

New Course
CIS 2720 Cloud Computing Applications

1. Proposed course prefix and number:

CIS 2720

2. Proposed credit hours:

3

3. Proposed course title:

Cloud Computing Applications

4. Proposed course prerequisites:

CIS 2700 OR instructor's permission for BBA degree candidates other than CIS, BA, DM&E majors.

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 Computing Applications

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 2720 – Cloud Computing Applications.

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

CIS 2720 – Cloud Computing Applications is a new course which is a required core course in the proposed redesigned CIS major. This new course will allow students to acquire skills in the

Cloud Computing area and eventually get certification. The job market for graduates with Cloud Computing skills are increasing rapidly.

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.

After taking CIS 2720, student will be able to: 1) Understand the fundamental Cloud Computing knowledge, the evolution of cloud computing, its applicability, and benefits 2) Discuss the concept of cloud and cloud computing 3) Understand the concepts and characteristics of different types of cloud-based services 4) Explain the basic ideas and principles in datacenter design, cloud management techniques and cloud software deployment considerations 5) Understand the different CPU, memory and I/O virtualization techniques supported by cloud computing 6) Discuss various innovative cloud-based networking technologies, such as Software-Defined Networking (SDN) and Network Function Virtualization (NFV) 7) Identify different types of cloud storage technologies, including object storage, block-level storage, archival storage, and Big Data file systems 8) Identify security and privacy issues in cloud computing

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 2720 – Cloud Computing Applications is a new course which is a required core course in the proposed 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 Amazon Web Services (AWS) and Microsoft Azure Cloud Computing platforms, it is expected that the proposed new course on Cloud Computing will make the CIS major more attractive and reverse the declining enrollment in the program.

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. Department is already offering the content of CIS 2720 in CIS 5550 - Topics in Computer Information Systems. 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 2720. The demand for this course may only start to appear from Spring of 2022.

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:

Cloud computing is the latest paradigm shift in information technology (IT). It has seen the

fastest adoption into the mainstream IT than any other technology in the domain. The core objectives of cloud-based services are to provide the highest level of agility, performance and efficiency, thus completely dominating IT service delivery. With this unique paradigm shift, cloud computing brings in new opportunities and challenges for businesses, as well as for the system administrators who manage the IT-related activities. This course covers several cloud-based models that comprise the modern concept of cloud computing, such as SaaS, PaaS, IaaS, and XaaS. Topics also include cloud computing infrastructure, datacenter architecture, cloud-based network, cloud storage, virtualization, and cloud-based services. Students receive experiential learning on popular cloud service platform like Amazon AWS. The goal is to prepare students to obtain entry-level AWS cloud certification

CIS 2720 Cloud Computing Applications

Learning Goals and Objectives

CIS 2720 is directly related to a student's ability to meet four (5) of the seven (7) goals for undergraduate/graduate students receiving a degree from the Haworth College of Business:

1. Students will be effective communicators
2. Students will have effective team skills
3. Students will acquire global business understanding
4. Students will understand information technology systems
5. Students will understand ethical business practices
6. Students will be critical thinkers
7. Students will have common business knowledge

Course Theme

Develop core knowledge of the field of Cloud Computing and an in-depth study into its enabling technologies and main building blocks.

Prerequisites

CIS 2700 OR instructor's permission for BBA degree candidates other than CIS, BA, DM&E majors.

Course Description

Cloud computing is the latest paradigm shift in information technology (IT). It has seen the fastest adoption into the mainstream IT than any other technology in the domain. The core objectives of cloud-based services are to provide the highest level of agility, performance and efficiency, thus completely dominating IT service delivery. With this unique paradigm shift, cloud computing brings in new opportunities and challenges for businesses, as well as for the system administrators who manage the IT-related activities. This course covers several cloud-based models that comprise the modern concept of cloud computing, such as SaaS, PaaS, IaaS, and XaaS. Topics also include cloud computing infrastructure, datacenter architecture, cloud-based network, cloud storage, virtualization, and cloud-based services. Students receive experiential learning on popular cloud service platform like Amazon AWS. The goal is to prepare students to obtain entry-level AWS cloud certification.

Expectations and Goals

After taking this course, student will be able to:

- 1) Understand the fundamental Cloud Computing knowledge, the evolution of cloud computing, its applicability, and benefits
- 2) Discuss the concept of cloud and cloud computing
- 3) Understand the concepts and characteristics of different types of cloud-based services
- 4) Explain the basic ideas and principles in datacenter design, cloud management techniques and cloud software deployment considerations
- 5) Understand the different CPU, memory and I/O virtualization techniques supported by cloud computing
- 6) Discuss various innovative cloud-based networking technologies, such as Software-Defined Networking (SDN) and Network Function Virtualization (NFV)
- 7) Identify different types of cloud storage technologies, including object storage, block-level storage, archival storage, and Big Data file systems
- 8) Identify security and privacy issues in cloud computing

Required Materials

The following items are the required:

- 1) Textbook: There is no textbook required for this class. Each module is based on recent conference/journal papers as well as documentation from cloud providers.

- 2) A form of media storage (or use a personal laptop):
 - a. USB Flash Drive
 - b. Google Drive
 - c. OneDrive
- 3) Access to a computer with Internet access, microphone, and a webcam device
- 4) Access to latest version of Chrome, Firefox, and IE
- 5) Access to e-Learning <https://elearning.wmich.edu/> for various items, such as lecture slides, discussions, points, lab assignments, quizzes, and exams.
- 6) Supplemental materials, such as websites and software (available on e-Learning)

Course Contents

The objective of this course is to provide a strong, fundamental understanding of Cloud Computing through lectures, exercises, and projects. Students will learn how to create, access, and manipulate cloud computing services provided by Amazon Web Services cloud provider, as well as how to incorporate cloud computing technologies into business.

The exercises and projects are designed to teach students how to utilize the cloud services into daily business functions, as well as the basic understanding on what hardware needs to be used for supporting cloud computing.

In this course, we will also spend a good deal of time studying cloud computing infrastructures, and concepts. Students will find that this information applies to any cloud computing technologies no matter what cloud provider they choose.

- a. Hands-on Labs (200 points): We will complete eight (8) hands-on labs throughout the semester. Lab assignments and due dates will be posted on e-Learning.
- b. Exams (400 points): There will be two (2) exams: One throughout the semester and one final exam. The final exam will be comprehensive (cumulative); we will discuss the exams in detail in class.
- c. Knowledge quizzes, in-class tasks, and exercises (100 points): Throughout the semester, brief unplanned knowledge quizzes, in-class tasks, and exercises will be planned to measure a student's skill and knowledge base. Students must be present to partake of them. These cannot be made up in any case (even a pre-excused absence), but more than the allotted number will be given so students have the possibility to reach the 100 points. If a student is present and does well on all of them, any amount over the 100 points will be considered extra credit.
- d. Semester-long Project (300 points): A semester-long project will be given to students as the team project (max. 2 member per team). The example topics of the project will be discussed during the class. With the approval from the instructor, the students can propose their own project topic that utilizes cloud computing technologies and services.
- e. Extra Credit: Please see the knowledge quizzes and exercises section.

Assignments:

All work must be the student's own. Students are encouraged to ask questions, discuss concepts, etc. with each other and on the discussion board, but the final product must be each student's work. Students are also expected to have read the assigned materials before the class meeting.

Due Dates:

All due dates are set on the course calendar and will be adhered to unless there are unanticipated issues (e.g., e-Learning down during an assignment turn-in period). All due dates are firm.

Hand-on Exercises:

Late assignments are permitted, but not encouraged. An assignment can be submitted up to three (3) days after the due date. Each late day incurs a 10% penalty. For example, an assignment that would have received an 85% but is turned in two (2) days late would instead receive a 65% (not passing). Late assignments will not receive as much feedback as those turned in on time. If an

emergency arises that prevents a student from completing work on time, the instructor should be contacted as soon as possible. The late policy may be waived at the instructor's discretion in case of an emergency. Emergencies are defined as serious and unexpected events. Emergencies cannot be planned. Examples of emergencies are: a serious health crisis of the student or in the student's immediate family. Examples of non-emergencies are: family weddings, vacations, conferences, work travel, or any other event that can be anticipated.

Knowledge Quizzes, In-class tasks, and Exercises:

Knowledge quizzes, in-class task, and exercises cannot be made up in any situation (even pre-excused absences), but more than the allotted number of points will be offered during the semester.

Exams:

Students are required to take the exams on the assigned days and times online (proctored via LockDown browser with a webcam). A computer with a webcam device is strictly required. Please check the course calendar on e-Learning for this information. Missed exams may only be handled with a documented excuse. A documented excuse consists of letterhead from a medical doctor. This letter must include the statement "I have advised the student to stay home on the following dates: [DATES], for medical reasons." Other documentation will not be considered. Documentation not on letterhead will not be considered. Documentation that does not contain the statement above will not be considered. If a student must miss an exam due to university-sponsored event or legal mandate, documentation to this effect must be presented IN ADVANCE of the exam date. Any student who has not received a WRITTEN (email) notice from the instructor concerning missing an exam in advance will not be allowed to receive credit for that exam.

Scheduled Work:

This class requires work on numerous assignments throughout the semester. To be successful, it is important for students to keep up with the schedule and check it frequently. While the instructor reserves the right to make changes as the semester progresses, the class will always discuss and agree to major changes in the schedule.

Amount of Work:

This class will place great demands on a student's time OUTSIDE OF CLASS. Students will need to be able to access a computer system and have time in their schedule for projects and completing other assignments.

This is all in addition to completing the readings and making sure that students understand and can apply concepts and theories.

Turning in Work:

All class work is digital in nature. Resisting the temptation to "change one last item" after a deadline has passed will be paramount to a student's success. If an item (no matter how small) is changed after the due date and time AND before an evaluation is received, it is considered late.

- a. DO ORIGINAL WORK. Do not work on an entire assignment step-by-step with other students (unless directed by the instructor). Identical errors or copying in any work will result in a grade of zero for all involved. (See Academic Integrity.)
- b. DO ASK QUESTIONS. Make sure to ask questions in class, on the discussion board, in the chat area, email, and come to office hours. We are here to learn and that means a great deal of coding, recoding, and asking questions.

Finally, all students are treated equally and fairly. There will be no make-up work or extra projects for any individual student.

Attendance:

Sessions are premised on each student's presence. Class sessions include information far beyond that found in the texts. Therefore, the instructor expects each student to:

1. Attend class,
2. Read the assignments prior to each class session.

3. Prepare for knowledge quizzes, and
4. Complete all required work.

Missing any of these items will have an impact on a student's learning and ultimately the course grade.

To ensure a positive learning experience and productivity in this course, students are expected to show up on time at each class meeting throughout the entire semester. No matter whether excuses are legitimate or not, the maximum absences permitted in the semester is two (2). If a student has more than two (2) absences (based on the collected data) in this class, their grade will automatically be an "E". Except emergencies, any class absence due to critical reasons must be pre-approved by the instructor at least 24 hours in advance. Such approval may be easily obtained by sending an email to the instructor. If necessary, students will need to prove the legitimacy of their absence. In addition, if a student comes to class ten (10) or more minutes after the class start time, they will be considered "late," and if they leave the class ten (10) or more minutes before the class ending time (or dismissal), they will be considered "truant." Two counts of late/truant will be treated as one "absence."

Remember, if students miss a class they are still responsible for any material and class work that they miss. The instructor encourages all students to form class contacts to learn of items missed. Please do not e-mail the instructor or come to office hours expecting to learn about everything we covered in a missed class.

Ultimately, the class needs everyone here, and each student needs to be here. There is no way to duplicate class instruction and discussion. Missing classes can result in serious problems that show up in assignments.

Participation:

To participate, students must be present and pay attention to the class task or discussion. Class comments are assessed on quality, not quantity, to a point.

Professional Written and Oral Communication Standards Guideline:

Effective communication skills are critical to Haworth College of Business students' personal and professional success. In accordance with the College's learning goal that students must be effective communicators, business students must practice professional standards in written and oral communications. Students' assignments, therefore, must meet minimum standards to be acceptable. Standards for written work address errors in form including spelling, punctuation, format, and basic grammar, as well as technical English errors. Standards for oral work include professionalism in demeanor and dress, presentation delivery skills, quality of graphic support, and the above standards for written work. If these standards are not adhered to, the student's grade may be adjusted accordingly. Students are encouraged to seek assistance through the Haworth College of Business Communication Center.

Respect and Intellectual Freedom:

Opportunities for debate and discussion will also provide opportunities to interact with classmates who espouse different views and opinions. While we can always discuss ideas and issues openly, we must also respect one another as human beings. As such, we will adhere to WMU's policy on Civility (see below).

Responsibility:

Students are responsible for their own individual work in this class. This includes doing the work and maintaining standards of academic integrity.

Academic Integrity:

Students are responsible for making themselves aware of and understanding the policies and procedures in the Undergraduate Catalog <http://catalog.wmich.edu/> that pertain to Academic Integrity.

These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. If there is reason to believe students have been involved in academic dishonesty, they will be referred to the Office of Student Conduct <http://www.wmich.edu/conduct/>. Students will be given the opportunity to review the charge(s). If students believe they are not responsible, they will have the opportunity for a hearing. Consult with the instructor prior to the submission of an assignment if uncertain about an issue of academic honesty.

In particular for this class, please note the University's policy on computer misuse <http://www.wmich.edu/it/policies/>: "Computer misuse is disruptive or illegal use of computer resources." The instructor may pursue any evidence of computer misuse.

Other Important Policies:

- Civility: http://wmich.edu/sites/default/files/attachments/u370/2016/Civility%20Stmt.7-27-16_0.pdf
- Diversity: <http://wmich.edu/diversity>
- Religious Observance: <http://www.wmich.edu/policies/religiousobservances-policy>
- Sexual Assault and Misconduct Policy: <http://www.wmich.edu/sexualmisconduct/>
- Student Disabilities: <http://www.wmich.edu/disabilityservices/>

Communication

Students are responsible for reading the postings and announcements on eLearning and on WMU email accounts.

Students should also check eLearning for resources, schedule updates, special instructions on assignments, etc. Keeping up to date with material is extremely important.

The instructor will also post all announcements to e-Learning.

E-Learning Discussion Board

Use the discussion board to ask questions concerning the course work, pose ideas about technology, share useful Websites, etc.

The instructor will check the board on a daily basis and answer questions.

Email

Students who leave email in most cases will have a response within 24 hours after the instructor receives the email. Sometimes the response may be to simply set up an appointment.

Use the subject line to alert the instructor to an email from this course. Identify it by putting CIS 2600 at the beginning for the quickest reply. For example: Subject: [CIS 2720-T 1830 ~ 2100] What is the exam date?

Use WMU email for individual course correspondence. The instructor guarantees replies to @wmich.edu

Problems

If a student is having trouble in this class, the student is responsible for talking about the nature of the difficulty while there is still time in the course to do something about it.

Questions

Questions about this syllabus or other class matters should be directed to the instructor.

Course/Exam Schedule: This information is on e-Learning.

Assignments and Evaluations

Students are responsible for keeping track of assignments and progress in this course. Save all graded assignments (including email) to have a complete record of scores. All assignment evaluations will be uploaded into e-Learning.

Grades will be posted periodically on e-Learning. Students are responsible for checking grades and reporting (and proving) any errors in the record within one week of the posting. Students will be

notified via e-Learning when points are posted. Students are responsible for knowing what happened in class, including changes in assignments or due dates. Students are responsible for reading the textbook and Web readings, and for asking questions about material that is not understood.

Grading

Students will be evaluated based on various assignments and exams created throughout the semester that demonstrate comprehension and application of various programming concepts, approaches, and techniques.

Assignments

Hands-on Exercises	200 points
Quizzes, tasks, and Exercises	100 points
Midterm Exam	150 points
Final Exam	250 points
Semester-long Project	300 points
Total Points	1000 points

Final Grade

Final grades will be based on accumulated points.

A	940 ~ 1000	C	700 ~ 759
BA	880 ~ 939	DC	650 ~ 699
B	820 ~ 879	D	600 ~ 649
CB	760 ~ 819	E	Below 600

Incomplete Policy

An "incomplete" is a temporary grade that the instructor may give to a student when illness, necessary absence, or other reasons beyond the control of the student prevent completion of course requirements by the end of the semester or session. This grade will not be given as a substitute for a failing grade. A grade of "I" must be removed by the instructor who gave it or, in exceptional circumstances, by the department chairperson. If the unfinished work is not completed and the "I" grade removed within one calendar year of the assignment of the "I," the grade shall be converted to an "E" (failure). Students who receive an incomplete grade in a course must not re-register for the course in order to remove the "I."

Current COVID-19 Statement and Guidelines

Due to the current COVID-19 Pandemic, and consistent with the State of Michigan* requirements and the WMU Safe Return plan (<https://wmich.edu/safereturn>), safety requirements are in place to minimize exposure to the Western Michigan University community. These guidelines apply to all in-person or hybrid classes held either inside or outside a WMU building. Facial coverings (masks), over both the nose and mouth, are required for all students while in class, no matter the size of the space. This includes outdoor class settings where social distancing is not possible (i.e., at least six feet of space between individuals). Following this recommendation can minimize the transmission of the virus, which is spread between people interacting in close proximity through speaking, coughing, or sneezing. During specified classes in which facial coverings (masks) would prevent required class elements, students may remove facial coverings (masks) with instructor permission, in accordance with the exceptions in the Facial Covering (mask) Policy** ("such as playing an instrument, acting, singing, etc."). Facial coverings (masks) must remain in place throughout the class. Any student who removes the mandatory facial covering (mask) during class will be required to leave the classroom immediately. Facial coverings (masks) are not a substitute for social distancing. Students shall observe current social distancing guidelines in all instructional spaces, both indoors and outdoors. Students should avoid congregating around instructional space entrances before and after class sessions. Students should exit the instructional space immediately after the end of class to help ensure social distancing and to allow for those attending the next scheduled class session to enter. Students who are unable to wear a facial covering (mask) for medical reasons must contact

Disability Services for Students (<https://wmich.edu/disabilityservices>) before they attend class. These guidelines are in place to ensure the safety of all students, faculty, and staff during the pandemic. Noncompliance is a violation of the class requirements and the Student Code of Honor (<https://wmich.edu/conduct/expectations-students>).

*For current State of Michigan Executive orders, see: https://www.michigan.gov/whitmer/0,9309,7-387-90499_90705---,00.html

**For the WMU Facial Covering (Mask) Policy, see: <https://wmich.edu/policies/facial-covering-mask>

Topic Coverage (14 Week Course)

Week	Main Topic	Topic Detail including Sub-Topics
1	Introduction to Cloud Computing	Cloud computing fundamentals, Reasons for the paradigm shift, Economics of cloud computing, Cloud computing benefits
2	Cloud-based Services	Cloud-based service models: SaaS, PaaS, IaaS, MaaS, FaaS, and MaaS, Introduction to Amazon AWS
3		
4	Cloud Infrastructure, Datacenter Design, and Cloud Management	Understand cloud-based infrastructure, Understand datacenter architecture and the underlying technologies, Cloud resource management and software deployment
5		
6	Virtualization in Cloud Computing	Discuss virtualization concepts, Understand different CPU, memory and I/O virtualization techniques, Virtualization benefits
7	Cloud-based Networking Technologies	Understand the basics of the computer networks, Discuss Software-Defined Networking (SDN), Understand the Network Function Virtualization (NFV) technology
8		
9	Cloud-based Storage	Identify different types of cloud storage technologies Understand Big Data file systems
10	Cloud Computing Service Provider: Amazon AWS	Discuss the key offering of Amazon AWS, Understand AWS instance, Understand different types of AWS storage technologies AWS computing models, AWS VPC (Virtual Private Cloud), Load balancing and auto scaling
11		
12	AWS Identity and Security Management	AWS security features and management, AWS resource management, AWS security compliance, AWS credential administration
13		
14	Security and Privacy Issues in Cloud Computing	Understand the security and privacy issues in cloud computing Discuss issues and the future of cloud computing