



# THE UNIVERSITY OF WINNIPEG

## APPLIED COMPUTER SCIENCE

**Course Number: GACS-7307-001**

**Course Name: Advanced Concepts in Cloud Computing**

### Instructor Information

**Professor: Talal Halabi**

**Office: 3D19**

**E-mail: t.halabi@uwinnipeg.ca**

**Office Hours: Fri: 8:30 – 9:30**

**Class Meeting Time: Tue & Thu: 11:30 – 12:45**

**Room No: TBD**

**Course Web Page: Will be available on Nexus**

### Important Dates

First Class:	January 7 <sup>th</sup> , 2021
Submission of proposals:	January 24 <sup>th</sup> , 2021
Midterm Exam:	February 23 <sup>rd</sup> , 2021
Reading Week (No Classes):	February 14 <sup>th</sup> – 20 <sup>th</sup> , 2021
Final Withdrawal Date w/o academic penalty:	March 16 <sup>th</sup> , 2021
(A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date)	
Last Class:	April 1 <sup>st</sup> , 2021
Presentations:	April 6 <sup>th</sup> , 2021
Submission of term papers:	April 11 <sup>th</sup> , 2021
Final Exam:	TBD

### Course Objectives/Learning Outcomes

This course provides extensive coverage of major subjects in Cloud Computing. It gives an overview of Cloud Computing and explains its main service delivery models, deployment architectures, and key enabling technologies and mechanisms such as virtualization, parallel computing, and BigData analytics. Students will acquire considerable knowledge in Cloud data and resource management, architectural design patterns, security and privacy challenges and solutions, as well as commercial and open-source Cloud systems. Other topics that are covered include application migration to the Cloud, interoperability issues, Quality of Service (QoS) and

Service Level Agreement (SLA). Students will also gain critical research skills by taking on a research project in a subject related to Cloud Computing.

## **Remote Learning**

All course material including lecture notes, slides, and assignment details will be available on Nexus. Students are responsible for material covered in video lectures and announcements made in Nexus.

Students must be available via Zoom during the lecture times.

- Students must display their real/full name
- Use of Video is optional
- Participants must be muted when not speaking
- Students may interact via chat, voice or gestures

Students can find answers to frequently asked questions related to remote learning here:

<https://www.uwinnipeg.ca/covid-19/remote-learning-faq.html>.

Note: a permitted or necessary change in mode of delivery may require adjustments to important aspects of course outlines, like class schedule and the number, nature, and weighting of assignments and/or exams.

## **Evaluation Criteria**

### ***Midterm Exam (15%)***

- Open-book, online midterm exam.

### ***Final Exam (20%)***

- Open-book, online final exam.
- The final exam is comprehensive and covers all materials discussed throughout the course.

### ***Reading activity and class presentation (5%)***

- Students are required to study a scientific research paper in the area of Cloud Computing (given by the instructor) and present it in class during the term.
- Details about the presentation requirements will be communicated with the students in class.

### ***Research Project (60%)***

- Students will be required to conduct a comprehensive research project. Topics will be related to Cloud Computing applications, resource management, and security.
- The project will present a new idea. It could be theoretical or technical.
- Depending on the class size, students maybe assign into groups, and then the project will be done as a group project. In this case, there will be additional evaluation criteria on each individual student on their contribution to the overall project in the group.

- Proposals must be submitted on the due day no later than 11:59:59 pm. They must be submitted by email as PDF (Portable Document Format) files to my University of Winnipeg email account – [t.halabi@uwinnipeg.ca](mailto:t.halabi@uwinnipeg.ca)
- Proposals could be up to two pages, including a brief introduction, a discussion of related work in the literature, a description of the research objective(s), and the prospective methodology. Proposals must be typed. No handwritten proposals will be accepted.
- Research projects will be evaluated based on originality, technical soundness, realization of declared objectives, outcomes or results, and the quality of the presentation. For group projects, individual contribution will be part of the evaluation (more details will be provided in class and on the course website).
- The final research paper will be formatted as a scientific publication of minimum five pages and maximum eight pages (two columns). More information about paper format will be given in class. Papers must be typed in Latex. No handwritten papers will be accepted.
- The final research paper must be submitted on the due day no later than 11:59:59 pm. It must be submitted by email as PDF (Portable Document Format) files to my University of Winnipeg email account – [t.halabi@uwinnipeg.ca](mailto:t.halabi@uwinnipeg.ca)
- Students will be required to present their projects in class at the end of term.
- Students can refer to the following conferences and journals for potential research topics:
  - IEEE CloudNet <https://cloudnet2019.ieee-cloudnet.org/authors/>
  - IEEE CloudCom <http://2019.cloudcom.org/>
  - SmartCloud <http://www.cloud-conf.net/smartcloud/2018/cfp.htm>
  - FiCloud <http://www.ficloud.org/2019/call4paper.php>
  - IEEE Transactions on Cloud Computing

### **Final Letter Grade Assignment**

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	90+ - 100%	B+	75 - 79%	C	60 - 64%
A	85 - 90%	B	70 - 74%	D	50 - 59%
A-	80 - 84%	C+	65 - 69%	F	below 50%

### **Test / Exam Requirements**

- Photo ID is required for the final exam
- Midterm and final exams will be delivered via Nexus. Students must have video capability and be prepared to present their student ID
- Midterm and final exams are open book. However, students are permitted to view **only** the following authorized course material:
  - Class notes, slides, and assignment descriptions and solutions
  - Course textbook

- Student's own course notes and assignment submissions
- Students may use an external tool such as a text editor or IDE to write answers to questions before entering them into the exam
- Students may contact the instructor to ask questions during the exam
- External resources (or any material not listed above) are NOT PERMITTED
- Communication with others (except the instructor) is NOT PERMITTED
- All work must be entirely the students' own. Collaboration or sharing of work is NOT PERMITTED
- You are expected to write the test/exam on its given day. Unless a medical certificate is provided, no accommodation is made for missed exams.

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work or examinations without penalty. A list of religious holidays can be found in the 2020-21 Undergraduate Academic Calendar.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams or during lectures/laboratories are encouraged to contact Accessibility Services (AS) at 204.786.9771 or <https://www.uwinnipeg.ca/accessibility-services/> to discuss appropriate options. All information about a student's disability or medical condition remains confidential.

### **Prerequisite and Restriction Information\***

(This information can be found in the UW General calendar)

- Consent of Department Graduate Studies Committee Chair (or research supervisor)

### **Email Communication Requirements**

- Emails from accounts at uwinnipeg.ca are usually not filtered by the UofW email filter. Thereby it is recommended electronic communication used for the course utilize a UofW email account to minimize the risk of filtering.
- Use 'GACS-7307' as subject in email communication related to the course.

### **Regulations, Policies, and Academic Integrity**

Academic dishonesty is a very serious offense and will be dealt in accordance with the University's policies.

*Avoiding Academic Misconduct:* Students are encouraged to familiarize themselves with the Academic Regulations and Policies found in the University Academic Calendar at: <https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf>

Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals) and 10 (Grade Appeals). Please note, in particular, the subsection of Student Discipline pertaining to plagiarism and other forms of cheating.

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures: <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-procedures.pdf>
- UW Library video tutorial “Avoiding Plagiarism” <https://www.youtube.com/watch?v=UvFdxRU9a8g>

Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves “aiding and abetting” plagiarism. Students who do this can be charged with Academic Misconduct.

*Non-academic misconduct.* Students are expected to conduct themselves in a respectful manner on campus and in the learning environment irrespective of platform being used. Behaviour, communication, or acts that are inconsistent with a number of UW policies could be considered “non-academic” misconduct. More detailed information can be found here:

- Respectful Working and Learning Environment Policy <https://www.uwinnipeg.ca/respect/respect-policy.html>,
- Acceptable Use of Information Technology Policy <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/acceptable-use-of-information-technology-policy.pdf>
- Non-Academic Misconduct Policy and Procedures: <https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-procedures.pdf>.

*Copyright and Intellectual Property.* Course materials are the property of the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides—irrespective of format. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor/presenter before, for example, photographing, recording, or taking screenshots of slides, presentations, lectures, and notes on the board. Students found to be in violation of an instructor’s intellectual property rights could face serious consequences pursuant to the Academic Misconduct or Non-Academic Misconduct Policy; such consequences could possibly involve legal sanction under the Copyright Policy

[https://copyright.uwinnipeg.ca/docs/copyright\\_policy\\_2017.pdf](https://copyright.uwinnipeg.ca/docs/copyright_policy_2017.pdf)

## Privacy

Students have rights in relation of the collecting of personal data the University of Winnipeg:  
<https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html>.

More information:

- Zoom and Privacy: <https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html>
- Testing/Proctoring: <https://www.uwinnipeg.ca/privacy/zoom-test-and-exam-proctoring.html>.

## **Required TextBook(s)/Reading List**

Relevant textbook chapters and sections will be given during lectures. Class notes (including references), supplementary scientific papers, and notices will be posted on the course website. Students are responsible for all material covered in class and posted on the website. Students are also responsible for announcements made in class and via email.

The following textbooks may be partially used:

### **Cloud Computing: Principles and Paradigms**

Authors: Rajkumar Buyya, James Broberg, and Andrzej M. Goscinski  
Publisher: Wiley (March 29 2011)  
ISBN-10: 0470887990

### **Cloud Computing Design Patterns**

Authors: Thomas Erl, Robert Cope, and Amin Naserpour  
Publisher: Prentice Hall; 1 edition (June 4 2015)  
ISBN-10: 0133858561

### **Cloud Computing Security**

Author: Flavio Lombardi  
Publisher: Artech House Publishers (Sept. 1 2015)  
ISBN-10: 1608079899

## **Course Outline (Tentative)**

**Week one** - Overview of Cloud Computing and Service Delivery Models

**Week two** - Service Oriented Architectures, Cloud Federation, and web service composition

**Week three** - System and Network Virtualization

**Week four** - Cloud Resource Allocation and Management

**Week five** - Cloud Data Management: Storage and Analytics (MapReduce/Hadoop)

**Week six/seven** - Cloud Architecture Design Patterns

**Week eight/nine** - Cloud Security and Privacy

**Week ten/eleven** - Mobile Computing, Fog, and Internet of Things (IoT)

**Week twelve** - Research Trends in Cloud Computing

Note that all topics listed may not be covered and may be offered in a slightly different time order.

### **Additional Course Related Information**

1. When it is necessary to cancel a class due to exceptional circumstances, instructors will make every effort to inform students via uwinnipeg email (and/or using the preferred form of communication, as designated in this outline), as well as the Departmental Assistant and Chair/Dean so that class cancellation forms can be posted outside classrooms
2. Students are reminded that they have a responsibility to regularly check their uwinnipeg e-mail addresses (and/or using the preferred form of communication, as designated in this outline) to ensure timely receipt of correspondence from the university and/or their course instructors
3. Please note that withdrawing before the VW date does not necessarily result in a fee refund (March 16th is VW date for classes that begin in January to April).