

# CNIT R121: CISCO CCNA COMPUTER NETWORKING II

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**Originator**

alynch

**College**

Oxnard College

**Discipline (CB01A)**

CNIT - Computer Networking/IT

**Course Number (CB01B)**

R121

**Course Title (CB02)**

Cisco CCNA Computer Networking II

**Banner/Short Title**

Cisco CCNA Networking II

**Credit Type**

Credit

**Start Term**

Fall 2021

**Formerly**

ENGT R121

**Catalog Course Description**

This course is taken after students have acquired foundation-level computer networking knowledge from CNIT R120 (Cisco CCNA Networking I). The following topics are covered in this course: Static routing, dynamic routing protocols (RIPv2/EIGRP/OSPF), network address translation (NAT) and port address translation (PAT), Virtual Local Area Networks (VLANs), Access-Control Lists (ACLs), and DHCP. These topics are covered from the perspective of supporting networks using IPv4 or IPv6 addressing. Computer network security is emphasized in this course including port security, authentication, encryption, and analyzing protocol traffic. The curriculum is provided by the Cisco Networking Academy at no additional charge to students.

**Taxonomy of Programs (TOP) Code (CB03)**

0708.10 - \*Computer Networking

**Course Credit Status (CB04)**

D (Credit - Degree Applicable)

**Course Transfer Status (CB05) (select one only)**

B (Transferable to CSU only)

**Course Basic Skills Status (CB08)**

N - The Course is Not a Basic Skills Course

**SAM Priority Code (CB09)**

C - Clearly Occupational

**Course Cooperative Work Experience Education Status (CB10)**

N - Is Not Part of a Cooperative Work Experience Education Program

**Course Classification Status (CB11)**

Y - Credit Course

**Educational Assistance Class Instruction (Approved Special Class) (CB13)**

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

May be required

**Grading method**

Letter Graded

**Alternate grading methods**

Credit by exam, license, etc.

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

52.5

**Maximum Contact/In-Class Lecture Hours**

52.5

**Activity**

**Laboratory**

**Minimum Contact/In-Class Laboratory Hours**

52.5

**Maximum Contact/In-Class Laboratory Hours**

52.5

**Total in-Class**

**Total in-Class**

**Total Minimum Contact/In-Class Hours**

105

**Total Maximum Contact/In-Class Hours**

105

**Outside-of-Class****Internship/Cooperative Work Experience**

Paid

Unpaid

**Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

105

**Maximum Outside-of-Class Hours**

105

**Total Student Learning****Total Student Learning****Total Minimum Student Learning Hours**

210

**Total Maximum Student Learning Hours**

210

**Minimum Units (CB07)**

4

**Maximum Units (CB06)**

4

**Prerequisites**

CNIT R120

**Entrance Skills****Entrance Skills**

Students require an understanding of computer networking fundamentals including the OSI model, cabling, network devices, Ethernet, IP addressing, TCP/IP protocols, wireless 802.11 standards, troubleshooting methodologies, and the basics of network security.

**Prerequisite Course Objectives**

CNIT R120-Configure a host with an IPv4 or IPv6 address that is appropriate for the network

CNIT R120-Configure a switch or router IOS using the command line interface

CNIT R120-Construct, terminate, and test out an Ethernet cable

CNIT R120-Describe the purpose of an IP address and subnet mask and how they are used on the Internet

CNIT R120-List the 7 layers of the open system interconnection (OSI) model and provide a brief description of each layer of the model

CNIT R120-Describe the purpose and function of TCP/IP protocols

CNIT R120-Troubleshoot common networking problems using a structured model and TCP/IP utilities

**Requisite Justification****Requisite Type**

Prerequisite

**Requisite**

CNIT R120

**Requisite Description**

Course in a sequence

**Level of Scrutiny/Justification**

Content review

**Student Learning Outcomes (CSLOs)****Upon satisfactory completion of the course, students will be able to:**

- |   |   |
|---|---|
| 1 | Demonstrate the ability to properly configure the OSPF link-state routing protocol to create a fully converged routed network.                      |
| 2 | Configure a Cisco router to be a DHCP server that supplies the proper IP address settings for a given network.                                      |
| 3 | Participate in a group research project on an advanced Cisco technology and present your topic to the class using a structured presentation format. |

**Course Objectives****Upon satisfactory completion of the course, students will be able to:**

- |    |   |
|----|---|
| 1  | Identify the various types of traffic flows in an enterprise network  |
| 2  | Configure a switch using the command line interface (CLI)   |
| 3  | Configure a router using the command line interface (CLI)   |
| 4  | Describe how the rapid spanning tree protocol (RSTP) improves the speed of convergence over the original spanning tree protocol (STP)       |
| 5  | Explain the importance of VLANs on an enterprise network  |
| 6  | Plan, configure, and verify VLANs using a switch and router   |
| 7  | Explain the difference between a classful routing protocol and a classless routing protocol   |
| 8  | Plan and implement a variable-length subnet mask (VLSM) IP addressing scheme  |
| 9  | Summarize the key differences between a distance vector routing protocol and a link state routing protocol                                  |
| 10 | Configure a network using the RIPv2 routing protocol  |
| 11 | Design and configure a network using single-area OSPF routing protocol  |
| 12 | Identify the appropriate encapsulation given a WAN type   |
| 13 | Explain how access control lists (ACLs) can filter traffic at router interfaces   |
| 14 | Create and apply standard and extended ACLs to control specific types of traffics   |
| 15 | Work effectively in a team to accomplish the objectives of a lab assignment   |
| 16 | Configure a Cisco router to be a DHCP server that supplies the proper IP address scope of addresses for a particular network or subnetwork. |
| 17 | Configure a Cisco router with network address translation and port address translation.   |
| 18 | Implement port-based security on a Cisco switch to protect against unauthorized network access.   |

**Course Content****Lecture/Course Content**

1. Enterprise Network Traffic Types
  - a. Intranet, Extranet, Internet
  - b. VoIP, Video, Data
  - c. Converged Networks
2. Cisco Command Line Interface (CLI)
  - a. User Mode, Privileged Mode, Global Mode
  - b. Configuration File
  - c. Passwords
  - d. Backup and Password Recovery
3. STP and RSTP
  - a. Bridge and Switch Loops
  - b. Fault Tolerance
  - c. Convergence
  - d. States of Operation

4. Virtual Local Area Networks (VLANs)
  - a. Segmentation
  - b. Broadcast Control
  - c. Frame Tagging
  - d. IEEE 802.1Q
5. Variable Length Subnet Mask (VLSM)
  - a. Classless Routing Protocols
  - b. IP Conservation
  - c. Rules and Best Practices
6. RIP and RIPv2
  - a. Distance Vector Routing Protocol
  - b. Routing Metrics
  - c. Configuration Using CLI
  - d. Troubleshooting Using CLI
7. EIGRP
  - a. Hybrid Routing Protocol
  - b. Routing Metrics
  - c. Configuration Using CLI
  - d. Troubleshooting Using CLI
8. OSPF
  - a. Link State Routing Protocol
  - b. Routing Metrics
  - c. Configuration Using CLI
  - d. Troubleshooting Using CLI
9. WAN Encapsulation
  - a. Point-to-Point Protocol (PPP)
  - b. Frame Relay
  - c. HDLC
  - d. PAP and CHAP
10. Access Control List (ACL)
  - a. Standard ACL
  - b. Extended ACL
  - c. Traffic Shaping
  - d. Security
11. DHCP
  - a. Configuration on a Cisco Router
  - b. DHCP for IPv4
  - c. DHCP for IPv6
  - d. Stateless IPv6
12. Network Address Translation/Port Address Translation
  - a. NAT Configuration Commands
  - b. PAT Configuration Commands
  - c. IPv4 RFC 1918 Private IP Addresses
13. Switchport Security
  - a. Static MAC port security
  - b. Dynamic MAC port security
  - c. Port security logging
  - d. Port security violations and recovery

#### **Laboratory or Activity Content**

1. VLAN Configuration
  - a. 802.1Q Frame Tagging
  - b. Segmentation and Broadcast Control
  - c. Routing Between VLANs
2. Static Routing Configuration
  - a. IPv4 Static Routing
  - b. IPv4 Default Routes and Summary Routes
  - c. IPv6 Static Routing
  - d. IPv6 Default Routes

3. Dynamic Routing Protocol Configuration
  - a. RIPv2
  - b. RIPng
  - c. EIGRP
  - d. OSPFv2
  - e. OSPFv3
4. DHCP Configuration
  - a. DHCP for IPv4
  - b. DHCP for IPv6
5. ACL Configuration
  - a. IPv4 Standard ACLs
  - b. IPv4 Extended ACLs
  - c. IPv6 ACLs
6. Network Address/Port Address Translation Configuration (NAT/PAT)
  - a. Static NAT
  - b. Dynamic NAT
  - c. Overloading (PAT)
7. Security
  - a. Port Security
  - b. DHCP Snooping
  - c. Authentication
  - d. Remote Access and Encryption

## Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

Problem solving exercises  
Skills demonstrations  
Written expression

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

Computational homework  
Essays  
Individual projects  
Laboratory activities  
Laboratory reports  
Objective exams  
Oral presentations  
Projects  
Problem-Solving Assignments  
Problem-solving exams  
Quizzes  
Reports/papers  
Skills demonstrations  
Skill tests

## Instructional Methodology

**Specify the methods of instruction that may be employed in this course**

Audio-visual presentations  
Collaborative group work  
Class activities  
Class discussions  
Distance Education  
Demonstrations  
Group discussions  
Guest speakers  
Instructor-guided use of technology  
Internet research  
Laboratory activities  
Lecture  
Small group activities

**Describe specific examples of the methods the instructor will use:**

1. Instructor will use publisher-provided PowerPoints to lecture on chapter Cisco CCNA course topics.
2. The instructor will introduce labs and demonstrate lab solutions where appropriate.
3. The instructor may summarize current IT events or trends in the IT industry and ask students questions regarding the information that was shared.
4. Small group research and presentation of current cybersecurity threats and best practices to defend against specific threats.
5. The instructor will illustrate some of the more challenging multiple-choice questions and performance-based questions that students may experience on the CCNA certification.

**Representative Course Assignments****Writing Assignments**

1. Students are required to answer reflection questions at the end of their lab activities to demonstrate that they grasp the material in the lab and to see if they can relate the knowledge to a new networking scenario.
2. Students are required to respond to questions posed at the current Oxnard College LMS portal. An example would be for a student to respond to a question explaining why an extended access list would be better than a standard access list in a given scenario.

**Critical Thinking Assignments**

1. Evaluation of a cybersecurity vulnerability and specific written recommendations to mitigate the risk.
2. Students will evaluate the technology needs of a fictitious company and determine a solution that best meets the needs of the customer. For example, a company is using an older routing protocol and is experiencing issues related to convergence and reachability. The student must make a recommendation on which routing protocol should be selected to satisfy the requirements of the customer and justify the decision in a written document.

**Reading Assignments**

1. Students are required to read and study the information in the assigned chapter of the curriculum in between classes in order to be prepared for the lecture and classroom lab activities. A typical reading activity would be for the students to read the chapter on switching so that they are prepared to implement port security on a Cisco switch.
2. Students are required to perform reading from assigned support websites such as [www.cisco.com](http://www.cisco.com), [www.arin.net](http://www.arin.net), [www.ietf.org](http://www.ietf.org), and [www.sans.org](http://www.sans.org).

**Skills Demonstrations**

1. Students will properly cable and configure a LAN, harden the network devices with the proper configuration, and implement an IP addressing scheme using DHCP.
2. Students will implement a simulated WAN link and implement the proper encapsulation and IP addressing scheme. Next, students will test for connectivity across the WAN link and troubleshoot any issues that may arise.

**Other assignments (if applicable)**

1. Students are required to complete hands-on activities using a network simulation program called Packet Tracer outside of class hours. An example of an activity using Packet Tracer would be to configure a router with the appropriate encapsulation type and then verify that the router is forwarding traffic normally.
2. In order to prepare for the Cisco CCNA Certification, students will be required to answer certification preparation questions using their [cisco.netacad.net](http://cisco.netacad.net) account.

**Outside Assignments****Representative Outside Assignments**

1. Read the assigned cloud based Cisco CCNA curriculum.
2. Complete labs that are embedded in the CCNA curriculum using the network simulation program called Cisco Packet Tracer.
3. Visit network security related websites such as [www.sans.org](http://www.sans.org) to learn about the latest cybersecurity threats and how to mitigate against these threats.

**Articulation****C-ID Descriptor Number**

ITIS 151

**Status**

Aligned

**Comparable Courses within the VCCCD**

CNSE M19 - Cisco System Computer Networking B

**Equivalent Courses at other CCCs**

College	Course ID	Course Title	Units
Santa Barbara City College	CNEE 126	CCNA II Advanced Routing and Switching	5

**District General Education****A. Natural Sciences****B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****E. Health and Physical Education/Kinesiology****F. Ethnic Studies/Gender Studies****CSU GE-Breadth****Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****Area C: Arts and Humanities****Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****IGETC****Area 1: English Communication****Area 2A: Mathematical Concepts & Quantitative Reasoning****Area 3: Arts and Humanities****Area 4: Social and Behavioral Sciences****Area 5: Physical and Biological Sciences****Area 6: Languages Other than English (LOTE)****Textbooks and Lab Manuals****Resource Type**

Textbook

**Description**

Switching, Routing, and Wireless Essentials version 7, Cisco Press, 2020

**Resource Type**

Other Instructional Materials



**Description**

Packet Tracer network simulation program, developed by the Cisco Networking Academy

**Resource Type**

Other Instructional Materials

**Description**

Wireshark protocol analyzer software.

**Resource Type**

Other Instructional Materials

**Description**

Manufacturer websites such as [www.cisco.com](http://www.cisco.com), [www.sans.org](http://www.sans.org), and [www.wireshark.org](http://www.wireshark.org).

**Distance Education Addendum**

**Definitions**

**Distance Education Modalities**

Hybrid (51%–99% online)

Hybrid (1%–50% online)

100% online

**Faculty Certifications**

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

**Regular Effective/Substantive Contact**

**Hybrid (1%–50% online) Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Topics will be presented for discussion with the opportunity to provide commentary and feedback on fellow student responses.
E-mail	Email will be used for individual interaction between professor and student, to send group email reminders of deadlines, to inform of upcoming course content.
Face to Face (by student request; cannot be required)	Face to face with students will take place at student request to discuss specific questions, issues, or concerns.
Video Conferencing	Zoom or comparable video conferencing software to lecture on course content, demonstrate lab assignments, answer student questions in real time, and provide student assistance on anything that is course related.
Other DE (e.g., recorded lectures)	Any real-time instruction will be recorded and available to students through the LMS.

**Hybrid (51%–99% online) Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Topics will be presented for discussion with the opportunity to provide commentary and feedback on fellow student responses.
E-mail	Email will be used for individual interaction between professor and student, to send group email reminders of deadlines, to inform of upcoming course content.
Face to Face (by student request; cannot be required)	Face to face with students will take place at student request to discuss specific questions, issues, or concerns.
Video Conferencing	Zoom or comparable video conferencing software to lecture on course content, demonstrate lab assignments, answer student questions in real time, and provide student assistance on anything that is course related.
Other DE (e.g., recorded lectures)	Any real-time instruction will be recorded and available to students through the LMS.

**100% online Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Topics will be presented for discussion with the opportunity to provide commentary and feedback on fellow student responses.
E-mail	Email will be used for individual interaction between professor and student, to send group email reminders of deadlines, to inform of upcoming course content.
Video Conferencing	Zoom or comparable video conferencing software will be utilized to lecture on course content, demonstrate lab assignments, answer student questions in real time, and provide student assistance on anything that is course related.
Other DE (e.g., recorded lectures)	Any real-time instruction will be recorded and available to students through the LMS.

**Examinations****Hybrid (1%–50% online) Modality**

Online  
On campus

**Hybrid (51%–99% online) Modality**

Online  
On campus

**Primary Minimum Qualification**

COMPUTER INFORMATION SYS

**Additional local certifications required**

Cisco CCNA certification. This course prepares students for the Cisco CCNA industry certification so the instructor needs to hold this certification to be qualified to teach the course.

**Review and Approval Dates****Department Chair**

08/21/2020

**Dean**

08/21/2020

**Technical Review**

08/26/2020

**Curriculum Committee**

08/26/2020

**Curriculum Committee**

11/25/2020

**CCCCO**

MM/DD/YYYY

**Control Number**

CCC000543432

**DOE/accreditation approval date**

MM/DD/YYYY