

# Computer Network Engineering

## Degrees, Certificates and Awards

Associate in Science: Computer Network Engineering

Certificate of Achievement: Computer Network Engineering

Skills Competency Award: Cisco Networking Associate

Skills Competency Award: Cisco Networking Professional

Skills Competency Award: Computer Networking Technology

## Program Description

The field of computer-related technologies continues to evolve at an astounding pace. Fortunately, the Department of Computer Network Engineering provides direct access to the wide variety of exciting careers in this field. The department not only offers programs which meet the general needs of the industry, but also provides several unique specialty programs. Most programs may be completed for a highly specific technical Certificate, or taken along with General Education courses for the broader A.S. Degree.

The Computer Network Engineering Program prepares students to work in the area of network support, a field which currently commands excellent salaries. Students are given extensive training for many of the major industry certification exams: A+, Microsoft and Cisco. Graduates are currently working as LAN/WAN specialists, network administrators, Internet/intranet administrators and network designers, and network engineers.

In addition to the Degree program, the department offers Skills Competency Awards for the CCNA and CCNP certifications.

Graduates from the Computer Network Engineering Department benefit greatly from the excellent reputation Santa Barbara City College has earned. In contrast to those with only highly specific training, the broad education received by our students makes them preferred job candidates with many local employers.

## Program Student Learning Outcomes

1. Apply basic computer hardware and software concepts to install, trouble-shoot and manage home and small business computer network systems.
2. Using appropriate IP addressing scheme and appropriate networking hardware and software, design, trouble-shoot and maintain a computer network infrastructure for small to medium size organizations.
3. Identify computer network security threats and vulnerabilities for a given network, choose appropriate network security hardware and software for a given security requirement, and apply necessary security measures to prevent a possible computer network compromise.
4. Given a computer network engineering problem, apply critical thinking, problem-solving techniques and effective communications skills to find solutions to the problem.

## Department Offices

*Division:* Technologies

*Department Chair:* Angel Cardenas (A-183, ext. 3063)

*Dean:* Betty Pazich (A-218, ext. 3044)

## Faculty and Offices

Angel Cardenas, *Chair* (A-183, ext. 3063)

Mohammad El-Soussi (A-179, ext. 2512)

Behzad Masooman, *Lab Teaching Assistant* (A-182A, ext. 2753)

## Requirements for A.S. Degree: Computer Network Engineering

### Department Requirements (39 units)

CIS 206 — MS Windows Server System Admin .....	4
CNEE 101 — Introduction to Computer Network Technology .....	3
CNEE 102 — PC Repair I: Hardware .....	3
CNEE 106 — Telecommunications and WAN .....	3
CNEE 110 — Networking Essentials .....	3
CNEE 112 — PC Repair II: Software .....	3
CNEE 120 — Fundamentals of Network Security .....	3

CNEE 125* — CCNA I: Introduction to Networking and Routers .....	5
CNEE 126+ — CCNA II: Switching and WAN .....	5
CNEE 146 — Firewalls and VPNs.....	4
CNEE 206 — MS Windows Network Infrastructure.....	3

*\*Students who completed CNEE 131 and CNEE 132 are exempt from taking CNEE 125.  
+Students who completed CNEE 133 and CNEE 134 are exempt from taking CNEE 126.*

**Recommended Course Sequence**

*First Semester*

CNEE 101 — Introduction to Computer Network Technology .....	3
CNEE 102 — PC Repair I: Hardware.....	3
CNEE 106 — Telecommunications and WAN .....	3

*Second Semester*

CNEE 110 — Networking Essentials.....	3
CNEE 112 — PC Repair II: Software .....	3
CNEE 125* — CCNA I: Introduction to Networking and Routers.....	5

*Third Semester*

CNEE 120 — Fundamentals of Network Security.....	3
CNEE 126+ — CCNA II: Switching and WAN .....	5

*Fourth Semester*

CNEE 146 — Firewalls and VPNs.....	4
CNEE 206 — MS Windows Network Infrastructure.....	3
CIS 206 — MS Windows Server System Admin .....	4

**College Requirements**

For complete information, see “Graduation Requirements” in the *Catalog* Index.

**Requirements for Certificate of Achievement: Computer Network Engineering**

**Department Requirements (39 units)**

CIS 206 — MS Windows System Administration .....	4
CNEE 101 — Introduction to Computer Network Technology .....	3

CNEE 102 — PC Repair I: Hardware.....	3
CNEE 106 — Telecommunications and WAN .....	3
CNEE 110 — Networking Essentials.....	3
CNEE 112 — PC Repair II: Software .....	3
CNEE 120 — Fundamentals of Network Security.....	3
CNEE 125* — CCNA I: Introduction to Networking and Routers.....	5
CNEE 126+ — CCNA II: Switching and WAN .....	5
CNEE 146 — Firewalls and VPNs.....	4
CNEE 206 — MS Windows Network Infrastructure.....	3

*\*Students who completed CNEE 131 and CNEE 132 are exempt from taking CNEE 125.  
+Students who completed CNEE 133 and CNEE 134 are exempt from taking CNEE 126.*

**Skills Competency Award: Cisco Networking Associate**

**Department Requirements (8 units)**

CNEE 125* — CCNA I: Introduction to Networking and Routers.....	5
CNEE 126+ — CCNA II: Switching and WAN .....	5

*Students must complete the above courses with a grade of “C” or higher or credit in all courses.*

**Skills Competency Award: Cisco Networking Professional**

**Department Requirements (16 units)**

CNEE 135 — CCNP 1: Advanced Routing.....	4
CNEE 136 — CCNP 2: Remote Access Networks.....	4
CNEE 137 — CCNP 3: Multi-Layer Switching.....	4
CNEE 138 — CCNP 4: Network Trouble-shooting.....	4

*Students must complete the above courses with a grade of “C” or higher or credit in all courses.*

## Skills Competency Award: Computer Networking Technology

### Department Requirements (10 units)

CNEE 106 — Telecommunications and WAN .....	3
CNEE 110 — Networking Essentials.....	3
CNEE 124 — Internetworking with TCP/IP .....	4

*Students must complete the above courses with a grade of "C" or higher or credit in all courses.*

## Course Descriptions

### CNEE 101 — Introduction to Computer Network Technology

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

Technical introduction to data communications and networks. It provides a thorough understanding of basic network components, and how they're implemented in a system. Topics include data communications hardware and software, transmission methodologies and rates, standards, protocols, terminology and concepts.

### CNEE 102 — PC Repair I: Hardware

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

Fundamentals of supporting and trouble-shooting computer hardware: motherboards, hard drives, I/O devices, memory, printers and multimedia devices. Includes hands-on lab activities.

### CNEE 105 — Network Wiring and Cabling

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

Introduction to networking: the physical layer; termination, testing, trouble-shooting and installation of network wiring and cabling. Participants receive a Certificate in Network Wiring and Cabling.

### CNEE 106 — Telecommunications and WAN

**(3) F, S — CSU**

*Skills Advisories: eligibility for ENG 100 and ENG 103*

Introduction to voice, data and video communications. Overview of the telecommunications industry, customer premises equipment, switched and private networks, transmission media, fiber optics, T-1 technology, channel banks, switching and signaling; advanced telecommunications services, local area networks, wide area networks, Internet, ISDN, personal computing systems and telecommunications protocols.

### CNEE 107 — Introduction to AV Technology

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H or ENG 110GB*

Introduction to rental, design and installation of audio-visual technology and audio-visual systems integration. Covers fundamentals used on a daily basis in the audio-visual industry.

### CNEE 110 — Networking Essentials

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 102*

Introduction to networking components and systems. Networking standards, protocols, operating systems, media and hardware. Includes hands-on lab activities.

### CNEE 112 — PC Repair II: Software

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 102*

Fundamentals of supporting and trouble-shooting computer operating systems. Installation, configuration and maintenance of different Windows OS. Includes hands-on lab activities.

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**CNEE 120 — Fundamentals of Network Security**

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 110*

Fundamentals of network security principles and implementation. Covers authentication, attacks and malicious code, threats and countermeasures, security topologies, intrusion detection, cryptography, firewalls and physical security concepts.

**CNEE 124 — Internetworking with TCP/IP**

**(4) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 110*

Introduction to developing or migrating to TCP/IP protocol. Hands-on approach to configuring a host, employing TCP/IP tools, and using application services to access TCP/IP-based internetworks.

**CNEE 125 — CCNA I: Introduction to Networking and Routers**

**(5) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 110*

First half of CCNA certification preparation. Networking concepts, TCP/IP, routing, Cisco IOS and Cisco router configuration.

**CNEE 126 — CCNA II: Switching and WAN**

**(5) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 125*

Second half of CCNA certification preparation. Switching, VLANs, ACL, WAN services, PPP, frame relay and wireless LANs.

**CNEE 128 — Fundamentals of Wireless LANs**  
**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for English 110 or ENG 110H*

*Course Advisories: CNEE 125*

Introduction to wireless LANs. A comprehensive overview of technologies, security and best design practices, with emphasis on hands-on skills.

**CNEE 135 — CCNP 1: Advanced Routing**

**(4) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CCNA certification*

Advanced Cisco routing configurations: OSPF, EIGRP, IS-IS, BGP and extended IP addressing. Designed to provide classroom and laboratory experience in current and emerging technologies leading to CCNP certification exam.

**CNEE 136 — CCNP 2: Remote-Access Networks**

**(4) — CSU**

*Course Advisories: CNEE 135*

WAN protocols, remote-access, network management and security, NAT and VPN. Second semester for Cisco Certified Network Professional.

**CNEE 137 — CCNP 3: Multi-Layer Switching**

**(4) — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 136*

Layers 2 and 3 switching. VLANs and routing. Third semester for Cisco Certified Network Professional. Provides classroom and laboratory experience in current and emerging technologies leading to Cisco certification.

**CNEE 138 — CCNP 4: Network Trouble-shooting**  
**(4) — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 137*

Cisco routers and switches trouble-shooting. Fourth semester for Cisco Certified Network Professional. Provides classroom and laboratory experience in trouble-shooting leading to CCNP.

**CNEE 144 — Fundamentals of Voice over IP  
(3) — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 126*

Introduction to converged data and voice networks, as well as the challenges faced by its various technologies. Course covers technologies common to many IP telephony implementations.

**CNEE 145 — Cisco IOS Network Security  
(3) — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 125*

Installation, configuration and operation of IP network security on perimeter routers: AAA security, access control, intrusion detection, network address translation and virtual private networks.

**CNEE 146 — Firewalls and VPNs  
(4) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 125*

Installation, configuration and operation of network security on PIX firewalls: AAA security, access control, intrusion detection, network address translation, virtual private networks and content filtering.

**CNEE 147 — Ethical Hacking – Penetration  
Testing**

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 120 and CNEE 126*

Introduction to hacking techniques and tools used for defensive purposes only. Network scanning, operating system and web vulnerabilities, router, firewall and wireless networks testing. Includes hands-on lab activities.

**CNEE 150 — Concepts of Electronics  
(4) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 100 and ENG 103*

Introduction to basic electrical principles for non-majors or those with no previous experience in electronics. Study of electricity, simple series and parallel circuits, magnetism, inductance, capacitance and active devices. Laboratory experience with basic electronic equipment.

**CNEE 175 — Cisco Network Associate Review  
(1.5) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 101 or CNEE 110 and CNEE 124*

Intensive course designed as a review of Cisco Network Associate principles.

**CNEE 181 — Introduction to IP Addressing  
and VLSM**

**(2) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

Advanced IP topics: Class-full IP addressing and subnetting; variable-length subnet mask; Classless Inter-Domain Routing; route summarization; Private IP Addressing; and NAT.

**CNEE 182 — Introduction to OSPF Routing  
(2) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

Introduction to OSPF Routing in LANs and WANs. Implementation in single and multiple area networks. Designed to provide classroom and laboratory experience in OSPF Routing.

**CNEE 183 — Introduction to BGP  
(2) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or 110H*

BGP routing configuration and implementation for single-homed and multi-homed connection to an ISP. Configuration of BGP policies.

**CNEE 184 — Introduction to ISDN and Frame Relay**

**(2) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 126 or CCNA certification*

Introduction to PPP, ISDN and frame relay architectures. ISDN BRI and PRI configuration. Dial-on-Demand routing and Back-Link configuration. Frame relay configuration and traffic shaping.

**CNEE 191 — Internetworking Design I**

**(3) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 126*

Fundamentals of network design for routed and switched networks, involving LAN, WAN and dial access services for businesses and organizations. Leads to Cisco Network Design certification.

**CNEE 192 — Internetworking Design II**

**(3) F, S — CSU**

*Skills Advisories: MATH 100 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 137*

Top-down design process and systematic methods for designing internetworks. Design of LAN and WAN networks. Leads to Cisco Network Design certification.

**CNEE 206 — MS Windows Network Infrastructure**

**(3) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 110 and CIS 206*

Introduction to MS Windows network infrastructure. Installation, configuration, management and support of DHCP, DNS, WEB, security and Internet services. Includes hands-on lab activities.

**CNEE 207 — MS Windows Security**

**(4) F, S — CSU**

*Skills Advisories: MATH 4 and eligibility for ENG 110 or ENG 110H*

*Course Advisories: CNEE 110 and CIS 206*

Provides knowledge to design and implement an effective security strategy in a network environment, using the Windows operating system. Prepares student for certification exam on Windows security.

**CNEE 219/AUTO 219 — Advanced Automotive Electronics**

**(4) F, S — CSU**

*Skills Advisories: Eligibility for ENG 100 and ENG 103*

Provides basic theory and practice of automotive electronic system operation and trouble-shooting. Covers the basic building blocks of circuits and digital systems. Focuses on batteries, starters, voltage regulators, lighting systems, ignition systems, alternators and computer systems.

**CNEE 295 — Internship in Computer Network Engineering and Electronics**

**(2-4) F, S — CSU**

*Skills Advisories: Eligibility for ENG 110 or ENG 110H*  
*Limitation on Enrollment: Completion of two courses in CNEE prior to enrollment in an internship course.*

Structured internship program in which students gain experience with community organizations related to the discipline.