Western University
Faculty of Engineering
***Department of Electrical and Computer Engineering***

**ECE 9014a – Data Management and Applications**

**COURSE OUTLINE Fall 2023**

## DESCRIPTION

The advancement in data collection and storage technologies allowed access to a massive amount of data in every field. Terms like data science and big data have been massively trending recently which indicates the importance of the topic. The goal of this course is to give the students an overall understanding of the data science process to provide them with the background they need to be able to utilize it in their perspective areas.

## ENROLLMENT RESTRICTIONS

Enrollment in this course is restricted to graduate students in the Department of Electrical and Computer Engineering, as well as any student that has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student's home program.

## COURSE FORMAT

In person

## TOPICS

| Topic # | Description | Learning Activities | Tentative Timeline |
|---|---|---|---|
| **1** | **Introduction** | | |
| | • Introduction to the Course<br>• Introduction to Relational DB systems | | Week 1 |
| **2** | **Operational DB Systems** | | |
| | Conceptual Modeling | | Week 2 |
| | Logical Modeling | Quiz 1 | Week 3 |
| | Normalization | Quiz 2 | Week 4 |

| | | | |
|---|---|---|---|
| | Implementation (SQL) | Quiz 3 | Week 5 |
| **3** | **Data Warehousing** | | |
| | Introduction & Modeling | Quiz 4 | Week 6 |
| | Example & Implementation | Quiz 5 | Week 7 |
| **4** | **Data Mining** | | |
| | Intro & Association Rule Mining | Quiz 6 | Week 8 |
| | Classification | Quiz 7 | Week 9 |
| | Clustering | Quiz 8 | Week 10 |
| **5** | **Data Visualization** | | |
| | Data Visualization | Quiz 9 | Week 11 |

## SPECIFC LEARNING OUTCOMES

| Degree Level Expectation | Weight | Assessment Tools | Outcomes |
|---|---|---|---|
| **Depth and breadth of knowledge** | 30% | • Quizzes<br>• Final Report | • Understanding of advanced concepts and theories<br>• Awareness of important current problems in the field of study<br>• Understanding of computational and/or empirical methodologies to solve related problems |
| **Application of knowledge** | 35% | • Quizzes<br>• Project | • Ability to apply knowledge in a rational way to analyze a particular problem<br>• Ability to use coherent approach to design a particular engineering system using existing design tools |
| **Professional capacity / autonomy** | 10% | • Project (Teamwork and management task) | • Awareness of academic integrity<br>• Ability to implement established procedures and practices in the coursework<br>• Defends own ideas and conclusions<br>• Integrates reflection into his/her learning process |
| **Communication skills** | 15% | • Project (Final Report and presentation task) | • Ability to communicate (oral and/or written) ideas, issues, results, and conclusions clearly and effectively |

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|---|---|---|---|
| **Awareness of limits of knowledge** | 10% | • Project (Knowledge application tasks) | • Awareness of the need of assumptions in complex scientific analyses and their consequences<br>• Understanding of the difference between theoretical and empirical approaches<br>• Ability to acknowledge analytical limitation due to complexity of practical problems |

**ASSESSMENTS**

| Assessment Type | Material Covered | Tentative Due Date | Weight |
|---|---|---|---|
| **Multiple Choice Quizzes (9)** | Topics 1-5 | Beginning of class time | 10% |
| **Group project** | | | |
| Project Deliverable 1 | Topics 1 - 2 | By the end of Week 6 | 45% |
| Final Report & Presentation | Topics 1 - 5 | By week 12 Presentations done during class time in The report is due by the end of the week | 45% |

**Activities in which collaboration is permitted:**

- Group project
- Exercises (can be discussed with colleagues but individual solutions are to be submitted)

**Activities in which students must work alone (collaboration is not permitted):**

- Quizzes
- Final Exam

**TEXTBOOK(s)**

- "Essentials of Database Management", J. A. Hoffer, H. Topi, R. Venkataraman, Pearson, 2017, ISBN: 0133405680
- "Data Mining: Concepts and Techniques", J. Han, M. Kamber, J. Pei, Elsevier Inc., 2011, ISBN: 978- 938093

**CHEATING, PLAGIARISM/ACADEMIC OFFENCES**

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write

their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence at the following website:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

**SYNCHRONOUS LEARNING ACTIVITIES**

Students are expected to participate in synchronous learning activities as outlined in the course syllabus and/or described by the instructor. If you have issues that will impede your ability to participate in synchronous activities, please discuss them with the course instructor at the beginning of the course.

**CONDUCT**

Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

**HEALTH/WELLNESS**

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. The Faculty of Engineering has a Student Wellness Counsellor. To schedule an appointment with the counsellor, contact Kristen Edwards (khunt29@uwo.ca) via confidential email and you will be contacted by our intake office within 48 hours to schedule an appointment.

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

**SICKNESS**

Students should immediately consult with the instructor (for a particular course) or Associate Chair

(Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

Students who are not able to meet certain academic responsibilities due to medical, compassionate, or other legitimate reason(s), could request for academic consideration. The Graduate Academic Accommodation Policy and Procedure details are available at:
https://www.eng.uwo.ca/graduate/current-students/academic-support-and-accommodations/index.html

**ACCESSIBLITY**

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW): http://academicsupport.uwo.ca/accessible_education/index.html

AEW is a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.