

CNIT R127: WIRELESS NETWORKING FUNDAMENTALS

Originator

alynch

College

Oxnard College

Discipline (CB01A)

CNIT - Computer Networking/IT

Course Number (CB01B)

R127

Course Title (CB02)

Wireless Networking Fundamentals

Banner/Short Title

Wireless Networking

Credit Type

Credit

Start Term

Fall 2021

Formerly

ENGT R127

Catalog Course Description

This course covers the fundamentals of wireless networking technology. At the completion of this course, students will have the ability to design, implement, administer, secure, and troubleshoot a wireless local area network (WLAN). This course is also helping to prepare students for a vendor-neutral wireless certification exam from the Certified Wireless Network Professionals (CWNP) organization.

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

Is this course part of a family?

No

Units and Hours

Carnegie Unit Override

No

In-Class

Lecture

Minimum Contact/In-Class Lecture Hours

43.75

Maximum Contact/In-Class Lecture Hours

43.75

Activity

Laboratory

Minimum Contact/In-Class Laboratory Hours

26.25

Maximum Contact/In-Class Laboratory Hours

26.25

Total in-Class

Total in-Class

Total Minimum Contact/In-Class Hours

70

Total Maximum Contact/In-Class Hours

70

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Minimum Outside-of-Class Hours

87.5

Maximum Outside-of-Class Hours

87.5

Total Student Learning

Total Student Learning

Total Minimum Student Learning Hours

157.5

Total Maximum Student Learning Hours

157.5

Minimum Units (CB07)

3

Maximum Units (CB06)

3

Student Learning Outcomes (CSLOs)

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

- | | |
|---|---|
| 1 | Demonstrate proficiency using a wireless LAN network configuration utility to create a profile and connect to a specific SSID and a specific encryption type. |
| 2 | Use a wireless scanning program to discover and list broadcast and non-broadcast SSIDs in a given area, identify the channels in use, determine signal strengths, and the encryption type for each SSID that is discovered. |
| 3 | Demonstrate the ability to create a layered wireless security defense including strong encryption, MAC filter, complex admin password, and a non-broadcast SSID. |

Course Objectives

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

- | | |
|---|--|
| 1 | Define the various standards for wireless networking |
| 2 | Configure wireless clients and access points to create a WLAN |
| 3 | Identify and install various types of antennas on wireless access points |
| 4 | Configure wireless security features on wireless devices |
| 5 | Perform a site survey |
| 6 | Apply the basic components of RF mathematics and measurement |

- 7 Identify factors impacting wireless LAN (WLAN) performance
- 8 Describe wireless access point features and capabilities

Course Content

Lecture/Course Content

1. Wireless technology
 - a. Analog and digital signals
 - b. Frequency, wavelength, and power
 - c. Modulation techniques
 - d. Radio wave propagation
2. RF Mathematics
 - a. Watt and milliwatt
 - b. Decibel (dB)
 - c. dBm, dBi, dBd
 - d. RSSI
3. Wireless standards
 - a. IEEE 802.11b
 - b. IEEE 802.11a
 - c. IEEE 802.11g
 - d. IEEE 802.11n
 - e. IEEE 802.11ac
 - f. IEEE 802.11ax
4. Wireless clients
 - a. Desktops, laptops, tablets, smartphones, and IoT devices
 - b. Wireless configuration utilities
 - c. Wireless configuration profiles
 - d. Infrastructure mode vs ad hoc mode
5. Access Points
 - a. SOHO vs Enterprise
 - b. Basic Service Set (BSS)
 - c. Independent Basic Service Set (IBSS)
 - d. Autonomous access points
 - e. Controller-based access points
 - f. Beacons
6. Antennas
 - a. Omni-directional
 - b. Dipole
 - c. Semi-directional
 - d. Highly-directional
 - e. Pole/mast mount
 - f. Ceiling mount
 - g. Wall mount
 - h. Outdoor/indoor mounting considerations
7. Antenna Accessories
 - a. RF cables, connectors, and signal splitters
 - b. Amplifiers and attenuators
 - c. Lightning arrestors and grounding rods/wires
 - d. Mounting systems
8. Wireless security
 - a. Wireless threats and vulnerabilities
 - b. WEP, WPA, WPA2, and 802.11i
 - c. MAC Filtering
 - d. RADIUS and 802.1x
 - e. Wireless scanning and protocol analyzing
9. Site survey

- a. Path considerations
 - b. Coverage and antenna placement
 - c. Roaming
 - d. Interference issues
 - e. Channel selection
 - f. Site drawing, walkthrough, and site survey report
10. Access point features and capabilities
- a. PHY support
 - b. Single-band vs. dual-band
 - c. Output power control
 - d. Operational modes
 - e. Multiple-SSID support
 - f. Guest access
 - g. Management interfaces
 - h. PoE support
 - i. Autonomous
 - j. Controller

Laboratory or Activity Content

1. Configure Wireless Access Point
 - a. Configure IEEE 802.11 a, b, g, n, ac, and ax
 - b. Configure SSID
 - c. Configure channel
 - d. Configure appropriate power levels
2. Configure Wireless Client
 - a. Configure IEEE 802.11 a, b, g, n, ac, and ax
 - b. Configure SSID
 - c. Configure wireless profile with various client utilities
3. Implement Wireless Security
 - a. Configure wireless encryption including WEP, WPA, WPAII
 - b. Configure MAC filter
 - c. Configure a RADIUS authentication server
 - d. Implement WPA2 PSK
 - e. Implement WPA2 enterprise mode
4. Antennas
 - a. Implement and test a dipole antenna
 - b. Implement and test a patch antenna
 - c. Implement and test a yagi antenna
 - d. Test signal strengths
 - e. Test horizontal and vertical plane propagation
5. Perform a Site Survey
 - a. Utilize a site survey tool kit
 - b. Evaluate sources of wireless interference
 - c. Determine optimal placement of AP
 - d. Determine proper channel selection and power levels
 - e. Produce a site survey report
 - f. Utilize a wireless protocol analyzer to examine wireless packets

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

Group projects
Individual projects
Laboratory activities
Laboratory reports
Objective exams
Oral presentations
Projects
Problem-Solving Assignments
Quizzes
Reports/papers
Research papers
Skills demonstrations
Skill tests

Instructional Methodology

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

Audio-visual presentations
Computer-aided presentations
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 wireless networking topics that map to the wireless networking certification housed by the Certified Wireless Networking Professionals (CWNP) organization.
2. The instructor will introduce wireless networking labs and demonstrate lab solutions where appropriate.
3. The instructor may summarize current wireless networking events or trends in the industry and ask students questions regarding the information that was shared.
4. Small group research and presentation of current cybersecurity threats against 802.11 wireless networks 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 wireless networking certification as specified by the CWNP organization.

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 demonstrate basic writing skills.
2. Students will be provided with wireless networking scenarios from fictitious companies and then write an essay describing how they would satisfy the requirements of the company.

Critical Thinking Assignments

1. Evaluation of a security vulnerability to an 802.11 wireless client or AP and specific written recommendations to mitigate the risk.
2. Students will evaluate the wireless technology needs of a fictitious company and determine a solution that best meets the needs of the customer. For example, a company is dealing with a lot of interference issues on the 2.4GHz frequency using the 802.11n protocol and the students needs to perform research and write a recommendation on how the company can not only address the interference issue but also improve bandwidth.

Reading Assignments

1. Students are required to read the information in the assigned chapter of the curriculum in between classes in order to be prepared for the lecture and lab activities. A typical reading activity would be for the students to read the chapter on wireless security and then in class configure the wireless clients and access point with IEEE 802.11i encryption (WPA II).
2. Students will be required to perform reading from assigned support websites such as www.cwnp.com, <https://www.ieee802.org/11/>, and <https://www.wi-fi.org/>.

Skills Demonstrations

1. Students will setup a WLAN with the network devices and configuration settings as specified in the lab.
2. Students will perform a wireless site survey to determine interference issues, optimal placement of AP(s), security settings, frequency, and channel.

Other assignments (if applicable)

In order to prepare for CWNP certification, students will be required to answer certification preparation questions and take simulated certification exams.

Outside Assignments**Representative Outside Assignments**

1. Read the assigned chapter material from the certified wireless networking professional (CWNP) curriculum.
2. Complete specified wireless labs using a network simulation program.

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

Tom Carpenter and Fehmi Sakkal (2017), *CWT-100: Certified Wireless Network Technician: Official Study Guide*, Published by Sybex, ISBN: 9781717721402

Resource Type

Other Instructional Materials

Description

1. Cisco Packet Tracer network simulation program

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)	Part of the course requires face to face time. Also, face to face with individuals will take place 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)	Part of the course requires face to face time. Also, face to face with individuals will take place to discuss specific questions, issues or concerns.
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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
Certified Wireless Network Administrator (CWNA) from the CWNP organization.

Review and Approval Dates	
Department Chair	08/28/2020
Dean	08/30/2020
Technical Review	09/09/2020
Curriculum Committee	09/09/2020
Curriculum Committee	11/25/2020

CCCCO

MM/DD/YYYY

Control Number

CCC000543433

DOE/accreditation approval date

MM/DD/YYYY