

Course Outline (F2018)

BME506: Introduction to Software

Instructor(s)	Olivia Das [Coordinator] Office: ENG464 Phone: (416) 979-5000 x 6114 Email: odas@ryerson.ca Office Hours: TBA
Calendar Description	This course introduces Biomedical Engineers to the principles and processes governing software design and development. Software development processes are explored in the context of procedural and object-oriented paradigms (C/C++). Topics include requirements analysis/specifications, detailed design and implementation, testing, inspection and debugging. Decomposition into classes and modules is examined from the point of view of data-flow, entity-relationships, and the unified modeling language (UML). Students will learn how to leverage industry standard tools for design and development. Laboratory work will focus on applications relating to biomedical engineering.
Prerequisites	BME 328 and CEN 199
Antirequisites	COE 318
Corerequisites	None
Compulsory Text(s):	1. A Concise Introduction to Software Engineering, Pankaj Jalote, (Undergraduate topics in Computer Science) ISBN-10:1848003013 ISBN-13:978-1848003019 Edition: 2008.
Reference Text(s):	1. C++ Primer Plus, Stephen Prata (6th Ed.), Publication Date: October 28, 2011, ISBN-10: 0321776402 ISBN-13: 978-0321776402. 2. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, 1995, Addison-Wesley Professional, First Edition, ISBN 0201633612.
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: <ul style="list-style-type: none"> 1. Use the knowledge of procedural and object-oriented software design. Apply software engineering principles and theories to define an accurate problem statement through approaches such as use cases. (4a) 2. Use relevant tools for requirements analysis, software design, implementation, debugging and testing. (5a) 3. Illustrate concepts of various stages of software development through appropriate graphical forms. (7c) <p>NOTE: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).</p>
Course Organization	3.0 hours of lecture per week for 13 weeks 2.0 hours of lab/tutorial per week for 12 weeks
Teaching Assistants	Hina Tariq Phillips Lai

Course Evaluation	Theory
	Quiz 5 %
	Midterm Exam 20 %
	Final Exam 45 %
	Laboratory
	Labs 30 %
	TOTAL: 100 %
Examinations	Midterm exam in Week 7, 1 hour (covers Weeks 1-6). Final exam, during exam period, 3 hours (covers weeks 1-13).
Other Evaluation Information	None
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction. (Chapter 1. Sections 1.1-1.3). C++ Language Basics & Control Flow. (Lecture notes. Slides).
2	3		The Software Problem. Software Development Process. Software Life Cycle (Waterfall. Prototyping. Iterative. Timeboxing. Agile). (Chapter 2. Sections 2.1-2.3.3. Sections 2.3.5-2.3.6. Lecture notes. Slides). C++ Functions. Function parameter(s). Function Overloading. (Lecture notes. Slides).
3	3		C++ Arrays. C-String. Pointers. (Lecture notes. Slides).
4	3		Requirements Analysis & Specifications. Functional/Non-functional requirements. UML Use Case Diagrams. Data-Flow Diagrams. Entity-Relationship Diagrams. SRS documentation. (Chapter 3. Sections 3.1-3.6. Lecture notes. Slides).
5	3		User Defined Data Types. Basic Data Structures. File I/O. C++ Enums and Structs. Stack and Queue Implementation. C++ File I/O. (Lecture notes. Slides).

6	3		OO - Introduction to Classes. Data Access. Member Functions & Constructors. Dynamic Memory and Destructors. (Lecture notes. Slides).
7	3		OO - Using Classes. Using C++ Classes. C++ Containers. (Lecture notes. Slides). MIDTERM EXAM.
8	3		Design - Brief Overview of Structured (i.e. Function-Oriented) Design versus Object-Oriented Design. OO - Cohesion and Coupling. Encapsulation. (Chapter 6. Sections 6.1-6.2. Lecture notes. Slides). C++ encapsulation (Lecture notes. Slides).
9	3		OO - Inheritance. Polymorphism. (Chapter 6. Section 6.3. Lecture notes. Slides). C++ Abstract Classes. Inheritance. Polymorphism. (Lecture notes. Slides).
10	3		OO - UML Diagrams. (Lecture notes. Slides).
11	3		Introduction to Testing. Unit Testing. Debugging. Code Inspection. (Chapter 7. Section 7.4-7.5. Lecture notes. Slides).
12	3		OO - Advanced Topics: Exception handling. Introduction to Design Patterns. (Lecture notes. Slides).
13	3		Course Review.

Laboratory/Tutorials/Activity Schedule

Week	Lab	Description
2	Lab0	Introduction to Eclipse CDT
3	Lab1	Language Basics – Functions and Control Flow
4	Lab2	Language Basics – Arrays and Command Line Arguments
5	Lab3	Language Basics – Practice with Pointers
6-7	Lab4	Language Basics – User Defined Types and File IO
8-9	Lab5	Object-Oriented Design and Implementation of a simple application

10-11	Lab6	Inheritance and Polymorphism
-------	------	------------------------------

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. If you have taken the course previously and are currently looking to get a laboratory exemption, then you must fill out this form: <http://www.ee.ryerson.ca/guides/ECE-LabExemptionForm.pdf>
5. 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 the [Academic Accommodation Support office](http://www.ryerson.ca/studentlearningsupport/academic-accommodation-support) (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.

Suspensions 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 and 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 the [Academic Integrity policy](https://www.ryerson.ca/senate/policies/pol60.pdf) (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/) (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) (https://www.ryerson.ca/studentlearningsupport) offers group-based and individual help with writing, math, study skills and transition support, and other issues.

Approved by: _____

Date _____

Course Instructor

Approved by: _____

Date _____

Associate Chair or Program Director