Ryerson University

Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

Course Outline (W2019)

COE848: Fundamentals of Data Engineering

Instructor(s)	Hossein Fani [Coordinator] Office: ENG324 Phone: TBA Email: hossein.fani@ryerson.ca Office Hours: Tuesday 12PM-01PM
Calendar Description	Data engineering is core to the effective development of scalable software applications. Rich data management schemes are needed to handle the sizeable Big Data that is available for processing. This course will cover related topics such as entity-relation diagrams, relational databases, data definition and manipulation languages, structured data representations formats, development of novel vocabularies and semi-structured data and also novel concepts in NoSQL databases.
Prerequisites	COE 528
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. Database Systems: The Complete Book, by Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer D. Widom, Prentice Hall, 2nd Edition, 2008, ISBN: 0131873253
Reference Text(s):	
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Use engineering knowledge to solve real world open-ended engineering problems. Use the specialized engineering knowledge to design specific components, systems, or processes. (**1c**) 2. Use engineering knowledge to solve real world open-ended engineering problems. Use the specialized engineering knowledge to design specific components, systems, or processes. (**1d**) 3. Anticipate the needs of the project, customize design processes, analyzes progress, and revises plans as necessary. Generate solutions for complex engineering design problems (**4a**), (**4b**) 4. Design and develop software tools that adhere to specific project specifications relating to data modeling and data model designs. (**5a**) **NOTE:** *Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*
Course Organization	3.0 hours of lecture per week for 13 weeks 1.0 hours of lab/tutorial per week for 12 weeks
Teaching Assistants	Chengliang Huang (c28huang@ryerson.ca) Raman Deep Singh (raman.singh@ryerson.ca)

Course Evaluation	<table><tr><td>Midterm Exam</td><td>25 %</td></tr><tr><td>Lab Reports and Final Project</td><td>35 %</td></tr><tr><td>Final Exam</td><td>40 %</td></tr><tr><td>TOTAL:</td><td>100 %</td></tr></table> Note: In order for a student to pass a course with **"Theory and Laboratory"** components, in addition to earning a minimum overall course mark of 50%, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the **"Course Evaluation"** section for details on the Theory and Laboratory components.
Examinations	Midterm exam in Week 7, two hours, closed book (covers Weeks 1-6). Final exam, during exam period, two hours, closed-book (covers Weeks 1-13).
Other Evaluation Information	The written reports will be assessed not only on their academic merit, but also on the communication skills of the author as exhibited through the reports. In order to achieve a passing grade in this course, the student must achieve an average of at least 50% in both theoretical and laboratory components. Lab assignments should be submitted 24 hours before the beginning of next lab. Late lab assignments will not be accepted and will receive a mark of 0. Two-week labs carry double weight than one-week labs.
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Entity-Relationship (E/R) Data Model
2	3		Design Principles Keys indexes Subclasses
3	3		Relational Database Model Subclass Structures to Relations
4	1		Quiz
4	2		Algebra of Relational Operations Relational Operations on Bags Extended Operators of Relational Algebra
5	3		Relational Model Queries
6	3		Data Model Constraints

7	2		Midterm
7	1		Database Modifications Views OOP Access to RDBMS I
8	3		Database Modifications Views OOP Access to RDBMS II
9	3		Data Engineering for Embedded Systems
10	3		Semi-structured Data Representation (XML XML Schema DTD)
11	3		Query and Transformation languages XPath XQuery and XSLT – Part I
12	3		Query and Transformation languages XPath XQuery and XSLT – Part II
13	3		NoSQL Databases

Laboratory/Tutorials/Activity Schedule

Week	Lab	Description
2	-	Project Scope Definition and Project Specification Document Development
3	-	E/R Diagram Design
4	-	Relations and Schema Design
5	-	Index and Key Design
6	-	Query Formulation
7	-	Foreign Keys
8	-	Database Connectivity and Programming I
9	-	Database Connectivity and Programming II
10	-	Embedded Database Design and Connectivity
11	-	Database Representation in XML Schema and its XML Data Instances
12	-	Embedded Systems and Remote Data Access
13	-	Querying XML Schema and Instances

Policies & Important Information:

1. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.
4. Refer to our **Departmental FAQ** page for information on common questions and issues at the following link: https://www.ee.ryerson.ca/guides/Student.Academic.FAQ.html.

Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. ***Health certificates*** - If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component for health reasons, they should notify their instructor as soon as possible, and submit a Ryerson Student Health Certificate AND an Academic Consideration Request form within 3 working days of the missed date. Both documents are available at https://www.ryerson.ca/senate/forms/medical.pdf.. **If you are a full-time or part-time degree student, then you submit your forms to your own program department or school;**
2. ***Religious, Aboriginal and Spiritual observance*** - If a student needs accommodation because of religious, Aboriginal or spiritual observance, they must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration Request form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the requested absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the absence. Both documents are available at www.ryerson.ca/senate/forms/relobservforminstr.pdf. **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school;**
3. ***Academic Accommodation Support*** - Before the first graded work is due, students registered with theAcademic Accommodation Support office (AAS - www.ryerson.ca/studentlearningsupport/academic-accommodation-support) should provide their instructors with an Academic Accommodation letter that describes their academic accommodation plan.

Academic Integrity

Ryerson's Policy 60 (the Academic Integrity policy) applies to all students at the University. Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism - a serious academic offence, with potentially severe penalties and other consequences. It is expected, therefore, that all examinations and work submitted for evaluation and course credit will be the product of each student's individual effort (or an authorized group of students). Submitting the same work for credit to more than one course, without instructor approval, can also be considered a form of plagiarism.

Suspicions of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are found to have committed academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will normally be assigned one or more of the following penalties:

1. A grade reduction for the work, ranging up to an including a zero on the work (minimum penalty for graduate work is a zero on the work);
2. A grade reduction in the course greater than a zero on the work. (Note that this penalty can only be applied to course components worth 10% or less, and any additional penalty cannot exceed 10% of the final course grade. Students must be given prior notice that such a penalty will be assigned (e.g. in the course outline or on the assignment handout);
3. An F in the course;
4. More serious penalties up to and including expulsion from the University.

The unauthorized use of intellectual property of others, including your professor, for distribution, sale, or profit is expressly prohibited, in accordance with Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to theAcademic Integrity policy(https://www.ryerson.ca/senate/policies/pol60.pdf) and to the Academic Integrity Office website (https://www.ryerson.ca/academicintegrity/).

Important Resources Available at Ryerson

1. The Library (https://library.ryerson.ca/) provides research workshops and individual assistance. Inquire at the Reference Desk on the second floor of the library, or go to library.ryerson.ca/guides/workshops
2. Student Learning Support(https://www.ryerson.ca/studentlearningsupport) offers group-based and individual help with writing, math, study skills and transition support, and other issues.