

Western University
Faculty of Engineering
Department of Electrical and Computer Engineering

SE 4455b – ECE 9016: Cloud Computing
Course Outline 2022-23

Description:

Cloud Computing is a recently emerged and rapidly changing and growing field in which computing resources and applications are offered as services as opposed to products. LinkedIn identified Cloud Computing is one of the [most in-demand skills in 2020](#). The course concentrates on the fundamental elements of cloud computing such as resource virtualization and distributed systems including the main concepts of cloud infrastructures. Laboratory activities will allow students to be exposed to fundamental technologies used by cloud computing such as virtual machines, virtual machine monitors, resource allocations, etc.

Instructor: Dr. Alexandra L'Heureux
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Consultation hours: by appointment

Academic Calendar Copy:

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Contact Hours: 3-lecture hours/week, 2-laboratory hours/week, 0.5 course.

Prerequisites: (ECE 4436A/B, SE 3313A/B, SE 3314A/B), or (Computer Science 3357A/B, Computer Science 3305A/B).

Co-requisite: Computer Science 4457A/B, only for Computer Science students.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

CEAB Academic Units: Engineering Science 75%, Engineering Design 25%.

Recommended References:

- References & Material will be provided

General Learning Objectives (CEAB Graduate Attributes)

Knowledge Base	I	Use of Engineering Tools	I	Impact on Society and the Environment	
Problem Analysis		Individual and Team Work		Ethics and Equity	
Investigation		Communication Skills		Economics and Project Management	x
Design		Professionalism		Life-Long Learning	A

Notation: where x be I: *Introductory*, D: *Intermediate*, A: *Advanced*, or empty. I – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. D – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. A – It is expected that the student can apply the knowledge without prompting (e.g. no review).

Course Objectives and Specific Learning Outcomes	CEAB Graduate Attributes Indicators
<p>1. Introduction to Cloud Computing</p> <p>By the end of this section the students should be able to:</p> <ul style="list-style-type: none"> a. Understand the promise and opportunities of cloud computing along with its challenges. b. Describe the technological principles that have enabled cloud computing. c. Identify core features of cloud computing, such as, elasticity, multi-tenant, on-demand, ubiquitous access, usage metering, self-service, etc. 	KB4
<p>2. Introduction to Resource Virtualization.</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Describe the need, pros and cons of resource virtualization. b. Name the types of virtualization of computing and describe the hardware/software support required. c. Describe types of network virtualization and its applications in cloud computing. d. Describe the basic principles of virtualization of storage. 	KB4
<p>3. Cloud Computing Architecture and Management.</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Describe cloud architecture layers (client, network, management, hardware) and their function. b. Describe cloud service models such as infrastructure, platform and software as a service (IaaS, PaaS, SaaS) and provide examples. 	KB4

<ul style="list-style-type: none"> c. Make a cost/benefit/risk analysis for a given case of IaaS, PaaS and SaaS. d. Classify and describe the type of Clouds (Public clouds, Private clouds, Hybrid or heterogeneous clouds, Community clouds). 	
<p>4. Cloud Resource Management and Scheduling. At the end of this section, students will be able to:</p>	Not Assessed
<ul style="list-style-type: none"> a. Understand the policies and mechanisms for cloud resource management, and the resource allocation control theoretic approaches. b. Analyze cloud-based scheduling algorithms, such as the fair queuing, starttime fair queuing, and borrowed virtual time scheduling algorithms. 	
<p>5. Industrial Cloud Platforms and New Application Developments: At the end of this section, students will be able to:</p>	ET2, LL2
<ul style="list-style-type: none"> a. Apply several different options for building enterprise cloud computing applications using the cloud computing solutions offered as Infrastructure as-a-Service (IaaS) and Platform-as-a-Service (PaaS) services in the market, such as Amazon Web Services, Google AppEngine, Microsoft Azure, Heroku, and RightScale. b. Detailing the development architecture of cloud-based applications ranging from scientific to engineering, gaming, and social networking domains. 	

Evaluation

Course Component	Weight
Exercise Labs	15%
Challenge Labs	15%
Self-Learning	5%
Review Questions	5%
Midterm Examination	30%
Final Examination	30%

To obtain a passing grade in the course, a mark of 50% or more must be achieved on the examination components (midterm and final), as well as on the laboratory components. An examination or laboratory mark < 50% will result in a final course grade of 48% or less.

Late Submission Policy: Late submission will be allowed for up-to 3 days after the due date. A penalty of 10% per day will be subtracted for late submissions, to a maximum of 3 days late.

Special Accommodation: Special accommodations would only be considered upon recommendation from the accommodations center.

Final Examination: The final examination will take place during the regular examination period.

Use of English: In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Attendance: Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Absence Due to Illness or Other Circumstances: Students should immediately consult with the instructor or department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached “Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled”). The student should seek advice from the instructor or department Chair regarding how best to deal with the problem. Failure to notify the instructor or department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Missed Midterm Examinations: If a student misses a midterm examination, the exam will not be rescheduled. The student must follow the Instructions for Students Unable to Write Tests and provide documentation to their department within 24 hours of the missed test. The department will decide whether to allow the reweighting of the test, where reweighting means the marks normally allotted for the midterm will be added to the final exam. If no reasonable justification for missing the test can be found, then the student will receive a mark of zero for the test.

If a student is going to miss the midterm examination for religious reasons, they must inform the instructor in writing within 48 hours of the announcement of the exam date or they will be required to write the exam.

Cheating and Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Policy on Repeating All Components of a Course: Students who are required to repeat an Engineering course must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted by the student for grading in subsequent years.

Internet and Electronic Mail: Students are responsible for regularly checking their Western e-mail and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted about the course.

Accessibility: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services: Office of the Registrar, <http://www.registrar.uwo.ca/>
Student Development Centre, <http://www.sdc.uwo.ca/>
Engineering Undergraduate Services, <http://www.eng.uwo.ca/undergraduate/>
USC Student Support Services, <http://westernusc.ca/services/>

Students who are in emotional/mental distress should refer to Mental Health @ Western, http://www.health.uwo.ca/mental_health/, for a complete list of options about how to obtain help.