

# CNIT R151: CLOUD COMPUTING AND VIRTUALIZATION

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**Originator**

alynch

**College**

Oxnard College

**Discipline (CB01A)**

CNIT - Computer Networking/IT

**Course Number (CB01B)**

R151

**Course Title (CB02)**

Cloud Computing and Virtualization

**Banner/Short Title**

Cloud Computing&amp;Virtualization

**Credit Type**

Credit

**Start Term**

Fall 2021

**Catalog Course Description**

This course educates students about cloud computing, cloud deployment and service models, cloud infrastructure, cloud backup and storage, security issues related to the cloud, and how to leverage the cloud for cost savings. Students will also gain experience with the most popular cloud computing platforms in the market including Google Cloud, Amazon AWS, and Microsoft Azure.

**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

**Faculty notes on field trips; include possible destinations or other pertinent information**

Possible destinations would be an IT shop, an IT managed service provider, or a public sector managed network.

**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**

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

**Advisories on Recommended Preparation**

CNIT R101 or CNIT R120 or CNIT R142

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

The expectation is that a student already has a solid understanding of foundation-level computer networking prior to taking this course.

**Prerequisite Course Objectives**

CNIT R101-List and define the main components of a personal computer.

CNIT R101-Describe the difference between application software and operating system software.

CNIT R101-Summarize the difference between proprietary software and open source software.

CNIT R101-Describe the differing characteristics between a peer-to-peer network and a client/server network.

CNIT R101-Create a functional Ethernet and wireless network using a network virtualization program.

CNIT R101-Analyze methods to protect a PC and computer network and make recommendations about a security solution for a small network.

CNIT R101-Demonstrate the ability to use a bottom-up, layered approach to troubleshooting the most common PC and computer networking problems.

CNIT R101-List the different types of wide area networks (WANs) of an Internet service provider (ISP) and summarize the advantages and disadvantages of each.

CNIT R101-List and describe the most common wireless security protocols.

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

CNIT R120-Differentiate between various network topologies

CNIT R120-Identify the components of an Internet service provider (ISP) and network operations center (NOC)

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

CNIT R120-Create an Ethernet LAN and enable permissions to share resources across the network.

CNIT R120-Create a secure wireless network using IEEE 802.11 protocols

CNIT R120-Describe the features of a firewall and how it can be used to protect against an attack  
CNIT R120-Capture and analyze network traffic using a packet capture program  
CNIT R120-Differentiate between a virus, worm, and Trojan horse as it relates to malware.  
CNIT R142-Install and identify PC components.  
CNIT R142-Define the key differences between operating systems and minimum resource requirements between the operating systems.  
CNIT R142-Describe basic computer networking concepts related to protocols, addressing, bandwidth, networking devices, and troubleshooting techniques.  
CNIT R142-Identify the characteristics of hardware and software security including physical security, encryption, and protection from viruses and other malicious attacks.  
CNIT R142-Configure, troubleshoot, and optimize the Windows, Android, and Apple OS X operating systems.  
CNIT R142-List the frequencies, available channels, and bandwidths of the various 802.11 WLAN standards.

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## Requisite Justification

### Requisite Type

Advisory

### Requisite

CNIT R101

### Requisite Description

Course in a sequence

### Level of Scrutiny/Justification

Content review

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### Requisite Type

Advisory

### Requisite

CNIT R120

### Requisite Description

Course in a sequence

### Level of Scrutiny/Justification

Content review

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### Requisite Type

Advisory

### Requisite

CNIT R142

### Requisite Description

Course in a sequence

### Level of Scrutiny/Justification

Content review

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## Student Learning Outcomes (CSLOs)

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

- |   |   |
|---|---|
| 1 | Develop a Cloud migration strategy for a company, including moving to the Cloud from a traditional data center, and explain which Cloud computing models are best used for different business and IT organizations. |
|---|---|

- 2 Create a Virtual Machine (VM) in the Cloud and be able to configure that VM for processor type, memory type, geographical location, and storage type parameters.
- 3 Differentiate between the different types of Cloud services including SaaS, PaaS, and IaaS.

### Course Objectives

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

- 1 Explain the importance and benefits of cloud computing and the need for its rapid adoption.
- 2 Explain roadmap for transformation from a classic data center environment to a cloud environment.
- 3 Identify and differentiate various infrastructure components of classic and virtualized data center.
- 4 Summarize cloud requirements and available tools at each layer of IT infrastructure.
- 5 Explain business continuity options in a cloud environment.
- 6 Discuss effective cloud computing deployment models for businesses and IT organizations.
- 7 Deploy virtual machines and network infrastructure in the cloud.
- 8 Perform detailed exploration of cloud products and services.
- 9 Describe infrastructure framework and service management activities in cloud computing.
- 10 Research and address security concerns commonly found in cloud computing environments.
- 11 Create a cloud migration strategy using best practices given a mock scenario for an enterprise.
- 12 Determine system requirements to implement a specific desktop or server virtualization solution in the cloud.
- 13 Monitor user access and resource usage using cloud based administration tools.
- 14 Gain a working knowledge of the most popular cloud computing platforms on the market.

### Course Content

#### Lecture/Course Content

1. Introduction to Cloud Computing
  - a. Business drivers
  - b. Definition of cloud computing
  - c. Essential characteristics
  - d. Cloud service management processes
  - e. Cloud services and deployment models
  - f. The economics of cloud
2. Classic Data Center (CDC)
  - a. Key elements of CDC
  - b. Compute
  - c. Storage
  - d. Networking
  - e. Business Continuity
  - f. Data Center Management
3. Virtualized Data Center (VDC) – Computational Aspects
  - a. Processor virtualization and techniques
  - b. Details of virtual machine (VM) components
  - c. Management of computational resources
  - d. Converting physical machines to virtual machines
4. Cloud Storage
  - a. Key underlying technologies
  - b. Implementation methods for providing virtual storage to computer systems
  - c. Reliability and access
  - d. Mechanisms to protect single point of failure
  - e. Options for recovering from total site failure due to a disaster
5. Vendor Solutions
  - a. Software as a Service
  - b. Platform as a Service
  - c. Infrastructure as a Service
  - d. Rates and metered services

6. Virtualized Data Center (VDC) – Desktop and Application
  - a. Details of desktop virtualization technologies
  - b. Application implementation on a virtual desktop
7. Cloud Security
  - a. Key security concerns and threats
  - b. Infrastructure security mechanisms
  - c. Access control
  - d. Management
  - e. Best practices
8. Virtual Machine Operations in the Cloud
  - a. Creating virtual desktops
  - b. Creating virtual servers
  - c. Creating virtual networks
  - d. Managing virtual resources
  - e. Controlling access
9. Popular Cloud Computing Platforms
  - a. Google Cloud
  - b. Microsoft Azure
  - c. Microsoft Office 365
  - d. Amazon AWS

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

1. Microsoft Hyper-V
  - a. Creating a VM
  - b. Creating a virtual switch
  - c. Virtualized networking
  - d. Checkpoints
  - e. Virtual hard disk (VHD)
  - f. Moving a VM to another device
2. Create a virtual machine (VM) in the cloud utilizing different vendor solutions
  - a. Amazon AWS
  - b. Google Cloud
  - c. Microsoft Azure
3. Storage in the Cloud utilizing different vendor solutions
  - a. Google Drive
  - b. Microsoft OneDrive
  - c. Amazon Cloud Drive
  - d. Dropbox
  - e. Apple iCloud
4. Scaling up and scaling down virtual machines (VM's) utilizing different vendor solutions
  - a. Amazon AWS
  - b. Google Cloud
  - c. Microsoft Azure
5. Networking in the Cloud
  - a. Client side networking
  - b. Network management
  - c. IP addressing
  - d. Switching and routing in virtual environments
  - e. Performance tuning
  - f. ISP service level agreements
6. Securing resources in the Cloud
  - a. Security policy creation and implementation
  - b. User account access control
  - c. Password complexity
  - d. Encryption
  - e. Data integrity
  - f. Antivirus and firewalls designed for virtualized solutions
  - g. Monitoring and auditing

## 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):**

Essay exams  
Essays  
Group projects  
Individual projects  
Laboratory activities  
Laboratory reports  
Oral analysis/critiques  
Objective exams  
Oral presentations  
Projects  
Problem-Solving Assignments  
Problem-solving exams  
Quizzes  
Reports/papers  
Research papers  
Skill tests

## Instructional Methodology

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

Audio-visual presentations  
Computer-aided presentations  
Collaborative group work  
Class activities  
Class discussions  
Distance Education  
Demonstrations  
Field experience/internship  
Field trips  
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 CompTIA Cloud+ course topics.
2. The instructor will introduce labs and demonstrate lab solutions where appropriate.
3. The instructor may summarize current IT cloud computing events or trends in the industry and ask students questions regarding the information that was shared.
4. Small group activities related to researching and reporting out recently released cloud computing technologies and service options.
5. The instructor will illustrate some of the more challenging multiple-choice questions and performance-based questions that students may experience on the CompTIA Cloud+ certification.

## Representative Course Assignments

### Writing Assignments

1. Students will be required to write summaries describing the differences in service between the different cloud service providers.
2. Students will be required to write a paper outlining the steps involved for a company to move from a traditional computing model to a cloud based computing model.
3. Students will be required to answer reflection questions on the lab assignments and relate the material to real-world scenarios.

### Critical Thinking Assignments

1. Evaluation of a security vulnerability on a cloud platform and a recommendation on mitigating the vulnerability prior to a successful exploit.
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 currently managing their own data center but they would like to know the advantages and disadvantages of moving from on-premise to cloud. The student will perform an objective analysis and evaluation of the situation and provide a recommendation based on their best judgement.

### Reading Assignments

1. 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 activities. A typical reading activity would be for the students to read the chapter on cloud based services so that in class they are prepared to discuss the difference between Infrastructure as a Service, Platform as a Service, and Software as a Service.
2. Read from assigned support websites such as [amazon.aws.com](http://amazon.aws.com), [azure.microsoft.com](http://azure.microsoft.com), and [cloud.google.com](http://cloud.google.com).

### Skills Demonstrations

1. Students will be required to demonstrate that they can configure a Microsoft Hyper-V virtualized network solution to include multiple VMs, a virtual switch, access to the host machine, and subsequently access to the physical network and Internet.
2. Students will demonstrate they can create a cloud-based VM with specific resource requirements as it relates to RAM, CPU, and disk space. Students will also be required to specify a specific OS for the VM.

### Other assignments (if applicable)

1. Students will be required to perform research and interact with websites from cloud based service providers such as Apple, Google, Microsoft, and Amazon.
2. Students will be assigned CompTIA Cloud+ certification prep questions and performance-based simulated labs that will help prepare them for success on the final exam and the CompTIA Cloud+ certification.

## Outside Assignments

### Representative Outside Assignments

1. Students will be required to read the assigned CompTIA Cloud+ curriculum to be properly prepared for the lecture, class activities, and lab activities.
2. Students will be assigned Cloud+ certification prep questions and performance-based simulated labs that will help prepare them for success on the final exam and the CompTIA Network+ certification.



**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**Montgomery, Todd and Stephen Olson. *CompTIA Cloud+ Study Guide Exam* (2nd ed.). Sybex, 2018**Resource Type**

Other Instructional Materials

**Description**Instructional support websites such as [aws.amazon.com](https://aws.amazon.com), [cloud.google.com](https://cloud.google.com), and [azure.microsoft.com](https://azure.microsoft.com).

## 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:**

<b>Method of Instruction</b>	<b>Document typical activities or assignments for each method of instruction</b>
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.
Other DE (e.g., recorded lectures)	Any real-time instruction will be recorded and available to students through the LMS.
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.

**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**

CompTIA Cloud+ certification. It is expected that the instructor will hold the CompTIA Cloud+ certification because that is the certification that this course is preparing students to pass.

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

09/14/2020

**Dean**

09/15/2020

**Technical Review**

09/23/2020

**Curriculum Committee**

09/23/2020

**Curriculum Committee**

11/25/2020

**CCCCO**

MM/DD/YYYY

**Control Number**

CCC000563432

**DOE/accreditation approval date**

MM/DD/YYYY