

# RYERSON UNIVERSITY

Ted Rogers School of Information Technology Management  
And G. Raymond Chang School of Continuing Education

## (C)ITM 711 – Cloud Computing

### COURSE OUTLINE FOR 2020-2021

#### 1.0 PREREQUISITE(S)

The prerequisite for this course is ITM 301. Students who do not have the prerequisite will be dropped from the course.

#### 2.0 INSTRUCTOR INFORMATION

- Name: Ravi Vatrappu
- Office Phone Number: +1-437-238-9348
- E-mail address: [vatrappu@ryerson.ca](mailto:vatrappu@ryerson.ca)
- Faculty/course web site(s): <https://my.ryerson.ca>
- Office Location & Consultation hours:
  - Your instructor is available for virtual consultation during scheduled consultation hours. Information on the consultation format is provided in the D2L course shell. If you wish to make an appointment, kindly do so via email to ensure the professor is available.
- E-mail Usage & Limits:

Students are expected to monitor and retrieve messages and information sent through D2L and Ryerson email on a frequent and consistent basis. In accordance with the policy on Ryerson student email accounts ([Policy 157](#)), Ryerson requires that any electronic communication by students to Ryerson faculty or staff be sent from their official Ryerson email account. Messages from other accounts may be disregarded.

#### 3.0 CALENDAR COURSE DESCRIPTION

This course will provide a comprehensive coverage on the concepts, architectures and technologies of cloud computing from a business perspective. It provides a deep-down analysis of architectures and mechanisms that capture the real-world of cloud platforms. It dives into all of the details that organizations need to know in order to plan for developing applications on cloud and what to look for when using applications or services hosted on a cloud.

#### **4.0 COURSE OBJECTIVES AND LEARNING OUTCOMES**

Learning outcomes describe what students are expected to have learned or achieved; as a result, they usually describe what students will be capable of doing, or what evidence will be provided to substantiate learning.

The objective of this course is to provide students with an opportunity to keep abreast of new topics of importance as they emerge in the field. Topics will vary from year to year and will be announced. Method of instruction will vary depending upon the topics offered. This course will provide a comprehensive coverage on the concepts, architectures, and technologies of cloud computing and its business perspective. It provides a deep-down analysis of architectures, mechanisms that capture the real-world cloud platforms. It dives into all of the details that an organization need to know in order to plan for developing applications on cloud and what to look for when using applications or services hosted on a cloud. It also prepares the students for organizational roles that require interaction with external vendors of cloud services.

#### **COURSE OBJECTIVES**

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

- Articulate the key concepts, technologies, strengths, and limitations of cloud computing.
- Explain the benefits, risks and challenges of using cloud services as an IT strategy.
- Characterize different cloud computing models, and describe different architecture models of cloud computing.
- Analyze and evaluate cloud computing solutions and recommend an appropriate solution according to the applications used.
- Explain the realization mechanism of cloud technologies

#### **5.0 TEXTS & OTHER READING MATERIALS**

**Title:** Cloud Computing: Concepts, Technology & Architecture (1st Edition)

**Author:** Thomas Erl, Ricardo Puttini, Zaigham Mahmood

**Publisher:** Prentice Hall

**ISBN:** 978-0133387520

#### **Suggested/Recommended Textbook**

**Title:** Cloud Computing Explained: Implementation Handbook for Enterprises (2nd Edition)

**Author:** John Rhoton

**Publisher:** Recursive Press

**ISBN:** 978-0956355607

#### **6.0 TEACHING METHODS**

In Fall 2020 this course will be taught will be taught remotely in virtual classrooms. Instruction will take place at scheduled hours, following the approach outlined in D2L Brightspace. You will not be required to attend the Ryerson University campus to complete this course.

The pedagogical approach for this course is Outcomes Based Action Learning. The course will incorporate the following teaching/learning methods: Lectures, readings, case study analysis, labs

exercises, lab assignments and discussions are the primary teaching methods in this course. Students are expected to have studied the assigned readings and completed any online or written pre-class assignments or quizzes prior to attending the lectures. The lectures will review and expand the textual material and provide students with the professor's commentary, examples, and illustration. The case studies will be used to link theoretical Cloud Computing concepts to practice in a business

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context. The in-class activities and problem sets will be used to allow the students to use their understanding of the material to develop Cloud solutions. The group assignment and regular status update meetings with the Professor will enable students to develop their "soft skills". Each student is expected to contribute to the active learning environment through in-class and/or online discussions and will be grade accordingly.

## 7.0 EVALUATION, ASSESSMENT AND FEEDBACK

The grade for this course is composed of the mark received for each of the following components:

Evaluation Component	Percentage of the Final Grade	Percentage of the Final Grade
Labs and Assignments		30%
Midterm Examination		25%
Final Examination		45%
<b>Total</b>		<b>100%</b>

NOTE: Students must achieve a course grade of at least 50% to pass this course.

- ❖ At least 20% of student's grade based on individual work will be returned to students prior to the last date to drop a course in good academic standing.

### Citation Format for Essays and Term Papers

All essay assignments, term paper and other written works must adhere with APA citation format. Technical errors (spelling, punctuation, proofing, grammar, format, and citations) and/or inappropriate levels of language or composition will result in marks being deducted. You are encouraged to obtain assistance from the Writing Centre ([www.ryerson.ca/writingcentre](http://www.ryerson.ca/writingcentre)) for help with your written communications as needed.

You can find APA guidelines and academic referencing from the following online resources:

[Student Learning Support > Online Resources > Writing Support Resources](#)

- [APA Basic Style Guide](#)

[Ryerson Library Citations and Style Guides](#)

- [APA Style](#)

## 8.0 TOPICS – SEQUENCE & SCHEDULE

Session	Topic	Learning Outcomes	Reading(s)	Activities & Due Dates
1	<b>Introduction to Cloud Computing</b> - Basic concepts, goals and benefits, risk and challenges	<ul style="list-style-type: none"> <li>- Understand virtualization</li> <li>- Describe the advantages and disadvantages of cloud computing</li> <li>-Realize threats on data hosted on cloud</li> </ul>	Chapters 2, 3 Lecture notes	Vendor products, services and technologies
2	<b>Fundamental Models</b> – Delivery models, deployment models	<ul style="list-style-type: none"> <li>- Understand the architectures of delivery models</li> <li>Infrastructure-as- a-Service (IaaS), Platform-as- a-Service (PaaS) and Software-as- a-Service (SaaS)</li> <li>- Differentiate between Public cloud, Community cloud, Private cloud and Hybrid cloud</li> </ul>	Chapters 4, 14 Lecture notes	Case Study:# 1, #2, #3
3	<b>Working with Clouds (Cost and Pricing)</b> – Business cost, usage cost, cost management	<ul style="list-style-type: none"> <li>- Distinguish cost model, upfront cost and recurring cost</li> <li>- Logging usage of cloud resources</li> <li>- Understand bill management</li> </ul>	Chapters 14, 15 Lecture notes	Lab exercise: <b>Assignment 1</b>
4	<b>Cloud Service Quality Metrics and SLA</b> – Availability, reliability, performance, scalability, resilience	<ul style="list-style-type: none"> <li>- Identify and describe the parameters for quality of service (QoS)</li> <li>-Optimize QoS</li> </ul>	Chapter 16 Lecture notes	Lab exercise
5	<b>Cloud-Enabling Technologies</b> – Data center technology, virtualization technology	<ul style="list-style-type: none"> <li>- Distinguish types of hypervisors for virtualization</li> <li>- Understand Data Center Technology- self-configuration, recovery, Remote Operation, Management and High Availability</li> <li>- Describe Multitenant Technology</li> </ul>	Chapter 5 Lecture notes	Lab exercise

		- Describe Service Technology		
6	<b>Cloud Infrastructure Mechanisms</b> – Logical network, virtual server, cloud storage	-Understand storage array and hot-swapping -Describe storage virtualization, fast data replication, SAN and NAS -Explore preconfigured virtual server, on-demand virtual server	Chapter 7 Lecture notes	<b>Assignment 2; Midterm Exam</b>
7	<b>Cloud Infrastructure Mechanisms</b> – Distributed architecture, resource management, load balancing, redundancy, failure recovery, Midterm Examination	- Describes cloud architectural models - Understand workload - Distribution Architecture - Understand Resource Pooling Architecture -Describe Scalability Architecture -Explain Elastic Resource -Understand Load Balancing Architecture -Explore Redundant Storage Technology -Describe Recovery Technology	Chapters 11, 12 Lecture notes	Lab exercise
8	<b>Cloud Management Mechanisms</b> – Resource, SLA and billing management systems	-Benefits of Remote Administration -Describe Resource Management mechanism -Understand SLA Management mechanism Understand Billing Management	Chapter 9 Lecture notes	Lab exercise; Midterm Exam Results Published and Reviewed
9	<b>Cloud Security Mechanisms</b> – Cloud-based security, hardened virtual server, secure communication channel	-Distinguish between Encryption, Hashing, and Digital Signature -Select appropriate security measure based on scenario -Differentiate between private key encryption and public key encryption	Chapter 10 Lecture notes	<b>Assignment 3</b>

10	<b>Specialized Cloud Architecture</b> – Direct I/O and LUN access, cross-storage and intra-storage device, multipath resource access	-Describe data access technology from storage -Understand the advantage and disadvantage of different data access technology	Chapters 14, 15 Lecture notes	Lab exercise
11	<b>Cloud Monitor Mechanisms</b> – SLA monitor, pay—per-use monitor, audit monitor	-Comprehend Service Level Agreement -Understand monitoring techniques	Chapter 8 Lecture notes	Assignment 4
12	Case study #1, #2, #3 conclusions	Reflect acquired knowledge to analyze case studies	Appendix	12

### 9.0 VARIATIONS WITHIN A COURSE

All sections of a course (Day and CE sections) will follow the same course outline and will use the same course delivery methods, methods of evaluation, and grading schemes. Any deviations will be posted on D2L Brightspace once approved by the course coordinator.

### 10.0 OTHER COURSE, DEPARTMENTAL, AND UNIVERSITY POLICIES

For more information regarding course management and departmental policies, please consult the [Course Outline Appendix](#) which is posted on the [Ted Rogers School of Information Technology Management website](#).

**NOTE:** Students must adhere to all relevant university policies found in their online course shell in D2L and /or on the following URL: [senate-course-outline-policies](#).

The appendix covers the following topics:

- Attendance & Class Participation
- Email Account
- Request for Academic Consideration
- Examinations & Tests
- Late Assignments
- Standard of Written Work
- Academic Grading Policy
- Academic Integrity
- Student Rights

## Important Resources Available at Ryerson

- [Academic Accommodation Support](#): Ryerson University acknowledges that students have diverse learning styles and a variety of academic needs. If you have a diagnosed disability that impacts your academic experience, connect with Academic Accommodation Support (AAS). Visit the [AAS website](#) or contact [aasadmin@ryerson.ca](mailto:aasadmin@ryerson.ca) for more information. Note: All communication with AAS is voluntary and confidential, and will not appear on your transcript.
- [The Library](#) provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or go to [Workshops](#).
- [Student Learning Support](#) offers group-based and individual help with writing, math, study skills, and transition support, as well as [resources and checklists to support students as online learners](#).
- You can submit an [Academic Consideration Request](#) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement.
- [Ryerson COVID-19 Information and Updates for Students](#) summarizes the variety of resources available to students during the pandemic.
- Familiarize yourself with the tools you will need to use for remote learning. The [Continuity of Learning Guide](#) for students includes guides to completing quizzes or exams in D2L or Respondus, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.