

C S 50A: NETWORK BASICS (CCNA)

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2021
Units:	4.5
Hours:	4 lecture, 2 laboratory per week (72 total per quarter)
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- The student will demonstrate an understanding of communications between two hosts on an IP network connected by an arbitrary collection of routers and switches. The student will perform a lab experiment requiring them to analyze the flow of data between two host using Wireshark or Packet Tracer.
- The student demonstrate understanding of the role of IP addressing in the TCP/IP Network Reference Model in Networking.

Description

Introduction to the architecture, structure, functions, components, and models of the internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. Students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Course Objectives

The student will be able to:

- Understand and describe the devices and services used to support communications in data networks and the internet
- Understand and describe the role of protocol layers in data networks
- Understand and describe the Network Access layer, including the physical media and data link protocols
- Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
- Understand and describe the function of the transport layer and its associated protocols
- Describe the role of the application layer and its protocols
- Use Cisco IOS command-line interface (CLI) commands to perform basic router configuration
- Utilize common network utilities to verify small network operations and analyze data traffic

Course Content

- Exploring the Network
 - LANs, WANs, and the internet
 - The network as a platform
 - The changing network environment
- Layered Models
 - The reasons why layered models were developed
 - The uses of layered models
 - The OSI model
 - The TCP/IP model
- Network Access
 - Physical layer protocols
 - Network media
 - Media
 - EMI
 - Crosstalk
 - Shielding
 - Media selection
 - Standards
 - Institute of Electrical and Electronics Engineers (IEEE)
 - Underwriters Laboratory (UL)
 - Electrical Industries Association/Telecommunications Industries Association (EIA/TIA)
 - Encoding and signaling
 - Network topologies
 - Topology
 - Bus topology
 - Star topology
 - Extended star topology
 - Logical vs. physical topologies
 - Internetworking
 - Data link layer protocols
 - The data link layer
 - Frames and frame format
 - Physical addressing
 - MAC addresses
 - HDLC/PPP addressing
 - Multi-access networks
 - Point to point networks
 - Ethernet
 - Ethernet protocol
 - Address Resolution Protocol
 - Hubs
 - Bridges
 - LAN switches
 - The Network Layer
 - Host addressing
 - Network addressing
 - Private vs. public addressing
 - Address Resolution Protocol (ARP)
 - Reverse Address Resolution Protocol (RARP)
 - Proxy ARP
 - Default gateway
 - Routing and routers
 - Routing protocols
 - RIP
 - OSPF
 - EIGRP
 - Network architecture
 - Campus LAN design
 - WAN design

E. IP Addressing

1. IP mathematics

- Binary numbering system
- Hexadecimal numbering system
- Converting between Binary, Hexadecimal, and Decimal
- IP addressing v4 and v6

a. IP addresses

- Network addresses
- Host addresses

d. Subnetting and Variable Length Subnetting

F. Transport Layer Protocols

- TCP
- UDP
- RTP

G. The Application Layer Protocols

- Their purpose and application
- Important application layer protocols
 - HTTP/HTTPS
 - SMTP
 - POP3
 - Telnet/SSH

H. Configuring a Network Operating System

- IOS Bootcamp
- Basic configuration
- Addressing schemes

I. IOS Utilities

- Show commands
- Debug commands
- Connectivity verification commands

Lab Content

A. Topology Orientation and Building a Small Network

- Correctly identify cables for use in the network
 - Physically cable a peer-to-peer and switched network
 - Verify basic connectivity on each network
- B. Using Wireshark to View Protocol Data Units
- Explain the purpose of a protocol analyzer (Wireshark)
 - Perform a basic PDU capture using Wireshark
 - Perform basic PDU analysis on straightforward network data traffic
 - Experiment with Wireshark features and options such as PDU capture and display filtering

C. Managing a Web Server

- Download, install, and verify a web server application
- Verify the default web server configuration file

2. Capture and analyze HTTP traffic with Wireshark

D. TCP/IP Transport Layer Protocols, TCP and UDP

- Identify TCP header fields and operation using a Wireshark FTP session capture
- Identify UDP header fields and operation using a Wireshark TFTP session capture

E. Examining a Route

- Use the route command to modify a Windows computer routing table
- Use a Windows Telnet client command telnet to connect to a Cisco router
- Examine router routes using basic Cisco IOS commands

F. IPv4 Address Subnetting

- Given an IP address and network mask, determine other information about the IP address, such as:
 - Network address
 - Network broadcast address
 - Total number of host bits

d. Number of hosts

G. Subnet and Router Configuration

- Subnet an address space per given requirements
- Assign appropriate addresses to interfaces and document
- Configure and activate Serial and FastEthernet interfaces
- Test and verify configurations
- Reflect upon and document the network implementation

H. Frame Examination

- Explain the header fields in an Ethernet II frame
- Use Wireshark to capture and analyze Ethernet II frames

I. Media Connectors Lab Activity

- Test cables using a Fluke620 LAN CableMeter and a Fluke LinkRunner
- Become familiar with the most common functions of a cable tester
- Test different cables for type and wiring problems

J. Cisco Switch MAC Table Examination

- Use the Telnet protocol to log into a Cisco Switch
- Use the Cisco IOS show mac-address-table command to examine MAC address and port associations

K. Creating a Small Lab Topology

- Design the logical network
- Configure the physical lab topology
- Configure the logical LAN topology
- Verify LAN connectivity

L. Final Case Study - Datagram Analysis with Wireshark

- Show how a TCP segment is constructed, and explain the segment fields
- Show how an IP packet is constructed, and explain the packet fields
- Show how an Ethernet II frame is constructed, and explain the frame fields
- Capture the contents of an ARP REQUEST and ARP REPLY and explain the fields in the packer

Special Facilities and/or Equipment

- Access to a network laboratory with current Cisco network equipment host computers required to support the class.
- A website or course management system with an assignment posting component (through which all lab assignments are to be submitted) and a forum component (where students can discuss course material and receive help from the instructor). This applies to all sections, including on-campus (i.e., face-to-face) offerings.
- When taught via Foothill Global Access on the Internet, the college will provide a fully functional and maintained course management system through which the instructor and students can interact.
- When taught via Foothill Global Access on the Internet, students must have currently existing email accounts and ongoing access to computers with internet capabilities.

Method(s) of Evaluation

- Tests and quizzes
- Written laboratory assignments
- Final examination

Method(s) of Instruction

- Lectures which include motivation for the architecture of the specific topics being discussed
- In-person or online labs (for all sections, including those meeting face-to-face/on-campus), consisting of:
 - An assignment webpage located on a college-hosted course management system or other department-approved internet environment.

Here, the students will review the specification of each assignment and submit their completed lab work

2. A discussion webpage located on a college-hosted course management system or other department-approved internet environment.

Here, students can request assistance from the instructor and interact publicly with other class members

Detailed review of laboratory assignments which includes model solutions and specific comments on the student submissions

In person or online discussion which engages students and instructor in an ongoing dialog pertaining to all aspects of designing, implementing and analyzing programs

When course is taught fully online:

1. Instructor-authored lecture materials, handouts, syllabus, assignments, tests, and other relevant course material will be delivered through a college-hosted course management system or other department-approved internet environment

2. Additional instructional guidelines for this course are listed in the attached addendum of CS department online practices

Representative Text(s) and Other Materials

Odom, Wendall. CCNA 200-301 Official Cert Guide, Volume 1. 2019.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Reading

1. Textbook assigned reading averaging 30 pages per week.
2. Online curriculum averaging 20 pages per week.
3. Online resources as directed by instructor though links pertinent to networking.
4. Library and reference material directed by instructor through course handouts.

B. Writing

1. Technical prose documentation that supports and describes the laboratory exercises that are submitted for grades.

Discipline(s)

Computer Science