I. CATALOG INFORMATION
   A. Discipline: COMPUTER NETWORKING SYSTEMS ENGINEERING (CNSE)
   B. Subject Code and Number: CNSE M19
   C. Course Title: Cisco System Computer Networking 3 and 4
   D. Credit Course units:
      Units: 4
      Lecture Hours per week: 3
      Lab Hours per week: 3
      Variable Units: No
   E. Student Learning Hours:
      Lecture Hours:
         Classroom hours: 52.5 - 52.5
      Laboratory/Activity Hours:
         Laboratory/Activity Hours 52.5 - 52.5
      Total Combined Hours in a 17.5 week term: 105 - 105
   F. Non-Credit Course hours per week
   G. May be taken a total of: X 1 2 3 4 time(s) for credit
   H. Is the course co-designated (same as) another course: No X Yes
      If YES, designate course Subject Code & Number: ________
   I. Course Description:
      Provides intermediate-level instruction on routing and LAN (local area network)
      switching, VLANs (virtual local area networks), routing protocols, access control
      lists (ACLs), and network management. Covers WANs (wide area networks),
      WANs design, point-to-point protocol (PPP), frame relay, virtual private
      networking and network management.
   J. Entrance Skills
      *Prerequisite: No X Yes Course(s)
         CNSE M18 and equivalent (Cisco 1 & 2 through Cisco Academy).
      *Corequisite: No X Yes Course(s)
      Limitation on Enrollment: No X Yes
      Recommended Preparation: No X Yes Course(s)
      Other: No X Yes
K. Other Catalog Information:

Second semester course in a series to provide Cisco System Network Associate (CCNA) certificate training and covers the second half of CCNA preparation.

II. COURSE OBJECTIVES

Upon successful completion of the course, a student will be able to:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Methods of evaluation will be consistent with, but not limited by, the following types or examples.</th>
</tr>
</thead>
</table>
| 1 | describe how the Open Systems Interconnection mode (OSI) reference model can be used as a hierarchical structure to design network in layers. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 2 | describe the advantages and disadvantages of using bridges, switches, and routers for LAN segmentation and the effects of switching, bridging, and routing on network throughput. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 3 | compare traditional shared LAN configurations with switched LAN configurations, and discuss the benefits of using a switched virtual local area network (VLAN) architecture. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 4 | describe the LAN design process; and identify network design issues, and network design methodology. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 5 | demonstrate how to use routers to connect two or more networks and how they are used to pass data packets between networks based on network protocol information. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 6 | use standard and extended ACLs (Access Control Lists) as a means to control network traffic and demonstrate how ACLs are | Quizzes  
Midterms  
Final exam |
<table>
<thead>
<tr>
<th></th>
<th>7</th>
<th>describe Internet Protocol Versions 4 and 6 and their operation and configuration.</th>
<th>Classroom project work demonstrating competency in this area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>identify and describe major areas in network management.</td>
<td>Quizzes, Midterms, Final exam, Classroom project work demonstrating competency in this area</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>describe the advantages of LAN switching and VLANS along with how they should be implemented.</td>
<td>Quizzes, Midterms, Final exam, Classroom project work demonstrating competency in this area</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>implement a method to control data packet flow across the network for security reasons based on ACLs on the routers.</td>
<td>Quizzes, Midterms, Final exam, Classroom project work demonstrating competency in this area</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>identify the design and addressing requirements for Internet Protocol Versions 4 and 6.</td>
<td>Quizzes, Midterms, Final exam, Classroom project work demonstrating competency in this area</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>describe the basics of a Wide Area Network (WAN), including common WAN technologies, types of wide-area services, encapsulation formats, and link options.</td>
<td>Quizzes, Midterms, Final exam, Classroom project work demonstrating competency in this area</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>describe WAN design processes.</td>
<td>Quizzes, Midterms, Final exam</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
<td>Learning</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 14 | define the basic components, processes, and operations of Point-to-Point Protocol communication. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 15 | describe Frame Relay services, standards, components, and operation. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 16 | demonstrate how to manage a network using techniques such as documenting, monitoring, and troubleshooting. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 17 | describe the basic implementation of wireless routers to support mobile computing and their respective security considerations. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 18 | complete successfully a skills-based assessment (SBA) final exam hosted at Cisco Academy measuring student application of course objectives. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |
| 19 | complete successfully a final exam hosted at Cisco Academy measuring student comprehension of course objectives. | Quizzes  
Midterms  
Final exam  
Classroom project work demonstrating competency in this area |

### III. COURSE CONTENT

<table>
<thead>
<tr>
<th>Estimated %</th>
<th>Topic</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture (must total 100%)</td>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>7.00% Network Management</td>
<td>8, 16</td>
<td></td>
</tr>
<tr>
<td>6.00% Point-to-Point Protocol (PPP)</td>
<td>12, 13</td>
<td></td>
</tr>
<tr>
<td>6.00% Frame Relay</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4.00% The OSI Reference Model and Routing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21.00% LAN Switching, Spanning Tree Protocol (STP) and troubleshooting</td>
<td>2, 3, 9</td>
<td></td>
</tr>
<tr>
<td>14.00% Virtual Local Area Networks (VLANs)</td>
<td>3, 9</td>
<td></td>
</tr>
<tr>
<td>7.00% LAN Design and network troubleshooting</td>
<td>1, 4, 13</td>
<td></td>
</tr>
<tr>
<td>10.00% Routing Protocols: Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP) in both Internet Protocol Version 4 (IPV4) and Internet Protocol Version 6 (IPV6)</td>
<td>5, 7, 11, 14</td>
<td></td>
</tr>
<tr>
<td>7.00% ACLs</td>
<td>6, 10</td>
<td></td>
</tr>
<tr>
<td>7.00% Internet Protocol Versions 4 and 6</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>11.00% Wide Area Networks (WANs) and Virtual Private Networks (VPNs)</td>
<td>12, 13</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lab (must total 100%)</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.00% Switch configuration and troubleshooting</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>10.00% Virtual Local Area Network (VLAN) configuration</td>
<td>3, 9</td>
</tr>
<tr>
<td>7.00% VLAN Trunking Protocol (VTP) configuration</td>
<td>3, 8</td>
</tr>
<tr>
<td>7.00% Spanning Tree Protocol (STP) configuration</td>
<td>2, 3, 8</td>
</tr>
<tr>
<td>7.00% Inter VLAN Routing and troubleshooting</td>
<td>2, 3, 5, 9, 10</td>
</tr>
<tr>
<td>7.00% Wireless enterprise configuration</td>
<td>17</td>
</tr>
<tr>
<td>7.00% PPP configuration and troubleshooting</td>
<td>12, 13, 14</td>
</tr>
<tr>
<td>7.00% Frame Relay configuration and troubleshooting</td>
<td>13, 15</td>
</tr>
<tr>
<td>5.00% Network security using routers and switches</td>
<td>6, 10, 17</td>
</tr>
<tr>
<td>10.00% ACL configuration and troubleshooting</td>
<td>6, 10</td>
</tr>
<tr>
<td>4.00% Dynamic Host Configuration Protocol (DHCP)</td>
<td>4, 5, 8</td>
</tr>
<tr>
<td>7.00% Network Address Translation (NAT)</td>
<td>5, 8, 10, 17</td>
</tr>
<tr>
<td>10.00% Skills-Based Assessment (SBA) course completion lab</td>
<td>18, 19</td>
</tr>
</tbody>
</table>

### IV. TYPICAL ASSIGNMENTS

**A. Writing assignments**

Writing assignments are required. Possible assignments may include, but are not limited to:

1. Short answer class assignments such as describing features of different routing protocols.
2. Short answer class assignments with specific configuration solutions to VLAN switching scenarios.

**B. Appropriate outside assignments**
Appropriate outside assignments are required. Possible assignments may include, but are not limited to:

1. assigned readings that explain routing and switching configurations and explain the benefits of those configurations.

2. field observations of best practices of network administration.

3. assigned simulation configuration scenarios from text that address routing and switching configuration.

4. assigned readings from text and other sources on new routing and switching advancements.

C. Critical thinking assignments

Critical thinking assignments are required. Possible assignments may include, but are not limited to:

1. plan, implement, and secure Local and Wide-Area Network using hosts, switches, and routers utilizing various protocols.

2. plan and implement a Local and Wide-Area Network addressing design using hosts, switches, and routers that demonstrate competency in implementing access control lists, VLANs, routing protocols, and address translation.

V. METHODS OF INSTRUCTION

Methods of instruction may include, but are not limited to:

- Distance Education – When any portion of class contact hours is replaced by distance education delivery mode (Complete DE Addendum, Section XV)
- Lecture/Discussion
- Laboratory/Activity
- Other (Specify) Online materials
  - Assigned Internet research
  - Computer simulations
- Optional Field Trips
- Required Field Trips

VI. METHODS OF EVALUATION

Methods of evaluation may include, but are not limited to:

- Essay Exam
- Problem Solving
- Classroom Discussion
- Reports/Papers/
- Skill Demonstration
- Participation
Skills-Based Assessment (SBA) lab exam provided by Cisco Academy for course completion assessment

VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS


VIII. STUDENT MATERIALS FEES

☐ No ☑ Yes

IX. PARALLEL COURSES

<table>
<thead>
<tr>
<th>College</th>
<th>Course Number</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaffey College</td>
<td>CISCO 3 &amp; 4</td>
<td>Cisco Internetworking III and IV</td>
<td>4/4</td>
</tr>
<tr>
<td>Los Angeles Trade Tech</td>
<td>MICROTEK 79 &amp; 80</td>
<td>Cisco Networking Academy - Semester III &amp; IV</td>
<td>3/3</td>
</tr>
<tr>
<td>Cypress College</td>
<td>CIS 232C and 233C</td>
<td>Cisco Networking 3 &amp; 4</td>
<td>3/3</td>
</tr>
</tbody>
</table>

X. MINIMUM QUALIFICATIONS

Courses in Disciplines in which Masters Degrees are not expected: any bachelor’s degree and two years of experience, or any associate degree and six years of experience.

XI. ARTICULATION INFORMATION

A. Title V Course Classification:
   1. This course is designed to be taken either:
      ☐ Pass/No Pass only (no letter grade possible); or
      ☑ Letter grade (P/NP possible at student option)
   2. Degree status:
      Either ☑ Associate Degree Applicable; or ☐ Non-associate Degree Applicable

B. Moorpark College General Education:
   1. Do you recommend this course for inclusion on the Associate Degree General Education list?
      Yes: ☐ No: ☑ If YES, what section(s)?
      ☐ A1 - Natural Sciences - Biological Science
      ☐ A2 - Natural Sciences - Physical Science
      ☐ B1 - Social and Behavioral Sciences - American History/Institutions
      ☐ B2 - Social and Behavioral Sciences - Other Social Behavioral Science
      ☐ C1 - Humanities - Fine or Performing Arts
C. California State University (CSU) Articulation:

1. Do you recommend this course for transfer credit to CSU? Yes: [x] No: 

2. If YES do you recommend this course for inclusion on the CSU General Education list? Yes: [ ] No: [x] If YES, which area(s)?

   A1 [ ] A2 [ ] A3 [ ] B1 [ ] B2 [ ] B3 [ ] B4 [ ]
   C1 [ ] C2 [ ] D1 [ ] D2 [ ] D3 [ ] D4 [ ] D5 [ ]
   D6 [ ] D7 [ ] D8 [ ] D9 [ ] D10 [ ] E [ ]

D. University of California (UC) Articulation:

1. Do you recommend this course for transfer to the UC? Yes: [ ] No: [x]

2. If YES do you recommend this course for the Intersegmental General Education Transfer Curriculum (IGETC)? Yes: [ ] No: [x]

   IGETC Area 1: English Communication
   - English Composition
   - Critical Thinking-English Composition
   - Oral Communication

   IGETC Area 2: Mathematical Concepts and Quantitative Reasoning
   - Mathematical Concepts

   IGETC Area 3: Arts and Humanities
   - Arts
   - Humanities

   IGETC Area 4: Social and Behavioral Sciences
   - Anthropology and Archaeology
   - Economics
   - Ethnic Studies
   - Gender Studies
   - Geography
A. Sequential course within a discipline.

1. describe VLAN Trunking Protocol, Rapid Spanning Tree, and Per-VLAN Spanning Tree Protocol and 802.1q Protocol.

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

- Physical Science Lab or Physical Science Lab only (non-sequence)
- Physical Science Lecture only (non-sequence)
- Biological Science
- Physical Science Courses
- Physical Science Lab or Biological Science Lab Only (non-sequence)
- Biological Science Courses
- Biological Science Lab course
- First Science course in a Special sequence
- Second Science course in a Special Sequence
- Laboratory Activity
- Physical Sciences

IGETC Area 6: Language other than English

- Languages other than English (UC Requirement Only)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)

XII. REVIEW OF LIBRARY RESOURCES

A. What planned assignment(s) will require library resources and use?

The following assignments require library resources:
Research, using the Library’s print and online resources, for a paper on an appropriate course topic such as routing protocols, switching methods, network security, or troubleshooting best practices.

B. Are the currently held library resources sufficient to support the course assignment?

YES: [X] NO: []

If NO, please list additional library resources needed to support this course.

XIII. PREREQUISITE AND/OR COREQUISITE JUSTIFICATION

Requisite Justification for CNSE M18

A. Sequential course within a discipline.

1. describe VLAN Trunking Protocol, Rapid Spanning Tree, and Per-VLAN Spanning Tree Protocol and 802.1q Protocol.
2. configure and troubleshoot static, default, and dynamic routing, including using RIP version 1 and 2 and Next Generation, OSPF routing protocol, and NAT.

3. configure and troubleshoot a small switched network, VLAN, and inter-VLAN routing.

4. describe how the data link layer provides reliable transit of data across a physical link by using the Media Access Control (MAC) addresses.

5. describe the operations of a router, a router's routing table, and lookup process, static and dynamic routing protocols, distance vector and link state protocols.

6. demonstrate how to use cable ties, cable support bars, wire management panels, and releasable Velcro straps to dress and secure the cable.

7. identify IP address classes and subnet masking.

8. describe how routers use a layer 3 addressing scheme to make forwarding decisions.

9. explain the primary functions that occur at the transport layer, which includes end-to-end control provided by sliding windows and the reliability in sequencing numbers and acknowledgments.

10. describe how the session layer coordinates service requests and responses.

11. describe how the presentation layer provides code formatting and conversion, and how it arranges and organizes data before it is transferred.

12. describe how the application layer deals with data packets from client-server applications, domain name services, and network applications.

13. perform tasks related to the OSI model, LANs, TCP/IP, and the upper 4 layers of the OSI model.

14. describe basic switching concepts, role of VLANs in separate networks and routing between them.

15. perform command line completion and prompting.

16. describe the correct procedures and commands to access a router, examine and maintain its components, and test its network connectivity.

17. setup a router by using the correct commands and startup sequence to do an initial configuration of a router.

18. use router modes and configuration methods to update a router's configuration file with current and prior versions of Cisco IOS software.
19. use a variety of Cisco IOS software source options, execute commands to load Cisco IOS software onto the router, maintain backup files, and upgrade Cisco IOS software.

20. demonstrate how to configure Cisco router with simulation and actual routers.

21. describe how TCP/IP operates to ensure communication across any set of interconnected networks.

22. identify IP address classes, network and node addresses, and subnet masking.

23. describe the difference between routing and routed protocols and how routers track distance between locations.

24. describe the initial configuration of the router to enable the IP routing protocols of RIP, EIGRP, and OSPF.

25. troubleshoot routing problems using a variety of protocols and their respective management command set.

26. configure and troubleshoot Access Control Lists (ACL) and the application of Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS) and Internet Protocol version 4 and 6, and Network Address Translation (NAT).

27. describe the basic functions that occur at each layer of the OSI model.

☐ B. Standard Prerequisite or Corequisite required by universities.

☐ C. Corequisite is linked to companion lecture course.

☐ D. Prerequisite or Corequisite is authorized by legal statute or regulation.

Code Section: __________

☐ E. Prerequisite or Corequisite is necessary to protect the students' health and safety.

☐ F. Computation or communication skill is needed.

☐ G. Performance courses: Audition, portfolio, tryouts, etc. needed.

and

Requisite Justification for equivalent (Cisco 1 & 2 through Cisco Academy).

☐ A. Sequential course within a discipline.
B. Standard Prerequisite or Corequisite required by universities.

C. Corequisite is linked to companion lecture course.

D. Prerequisite or Corequisite is authorized by legal statute or regulation.
   Code Section: ______

E. Prerequisite or Corequisite is necessary to protect the students' health and safety.

F. Computation or communication skill is needed.

G. Performance courses: Audition, portfolio, tryouts, etc. needed.

XIV. WORKPLACE PREPARATION

Required for career technical courses only. A career technical course/program is one with the primary goal to prepare students for employment immediately upon course/program completion, and/or upgrading employment skills.

Detail how the course meets the Secretary of Labors Commission on the Achievement of Necessary Skills (SCANS) areas. (For a description of the competencies and skills with a listing of what students should be able to do, go to: http://www.ncrel.org/sdrs/areas/issues/methods/assessment/as7scans.htm)

The course will address the SCANS competency areas:

1. Resources: the students will identify, organize, plan and allocate resources through course work and application of theory to practice.

2. Interpersonal: the students will work together as a team to build, evaluate projects, and solve technical problem scenarios.

3. Information: the students will acquire and use information through a variety of assignments, network technology tools, and computer software used in computer network systems.

4. Systems: the students will employ a variety of computer tools to complete projects or assess computer networking problems.

5. Technology: the students will use modern technology to acquire the skills needed to prepare for a career.

The course also addresses the SCANS skills and personal qualities:

1. Basic Skills: the students will read, perform computer mathematic operations, listen and speak in order to complete weekly assignments and participate in classroom discussions.

2. Thinking Skills: the students will think creatively and make decisions in order to
solve computer network problems and demonstrate reasonable problem solving skills.

3. Personal Qualities: the students will be required to display responsibility, self-management, integrity, and honesty throughout course work and classroom exercises.

XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM

1. Mode of Delivery

- Online (course will be delivered 100% online)
- Online with onsite examinations (100% of the instruction will occur online, but examinations and an orientation will be scheduled onsite)
- Online/Hybrid (a percentage of instruction will be held online and the remaining percentage of instruction will be held onsite)
- Lab activities will be conducted onsite
- Televideo (Examinations and an orientation will be held onsite)
- Teleconference
- Other

2. Need/Justification

Improve general student access.

3. Describe how instructors teaching this course will ensure regular, effective contact with and among students.

Use of VCCCD approved CMS and Cisco Academy instructional site to support student contact.

4. Describe how instructors teaching this course will involve students in active learning.

Various software tools and simulation tool (Packet Tracer) will be used so that students can practice their skills as it applies to the course material. Through the course management system (CMS), materials will be made available online for download. Skills-based labs for measuring understanding and student performance will be made available through the Cisco Academy site for students to perform at home and then complete the lab in the classroom as group project work.

5. Explain how instructors teaching this course will provide multiple methods of content representation.

All topics are available for research online and align with Cisco certification curriculum.

Use of videos for repetitive viewing.

The instructor can provide text, presentation slides, audio/visual materials, supplemental study guides, network configuration examples, video tutorials, review exam banks, and links to relevant topic websites.
6. Describe how instructors teaching this course will evaluate student performance.

Use of Cisco curriculum requires weekly completion of quizzes and labs prior to midterm and final exam and is tracked at Cisco Academy link. Student performance is reviewed weekly as a class and a grade-book is readily available to students at Cisco Academy link to track performance.

XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM
CNSE M19: Not Applicable

XVII. STUDENT MATERIALS FEE ADDENDUM
CNSE M19: Not Applicable

XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041
CNSE M19: Not Applicable

XIX. CURRICULUM APPROVAL
Course Information:
   Discipline: COMPUTER NETWORKING SYSTEMS ENGINEERING (CNSE)
   Discipline Code and Number: CNSE M19
   Course Revision Category: Outline Update

Course Proposed By:
   Originating Faculty: Edmond Garcia 10/09/2017
   Faculty Peer: Edmond Garcia 10/09/2017
   Curriculum Rep: 
   Department Chair: Navreet Sumal 10/11/2017
   Division Dean: Howard Davis 11/02/2017

Approved By:
   Curriculum Chair: Jerry Mansfield 03/07/2018
   Executive Vice President: Julius Sokenu 03/17/2018
   Articulation Officer: Jodi Dickey 02/28/2018
   Librarian: Mary LaBarge 02/25/2018

Implementation Term and Year: Fall 2018

Approval Dates:
   Approved by Moorpark College Curriculum Committee: 03/06/2018
   Approved by Board of Trustees (if applicable): 
   Approved by State (if applicable): 03/22/2018