

**I. CATALOG INFORMATION**A. Discipline: COMPUTER NETWORKING SYSTEMS ENGINEERING (CNSE)B. Subject Code and Number: CNSE M68C. Course Title: VMware Optimize and Scale

D. Credit Course units:

Units: 3Lecture Hours per week: 2.5Lab Hours per week : 1.5Variable Units : No

E. Student Learning Hours:

Lecture Hours:

Classroom hours: 43.75 - 43.75

Laboratory/Activity Hours:

Laboratory/Activity Hours 26.25 - 26.25**Total Combined Hours** in a 17.5 week term: 70 - 70

F. Non-Credit Course hours per week \_\_\_\_\_

G. May be taken a total of:  1  2  3  4 time(s) for creditH. Is the course co-designated (same as) another course: No  Yes 

If YES, designate course Subject Code &amp; Number: \_\_\_\_\_

I. Course Description:

Provides training using VMware's ESXi platform used by organizations which provide virtualized cloud computing systems. Teaches students how to optimize and scale the vSphere environment, troubleshoot operational faults, and identify root causes. Requires students to perform labs using vSphere ESXi Shell, vSphere Management Assistant, and vSphere Auto Deploy.

J. Entrance Skills

\*Prerequisite: No  Yes  Course(s)  
CNSE M30 or CNSE M31 or CNSE M55 or CNSE M67

\*Corequisite: No  Yes  Course(s)  
 \_\_\_\_\_

Limitation on Enrollment: No  Yes   
 \_\_\_\_\_

Recommended Preparation: No  Yes  Course(s)  
 \_\_\_\_\_

Other: No  Yes   
 \_\_\_\_\_

K. Other Catalog Information:

Completion of this course also satisfies the prerequisite for taking the VMware Certified Professional 5 exam.

II. COURSE OBJECTIVES

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

		<b>Methods of evaluation will be consistent with, but not limited by, the following types or examples.</b>
1	demonstrate use of VMware Management Resources.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
2	manage system performance in a virtualized environment.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
3	apply network scalability strategies.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
4	perform network optimization techniques.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
5	apply various storage scalability policies.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
6	apply storage optimization principles.	Quizzes Midterms Final exam

		Classroom project work demonstrating competency in this area
7	perform Central Processing Unit (CPU) optimization techniques.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
8	apply memory optimization principles.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
9	apply virtual machine and cluster optimization techniques.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area
10	apply host and management scalability strategies.	Quizzes Midterms Final exam Classroom project work demonstrating competency in this area

### III. COURSE CONTENT

Estimated %	Topic	Learning Outcomes
<b>Lecture</b> (must total 100%)		
15.00%	A. VMware Management Resources <ol style="list-style-type: none"> <li>1. Understand how vCenter Linked Mode manages multiple vCenter Server inventories</li> <li>2. Explain VMware vSphere® Distributed Power Management™</li> <li>3. Use Host Profiles to manage ESXi configuration compliance</li> <li>4. Use VMware vSphere® PowerCLI™ to perform vSphere administrative tasks</li> <li>5. Use Image Builder to create an ESXi installation image</li> <li>6. Use vSphere Auto Deploy to provision ESXi hosts</li> </ol>	10
8.00%	B. Storage Optimization <ol style="list-style-type: none"> <li>1. Diagnose storage access problems</li> <li>2. Understand how storage protocols, VMware vSphere® VMFS configuration, load balancing, and queuing affect performance</li> <li>3. Monitor key storage performance metrics</li> </ol>	6

	<ul style="list-style-type: none"> <li>4. Use vMA to manage virtual storage</li> <li>5. Troubleshoot common storage performance problems</li> </ul>	
10.00%	<p>C. Virtual Machine and Cluster Optimization</p> <ul style="list-style-type: none"> <li>1. Configure vMA</li> <li>2. Understand the esxcli and vicfg commands</li> <li>3. Configure ESXi technical support mode and SSH access</li> <li>4. Understand important ESXi and vCenter Server log files</li> </ul>	1
8.00%	<p>D. Performance in a virtualized environment</p> <ul style="list-style-type: none"> <li>1. Manage performance in a virtualized environment</li> <li>2. Understand vSphere performance troubleshooting methodology</li> <li>3. Understand software and hardware virtualization techniques and their effects on performance</li> <li>4. Use vSphere performance monitoring tools</li> </ul>	2
12.00%	<p>E. Network Scalability</p> <ul style="list-style-type: none"> <li>1. Apply network scalability principles</li> <li>2. Create, configure, and manage vSphere distributed switches</li> <li>3. Migrate virtual machines from standard switches to distributed switches</li> <li>4. Understand distributed switch features such as Private Virtual Local Area Networks, VMware vSphere® Network Input/Output Control, port mirroring, and NetFlow</li> </ul>	3
8.00%	<p>F. Network Optimization</p> <ul style="list-style-type: none"> <li>1. Apply network optimization techniques</li> <li>2. Understand performance features of network adapters</li> <li>3. Understand performance features of vSphere networking</li> <li>4. Monitor key network performance metrics</li> <li>5. Use vMA to manage virtual network configuration</li> <li>6. Troubleshoot common network performance problems</li> </ul>	4
8.00%	<p>G. Storage Scalability</p> <ul style="list-style-type: none"> <li>1. Demonstrate application of various storage multipathing configurations</li> <li>2. Understand vSphere storage Application Programming Interfaces (APIs) for array integration and storage awareness</li> <li>3. Explain profile-driven storage</li> <li>4. Add a storage policy to a virtual machine storage profile</li> <li>5. Describe VMware vSphere® Storage DRS™ operation</li> <li>6. Configure Storage Distributed Resource Scheduler (DRS) and VMware vSphere® Storage Input/Output Control</li> </ul>	5
8.00%	<p>H. CPU Optimization</p> <ul style="list-style-type: none"> <li>1. Apply Central Processing Unit scheduler adjustment and other features that affect CPU performance</li> <li>2. Monitor key CPU performance metrics</li> <li>3. Troubleshoot common CPU performance problems</li> </ul>	7
8.00%	<p>I. Memory Optimization</p> <ul style="list-style-type: none"> <li>1. Understand memory reclamation techniques and overcommitment</li> <li>2. Monitor key memory performance metrics</li> <li>3. Troubleshoot common memory performance problems</li> </ul>	8
15.00%	<p>J. Host and Management Scalability</p> <ul style="list-style-type: none"> <li>1. Perform customizations based on performance guidelines for virtual machines, resource allocation settings, VMware vSphere® Distributed Resource Scheduler™ clusters, resource pools, and VMware vSphere® High Availability admission control policies</li> <li>2. Troubleshoot virtual machine power-on failures</li> <li>3. Troubleshoot vSphere cluster problems</li> </ul>	9

<b>Lab (must total 100%)</b>		
5.00%	Using VMware vSphere Management Assistant	1, 2, 3, 4, 6
5.00%	VMware Monitoring Tools	1, 2, 3, 4, 7, 8, 9
5.00%	VMware vSphere Distributed Switches	3, 4, 5
5.00%	Port Mirroring	1, 2, 3, 4
5.00%	Monitoring Network Performance	1, 3, 4, 5
10.00%	Command-Line Network Management	1, 3, 4, 5
5.00%	Policy-Based Storage	1, 4, 5, 6
5.00%	Managing Datastore Clusters	2, 3, 4, 5, 6
5.00%	Monitoring Storage Performance	2, 3, 4, 5, 6
5.00%	Command-Line Storage Management	1, 2, 3, 5, 6
5.00%	Monitoring CPU Performance	1, 2, 3, 7, 10
5.00%	Diagnosing CPU Performance Issues	1, 2, 3, 4, 5, 6, 7
5.00%	Monitoring Memory Performance	1, 7, 8, 9, 10
5.00%	Diagnosing Memory Performance Issues	1, 7, 8
5.00%	Diagnosing VMware vSphere HA Cluster Resource Issues	1, 2, 3, 4, 9
5.00%	Host Profiles	2, 9, 10
10.00%	Using VMware vSphere PowerCLI	1, 2, 10
5.00%	Using VMware vSphere Auto Deploy on VMware vCenter Server Appliance	2, 3, 5, 9, 10

#### IV. TYPICAL ASSIGNMENTS

##### A. Writing assignments

Writing assignments are required. Possible assignments may include, but are not limited to:	
1	keep a lab journal that addresses problems, solutions, and configuration options.
2	write an explanation/analysis of the benefits of various configuration options of VMware after doing assigned readings on the subject.
3	create written documentation supporting a solution to a configuration scenario.

##### B. Appropriate outside assignments

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:	
1	research related topics to support classroom lab exercises, such as cloud computing designs posted online.
2	research VMware manuals to support classroom lab exercises on specific topics such as clustering, failover, redundancy, security, performance, and scalability.

3	research solutions and strategies used by competing vendors.
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**C. Critical thinking assignments**

Critical thinking assignments are required. Possible assignments may include, but are not limited to:	
1	configure lab solutions related to clustering, failover, redundancy, security, performance, and scalability.
2	solve lab scenarios to meet business requirements, such as backing up and clustering a virtual machine.
3	discuss advantages and disadvantages of multiple strategies used in solving lab problems and be able to identify or defend which strategy would be most appropriate.

**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) Use vendor provided PowerPoint presentations  
Online materials demonstrating relevant content  
Case studies

Optional Field Trips

Required Field Trips

**VI. METHODS OF EVALUATION**

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

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Essay Exam                      | <input checked="" type="checkbox"/> Classroom Discussion | <input checked="" type="checkbox"/> Skill Demonstration |
| <input checked="" type="checkbox"/> Problem Solving Exam | <input type="checkbox"/> Reports/Papers/Journals         | <input checked="" type="checkbox"/> Participation       |
| <input checked="" type="checkbox"/> Objective Exams      | <input checked="" type="checkbox"/> Projects             | <input checked="" type="checkbox"/> Other (specify)     |

Assessment of various lab scenarios

**VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS**

Crookston, Sean, and Harley Stagner. Managing and Optimizing VMware vSphere Deployments. VMware Press, 2013.

Nick Marshall. Mastering VMware vSphere 6. Sybex, 2015.

**VIII. STUDENT MATERIALS FEES**

No  Yes

**IX. PARALLEL COURSES**

<i>College</i>	<i>Course Number</i>	<i>Course Title</i>	<i>Units</i>
This is a new field of study, no comparable courses found at CCC or CSU systems			

**X. MINIMUM QUALIFICATIONS**

**Courses in Disciplines in which Masters Degrees are not expected:**  
 any bachelor's degree and two years of professional experience, or any associate degree and six years of professional 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
- C2 - Humanities - Other Humanities
- D1 - Language and Rationality - English Composition
- D2 - Language and Rationality - Communication and Analytical Thinking
- E1 - Health/Physical Education
- E2 - PE or Dance
- F - Ethnic/Gender Studies

C. California State University(CSU) Articulation:

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

2. If YES do you recommend this course for inclusion on the CSU General Education list?

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

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
- History
- Interdisciplinary, Social & Behavioral Sciences
- Political Science, Government & Legal Institutions
- Psychology
- Sociology & Criminology

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, on virtualization topics such as clustering, redundancy, operating systems, etc.

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

YES:  NO:

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

**XIII. PREREQUISITE AND/OR COREQUISITE JUSTIFICATION**

CNSE M68: Not Applicable

**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/assment/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 and 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; for example, use tools provided by VMware and tools provided

by the operating system vendors.

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 mathematical operations, listen and respond to 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 Use of Netlabs online equipment.

2. Need/Justification

Improve general student access.

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

The instructor will be available online and will monitor the Distance Learning online course. The instructor will use the available tools in the course management system (CMS) for two-way student/instructor communication. Instructor will use the CMS tools in order to provide assessments such as assignments and quizzes.

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

Discussion boards. Other tools, online and PC resident, and forums 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. Assessments for measuring understanding and student performance feedback will be made available through the CMS tools. Assignments, labs, and discussions will be available online.

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

All topics are available for research online and align with VMware proprietary curriculum. Use of videos and online discussion boards.

6. Describe how instructors teaching this course will evaluate student performance.

Quizzes, Homework, performance based Labs, and Exams.

#### **XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM**

CNSE M68: Not Applicable

#### **XVII. STUDENT MATERIALS FEE ADDENDUM**

CNSE M68: Not Applicable

#### **XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041**

CNSE M68: Not Applicable

#### **XIX. CURRICULUM APPROVAL**

Course Information:

Discipline:

COMPUTER NETWORKING SYSTEMS ENGINEERING (CNSE)

Discipline Code and Number: CNSE M68

Course Revision Category: Technical Course Revision

Course Proposed By:

Originating Faculty Edmond Garcia 11/09/2017

Faculty Peer: Edmond Garcia 11/09/2017

Curriculum Rep: \_\_\_\_\_

Department Chair: Navreet Sumal 11/09/2017

Division Dean: Howard Davis 11/16/2017

Approved By:

Curriculum Chair: Jerry Mansfield 03/07/2018

Executive Vice President: \_\_\_\_\_

Articulation Officer: Jodi Dickey 02/28/2018

Librarian: Mary LaBarge 02/26/2018

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