"><li>Designing IP Subnets</li><li>Using VLSM</li><li>Troubleshooting IPv4</li></ul> <p><b>Chapter 7 - IPv4 Services</b></p> <ul style="list-style-type: none"><li>Access Control Lists</li><li>Network Address Translation</li></ul> <p><b>Chapter 8 - Configuring IPv4 Routing Protocols</b></p> <ul style="list-style-type: none"><li>Understanding OSPF <b>Ch 19</b></li><li>Implementing OSPF <b>Ch 20</b></li></ul> <p><b>Chapter 10 - Wireless LANs</b></p> <ul style="list-style-type: none"><li>Wireless Network Fundamentals <b>Ch 26</b></li><li>Cisco Wireless Architectures</li><li>Securing Wireless Networks</li><li>Building a Wireless LAN</li></ul> <p><b>Chapter 11 IP Services</b></p> <ul style="list-style-type: none"><li>Device Management Protocols <b>Ch 10</b></li><li>Quality of Service (QoS) <b>Cha 11</b></li></ul>
--	--

**10. Course overview:**

This course covers various topics in computer networks. It includes protocols that govern way communication takes place on the network, the parameters for routing and network analysis and dissemination strategies in the static and dynamic networks. The TCP/IP model and other related topics sub-netting huge networks into small networks called subnets basic ethernet LAN implementation, designing Ethernet LANs, understanding IPv4, implementing IPv4, IPv4 design and troubleshooting, IPv4 services, configuring IPv4 routing protocols, implementing IPv6, and wireless LANs.

**11. Course objective:**

**12. Student's obligation**

It is the teacher's job to formulate a classroom management plan to facilitate the development of an effective learning environment. The student also has an obligation in the development of a quality learning environment. Following individual rules or expectations is just the beginning. In addition to complying with posted rules, students should be expected to show respect for self and others and meet all behavioural and academic expectations.

**13. Forms of teaching:**

Forms of teaching is on two phase

- ✓ In the beginning give the students theory lecture by using data show and White Board.
- ✓ Direct the students to labs in order to apply the commands and what they took in the

theory on computer supervising by the teacher itself with his assistant.

#### 14. Assessment scheme

- **Mid-term Exam**      **40 %**
  - **Lab Exams.**                                  **10%**
  - **Theoretical Exam**                              **15%**
  - **Quiz**    **5%**
  - **Attendance**                                      **5%**
  - **Activities**                                      **5%**
- **Final Exam**                              **60%**
  - **Practical**                                      **20%**
  - **Theoretical**                                      **40%**

#### 15. Student learning outcome:

At the completion of this course, students should be able to explain

#### 16. Course Reading List and References:

**Required Textbook: Computer Networking: CCNA 200-301 Official Cert Guide, Volume 1, WENDELL ODOM, CCIE No. 1624 Emeritus (ISBN: 9780135792735).**

#### 17. The Topics:

#### Lecturer's name

##### ■ Part I: Introduction to Networking

1. **Chapter 1**, "Introduction to TCP/IP Networking," introduces the central ideas and terms used by TCP/IP, and contrast the TCP/IP networking model with the OSI model.
  2. **Chapter 2**, "Fundamentals of Ethernet LANs," introduces the concepts and terms used when building Ethernet LANs.
- ❖ **Chapter 3**, "Fundamentals of WANs and IP Routing," covers the basics of the data-link layer for WANs in the context of IP routing but emphasizes the main network layer protocol for TCP/IP. This chapter introduces the basics of IPv4, including IPv4 addressing and routing.

##### ■ Part II: Implementing Ethernet LANs

- ❖ **Chapter 4**, "Using the Command-Line Interface," explains how to access the text based user interface of Cisco Catalyst LAN switches.
- ❖ **Chapter 5**, "Analyzing Ethernet LAN Switching," shows how to use the Cisco CLI to verify the current status of an Ethernet LAN and how it switches Ethernet frames.
- ❖ **Chapter 6**, "Configuring Basic Switch Management," explains how to configure Cisco switches for basic management features, such as remote access using Telnet and SSH.
- ❖ **Chapter 7**, "Configuring and Verifying Switch Interfaces," shows how to configure a variety of switch features that apply to interfaces, including

Reben M.S KURDA

(4 hrs) for each of them per week

<p>duplex/speed.</p> <ul style="list-style-type: none"> <li>■ <b>Part III: Implementing VLANs and STP</b></li> <li>❖ <b>Chapter 8, “Implementing Ethernet Virtual LANs,”</b> explains the concepts and configuration surrounding virtual LANs, including VLAN trunking.</li> <li>❖ <b>Chapter 9, “Spanning Tree Protocol Concepts,”</b> discusses the concepts behind IEEE Spanning Tree Protocol (STP), including Rapid STP (RSTP) and how they make some switch interfaces block frames to prevent frames from looping continuously around a redundant switched LAN.</li> <li>❖ <b>Chapter 10, “RSTP and EtherChannel Configuration,”</b> shows how to configure and verify RSTP and Layer 2 EtherChannels on Cisco switches.</li> </ul> <p><b>Part IV: IPv4 Addressing</b></p> <ul style="list-style-type: none"> <li>❖ <b>Chapter 11, “Perspectives on IPv4 Subnetting,”</b> walks you through the entire concept of subnetting, from starting with a Class A, B, or C network to a completed subnetting design as implemented in an enterprise IPv4 network.</li> <li>❖ <b>Chapter 12, “Analyzing Classful IPv4 Networks,”</b> explains how IPv4 addresses originally fell into several classes, with unicast IP addresses being in Class A, B, and C. This chapter explores all things related to address classes and the IP network concept created by those classes.</li> <li>❖ <b>Chapter 13, “Analyzing Subnet Masks,”</b> shows how an engineer can analyze the key facts about a subnetting design based on the subnet mask. This chapter shows how to look at the mask and IP network to determine the size of each subnet and the number of subnets.</li> <li>❖ <b>Chapter 14, “Analyzing Existing Subnets,”</b> describes how most troubleshooting of IP connectivity problems starts with an IP address and mask. This chapter shows how to take those two facts and find key facts about the IP subnet in which that host resides.</li> </ul> <p>■ <b>Part V: IPv4 Routing</b></p> <ul style="list-style-type: none"> <li>❖ <b>Chapter 15, “Operating Cisco Routers,”</b> is like Chapter 8, focusing on basic device management, but it focuses on routers instead of switches.</li> <li>❖ <b>Chapter 16, “Configuring IPv4 Addressing and Static Routes,”</b> discusses how to add IPv4 address configuration to router interfaces and how to configure static IPv4 routes.</li> <li>❖ <b>Chapter 17, “IP Routing in the LAN,”</b> shows how to configure and troubleshoot different methods of routing between VLANs, including Router-on-a-Stick (ROAS), Layer 3 switching with SVIs, Layer 3 switching with routed ports, and using Layer 3 EtherChannels.</li> <li>❖ <b>Chapter 18, “Troubleshooting IPv4 Routing,”</b> focuses on how to use two key troubleshooting tools to find routing problems: the <b>ping</b> and <b>traceroute</b> commands.</li> </ul> <p>■ <b>Part VI: OSPF</b></p> <ul style="list-style-type: none"> <li>❖ <b>Chapter 19, “Understanding OSPF Concepts,”</b> introduces the fundamental operation of the Open Shortest Path First (OSPF) protocol, focusing on link state fundamentals, neighbour relationships, flooding link state data, and calculating route based on the lowest cost metric.</li> <li>❖ <b>Chapter 20, “Implementing OSPF,”</b> takes the concepts discussed in the previous chapter and shows how to configure and verify those same features.</li> <li>❖ <b>Chapter 21, “OSPF Network Types and Neighbors,”</b> takes the next steps in OSPF configuration and verification by looking in more depth at the concepts of how routers enable OSPF on interfaces, and the conditions that must be true before two routers will succeed in becoming OSPF neighbors.</li> </ul> <p>■ <b>Part VI: OSPF</b></p> <ul style="list-style-type: none"> <li>❖ <b>Chapter 19, “Understanding OSPF Concepts,”</b> introduces the fundamental operation of the Open Shortest Path First (OSPF) protocol, focusing on link state fundamentals, neighbor relationships, flooding link state data, and calculating routes based on the lowest cost metric.</li> <li>❖ <b>Chapter 20, “Implementing OSPF,”</b> takes the concepts discussed in the previous chapter and shows how to configure and verify those same features.</li> <li>❖ <b>Chapter 21, “OSPF Network Types and Neighbors,”</b> takes the next steps in OSPF configuration and verification by looking in more depth at the concepts of how routers enable OSPF on interfaces, and the conditions that must be true before two routers will succeed in becoming OSPF</li> </ul>	
--	--

neighbours.	
<b>18. Practical Topics (If there is any)</b>	
<ol style="list-style-type: none"> <li>1. Environment Setup (Packet Tracer) and getting familiar with the Environments components and (Opening, Saving, Testing and Running a simple Networking)</li> <li>2. Design a simple Network</li> <li>3. Examples PC, Cable, Switches, Router</li> <li>4. Type of Cabling</li> <li>5. Example of Sending Packet messages through UDP</li> <li>6. Example of Networking Design in Virtual Ethernet Lans, in Layer 2</li> <li>7. Examples of IP Subnetting</li> <li>8. Examples of IP Subnetting</li> <li>9. Examples of IP Subnetting</li> <li>10. Example of OSPF</li> <li>11. IP Routing in the LAN</li> </ol>	<p>Reben M.S KURDA</p> <p>(2 hrs) for each of the Group per week</p>
<p><b>19. Examinations:</b></p> <p style="text-align: center;"><b><u>Samples of Questions</u></b></p> <p>Q1\ What is computer and figure out its main components.</p>	
<p><b>20. Extra notes:</b></p>	
<p><b>21. Peer review</b></p> <p>This course book has to be reviewed and signed by a peer. The peer approves the contents</p>	<p style="text-align: right;">پیداچوونہوہی ھاوہل</p>

of your course book by writing few sentences in this section.

*(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*

ئەم كۆرسىۋىكى دەپنەت لەلەيەن ھاۋملىكى ئەكادىمىيە سەير بىرئىت و ناۋەرۆكى بابەتەكانى كۆرسەكە پەسەند بىكات و جەند ووشەيەك بنوسىت لەسەر شىاۋى ناۋەرۆكى كۆرسەكە و واژۋوى لەسەر بىكات.  
ھاۋملى ئەو كەسەيە كە زانىارى ھەبىت لەسەر كۆرسەكە و دەبىت پلەي زانستى لە مامۇستا كەمتر نەبىت.