

New Couse
CIS 3760 Cloud-based Networking

1. Proposed course prefix and number:

CIS 3760

2. Proposed credit hours:

3

3. Proposed course title:

Cloud-based Networking

4. Proposed course prerequisites:

CIS 2660

5. Proposed course corequisites:

none

6. Proposed course prerequisites that may be taken concurrently (before or at the same time):

none

7. Minimum grade for prerequisites (default grades are D for Undergrad and C for Grad):

D

8. Major and/or minor restrictions:

Not Applicable

9. List all the four-digit major and/or minor codes (from Banner) that are to be included or excluded:

none

10. Classification restrictions:

Not Applicable

11. List all the classifications (freshman, sophomore, junior, senior) that are to be included or excluded:

none

12. Level restriction:

Not Applicable

13. List the level (undergraduate, graduate) that is to be included or excluded.

Not Applicable

14. Do prerequisites and corequisites for 5000-level courses apply to undergraduates, graduates, or both?

Not Applicable

15. Is this a multi-topic course?

No

16. Proposed course title to be entered in Banner:

Cloud-based Networking

17. Is this course repeatable for credit?

No

18. Is this course mandatory credit/no credit?

No

19. Select class type:

Lecture/Lab/Discussion

20. How many contact hours per week for this course?

3

A. Please choose Yes or No to indicate if this class is a Teacher Education class:

No

B. Please choose the applicable class level:

Undergraduate

C. Please respond Yes if this is a current general education course and/or a course being submitted for the new WMU Essential Studies program. Please respond No if it is neither.

No

D. Explain briefly and clearly the proposed improvement.

The purpose is to add a new course CIS 3760 – Cloud-based Networking .

E. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.).

CIS 3760 – Cloud-based Networking is a new course which is added as an elective courses in the proposed redesigned CIS major. This new course will allow students to acquire advanced skills in the Cloud Networking and possibly lead to their second networking certification. CIS

2660, the prerequisite of CIS 3760 prepares students for their first networking certification (Cisco certification). This course is part of Cloud Solutions Practitioner Career Pathway promoted in the redesigned CIS major. The job market for graduates with Networking and Cloud Computing skills is very strong.

F. List the student learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.

LEARNING OUTCOMES: After taking CIS 3760, student should be able to: • Understand the layered architecture of the computer network, including its capabilities and limitations. • Understand the concept of the switched networks. • Discuss the concept of routing algorithms, including static routing, dynamic routing, NAT, and access control list. • Explain the basics of Quality of Service (QoS) in computer networks, including flow control, congestion control, firewalls, network policies, and security measures. • Demonstrate expertise in the concept of network virtualization, including network functions and network services. • Understand standard datacenter network architecture. • Describe common cyber-attacks and apply appropriate defenses at multiple layers of the network architecture. • Understand the concept of the software-defined networking with its protocols. • Gain practical experience with network programming by implementing software-defined network using Python. • Integrate components on AWS platform.

G. Describe how this curriculum change is a response to student learning assessment outcomes that are part of a departmental or college assessment plan or informal assessment activities.

This change is a response of the departmental informal assessment activities.

H. Effect on other colleges, departments or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.

There is no effect on other colleges, departments, or programs. No other programs in the university offer any course completely on the Cloud Computing. Computer Science department's course "CS 5541 - Computer Systems" covers a very small topic on Cloud Computing.

I. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.

Redesign of CIS major has been proposed. CIS 3760 – Cloud-based Networking is a new course which is added as an elective in the proposed redesigned CIS major. This new course will allow students to acquire advanced skills in the Cloud Networking and possibly lead to their second networking certification. CIS 2660, the prerequisite of CIS 3760 prepares students for their first networking certification (Cisco certification). This course is part of Cloud Solutions Practitioner Career Pathway promoted in the redesigned CIS major.

J. Effects on enrolled students: are program conflicts avoided? Will your proposal make it

easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students' time. If a required course will be offered during summer only, provide a rationale.

The proposed changes will not have any effect on enrolled students. Students in the current CIS program will continue their program without interruption. The proposed changes, if approved, will be effective Fall 2021. Courses required by the current CIS curriculum will be offered uninterrupted.

K. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?

Since there are plenty of jobs available in the Cloud Computing platforms, it is expected that the proposed new course on Cloud-based Networking will make the CIS major more attractive and reverse the declining enrollment in the program. CIS program, with the introduction of CIS 3760, hopes to take the first mover advantage in the Cloud Computing curriculum.

L. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? How often will course(s) be offered? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

The proposed changes will not have any immediate effect on the department and University resources. This new course, if approved, will be effective from Fall 2021 but will not have significant demand until Fall 2022. Also, due to the reduced number of CIS major, some courses are offered one section instead of two. Therefore, department will have no problem offering CIS 3760.

M. With the change from General Education to WMU Essential Studies, this question is no longer used.

For courses requesting approval as a WMU Essential Studies course, a syllabus identifying the student learning outcomes and an action plan for assessing the student learning outcomes must be attached in the Banner Workflow system.

Not Applicable

N. (Undergraduate proposals only) Describe, in detail, how this curriculum change affects transfer articulation for Michigan community colleges. For course changes, include detail on necessary changes to transfer articulation from Michigan community college courses. For new majors or minors, describe transfer guidelines to be developed with Michigan community colleges. For revisions to majors or minors, describe necessary revisions to Michigan community college guidelines. Department chairs should seek assistance from college advising directors or from the admissions office in completing this section.

The proposed change will have no effect on the current transfer articulation for Michigan community colleges. This is a new course.

O. Current catalog copy:

None

P. Proposed catalog copy:

This course focuses on developing cloud-based network, including the foundational knowledge of communication networks for a modern large-scale cloud computing environment. The course explores in-depth concept and identifies challenges for cloud networking. The emphasis is on building a network infrastructure that provides the agility to deploy virtual networks on a shared infrastructure, providing both efficient transfer of big data and low latency communication. In addition, the course provides operational and design rationale. The topics include switching, packets routing, interdomain networking, flow control, congestion control, Quality of Service (QoS), virtualized networks, datacenter network architecture, cloud network requirements and traffic patterns. The course also covers the emerging idea in advancing the current network architecture, the Software-Defined Networking (SDN) to be more specific. Experiential learning includes integration of components from AWS platform to prepare students for AWS advanced networking specialty certification.

CIS3760: Cloud-based Networking

Master Syllabus

Course Description

Computer communication networks are among the most important and influential Information Technology (IT) infrastructures that humanity has ever built. Cloud based networking provides network connectivity between applications and resources deployed on a cloud.

This course focuses on developing cloud-based network, including the foundational knowledge of communication networks for a modern large-scale cloud computing environment. The course explores in-depth concept and identifies challenges for cloud networking. The emphasis is on building a network infrastructure that provides the agility to deploy virtual networks on a shared infrastructure, providing both efficient transfer of big data and low latency communication. In addition, the course provides operational and design rationale. The topics include switching, packets routing, interdomain networking, flow control, congestion control, Quality of Service (QoS), virtualized networks, datacenter network architecture, cloud network requirements and traffic patterns. The course also covers the emerging idea in advancing the current network architecture, the Software-Defined Networking (SDN) to be more specific. Experiential learning includes integration of components from AWS platform to prepare students for AWS advanced networking specialty certification.

Prerequisites & Co-requisites: **Prerequisite:** Junior standing and CIS2660; Minimum Grade of C

Learning Outcomes

- Understand the layered architecture of the computer network, including its capabilities and limitations.
- Understand the concept of the switched networks.
- Discuss the concept of routing algorithms, including static routing, dynamic routing, NAT, and access control list.
- Explain the basics of Quality of Service (QoS) in computer networks, including flow control, congestion control, firewalls, network policies, and security measures.
- Gain fluency in the concept of network virtualization, including network functions and network services.
- Understand standard datacenter network architecture.
- Describe common cyber-attacks and apply appropriate defenses at multiple layers of the network architecture.
- Understand the concept of the software-defined networking with its protocols.
- Gain practical experience with network programming by implementing software-defined network using Python.
- Hands-on experience that involves integration of components on AWS platform.

Topic Coverage (14 Week Course)

Week	Main Topic	Topic Detail including Sub-Topics
1	Computer Networking Basics	Layered architecture. Networking devices capabilities and limitations.
2	The Switched Networks	Packet switching in data plane, including forwarding tables and queues.
3		Routing algorithms and protocols in control plane. Distance vector, link state, and OSPF protocol
4		Border Gateway Protocol (BGP), and Interdomain structure and policies.
5	Traffic Control in Network	Flow control, Congestion control
6		Reliable connection concepts, and Queueing mechanism Quality of Service (QoS) Firewalls and network policies
7	Virtualization in Network	Understand the Network Service Virtualization. Understand the Network Function Virtualization (NFV) technology
8	Network Security	Understand the crypto basics. Certificate authorities.
9		Cyber-attacks: DNS poisoning, BGP hijacking, DDoS, botnet
10	Traffic Patterns in Cloud-based Network	Discuss applications running on top of cloud-based network. Traffic patterns in cloud-based network.
11	Introduction to SDN	Discuss SDN architecture. Programmability in networking.
12		SDN management.
13	Programming with SDN	Discuss network emulation software: Mininet
14		Python programming in SDN