SYSC 3120: Software Requirements Engineering
Course Syllabus
Winter 2018

Carleton University
Department of Systems and Computer Engineering

Instructor
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Office Hours: TBD and posted on cuLearn

Teaching Assistants (TAs)
TBD and posted on cuLearn

Dates, Times, and Locations

Lectures: Mondays 2:35PM–3:55PM
           Wednesdays 2:35PM–3:55PM
Labs:     Mondays 8:35AM–11:25AM
          Tuesdays 8:35AM–11:25AM

Students should consult cuLearn for the locations of the lectures and labs.

Calendar Description

Current techniques, notations, methods, processes, and tools used in Requirements Engineering. Requirements
elicitation, negotiation, modeling requirements, management, validation. Skills needed for Requirements
Engineering and the many disciplines on which it draws. Requirements analysis: domain modeling, modeling
object interactions, UML modeling. Introduction to software development processes.

Prerequisites:
SYSC 2100 and third-year status in Software Engineering

Students who have not satisfied the prerequisites for this course must either withdraw from the course, or
obtain a prerequisite waiver by visiting the Engineering Undergraduate Academic Support Office. Students
not meeting these conditions will be deregistered from the course after the last day for course registration.

Course Objectives & Learning Outcomes

Requirements engineering is a branch of software engineering concerned with discovering, analyzing,
modeling, validating, testing, and writing the real-world goals for, functions of, and constraints on software systems.
It is also concerned with the relationship of these factors to precise specifications of software behaviour, and
to their evolution over time, and across software families.

As more and more features are being defined for software systems, requirements engineering is becoming
increasingly important to help manage the development and evolution of features throughout the product
cycle. Requirements engineering has proven to be one of the most difficult and critical activities for the
successful development of software and software-intensive systems. Contrary to common belief, software
rarely fails. More often than not, software behaves exactly as it was designed to, but it was the requirements
that were flawed. Some sources assert that over 90% of software issues result from deficient requirements.
For example, if requirements are missing from a specification, then even the most careful implementation of
a system will not result in a product that is complete or useful. Moreover, if requirements are included in
the specification that are not actually valid, then the product or system becomes unnecessarily expensive.
Therefore, experience teaches us that getting requirements right, as well as precisely specifying them,
is essential for the establishment of safe, secure, and effective systems. As a result, solid requirements
engineering has been recognized as the key to improved, on-time, and on-budget delivery of software and
systems projects.
This course examines current software requirements engineering techniques, notations, methods, processes, and tools. It will cover informal, semi-formal, and formal approaches, while striking a balance between theory and practice. This course will involve building models of both software engineering processes and products, concerning both functional and non-functional goals, requirements, and specifications. It will provide students with the skills needed for software requirements engineering, as well as a foundation that can be used to systematically establish, define, and manage the requirements for large, complex, and changing software-intensive systems, from technical, organizational, and management perspectives.

Upon completion of this course, students should know and understand:

1. the role of, and need for, requirements engineering for the development of software systems;
2. the breadth of skills needed for requirements engineering, and the many disciplines upon which it relies;
3. the main principles that underlie requirements elicitation, analysis, and documentation;
4. how to elicit and document high-quality requirements;
5. how to organize requirements documentation so that it can be easily maintained and updated as user preferences and system behaviours evolve;
6. how to effectively use UML diagrams and notations in requirements analysis;
7. critical issues affecting the success of various approaches in requirements engineering.

Upon completion of this course, students should be able to:

1. describe the role of requirements engineering for the development of software systems;
2. explain the different types of requirements;
3. conduct requirements elicitation to describe the visible behaviour of a software system;
4. produce requirements analysis models made of consistent diagrams (using UML);
5. prepare well-organized, and maintainable software requirements documentation that can be reviewed, corrected, and (eventually) accepted by clients and stakeholders;
6. describe and participate in requirements verification, validation, and traceability activities.

Textbook

The following textbook is strongly recommended and is available at the Carleton bookstore.


Note: This course may not always follow the textbook closely.

Additional References & Resources

Throughout this course, the following useful references and resources may also be used:

Course Webpage

The course announcements, course syllabus, lecture slides used in class, assignments, and any material needed or used in the lab sessions, can be found on cuLearn. It is the student’s responsibility to be aware of the information on cuLearn, and to check regularly for announcements.

Email Correspondence

In order to ensure that you receive a timely response to emails that are sent to the instructor or TAs, please include [SYSC 3120] in the Subject, as emails will be filtered using this identifier.

Students are expected to show and maintain a high-level of professionalism in all email correspondence. This means that emails should include a proper salutation and sign-off/signature, and should refrain from using slang, texting abbreviations and acronyms, and emojis/emojis.

Note that email is not the best medium for technical questions. Technical questions submitted by email will be answered at the beginning of the next lecture.

Assessment

Labs (10%)

There will be a total of eleven (11) lab sessions. Each lab session will involve a short assignment worth 1% of the final grade (except for Lab 0 which will not be graded). Lab assignments will be due at the end of each lab session and must be submitted on cuLearn. Late lab assignments will receive a grade of 0. A lab is considered late if submitted after 11:30AM on the day of the lab session. Being absent from a lab, except for reasons accepted by the Associate Dean’s Office (see Academic Regulations of the University), will result in a grade of 0.

Assignments (15%)

There will be three (3) assignments. Each assignment is worth 5% of the final grade. Assignments will be posted on cuLearn and will be posted and due on the following dates:

<table>
<thead>
<tr>
<th>Assignment #</th>
<th>Posted Date</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January 22, 2018</td>
<td>February 5, 2018</td>
</tr>
<tr>
<td>2</td>
<td>February 5, 2018</td>
<td>March 5, 2018</td>
</tr>
<tr>
<td>3</td>
<td>March 12, 2018</td>
<td>March 26, 2018</td>
</tr>
</tbody>
</table>

The assignment solutions are due by 8:00PM on the due date. Students must submit their assignment solutions on cuLearn. Students are permitted to discuss general aspects of the assignments with other students in the class, but each person should hand in their own work. Students may consult outside sources, such as textbooks, but any use of any source must be documented/cited in the assignment solutions. Late assignments will be graded with a late penalty of 20% of the full grade per day except for reasons accepted by the Associate Dean’s Office (see Academic Regulations of the University).

The assignments will be graded by the TAs. Any request for regrading must be first directed to the TA that has graded your assignment. If after having talked to the TA you still believe that you deserve a higher grade, then you can contact the instructor. When the instructor regrades an assignment, all of the assignment solutions will be regraded.

Surprise Quizzes (0-5%)

During the lectures, the instructor can give a surprise five to ten minute quiz. There will be up to six (6) surprise quizzes. If the class writes one quiz during the term, it counts for 1% of the final grade. If the class writes more than one quiz, the quiz with the lowest grade does not count, while each of the others count for 1% of the final grade.
Midterm Exam (20%)
There will be one (1) midterm examination. It will be a closed book examination. The midterm exam is worth 20% of the final grade and will take place on **Wednesday, February 14, 2018,** from **2:35PM–3:55PM** (during the lecture time). The location of the midterm exam will be announced on cuLearn in due time. The midterm exam will cover the material from the lectures, labs, assignments, and the required textbook.

Final Exam (50-55%)
The final examination will be scheduled by the Registrar’s office in the usual way. It will be three (3) hours in duration and will cover the material from the lectures, labs, assignments, and the required textbook. The final exam counts for \((55 - \#\text{QuizzesThatCount})\%\) of the final grade. For example, if the class writes 4 quizzes, only 3 quizzes count and the final exam will be worth \((55 - 3) = 52\%\)

Tentative Course Outline
Note that this course outline is subject to change as circumstances dictate.

- **Part I: Introduction to Requirements Engineering**
  - Software Engineering Processes
  - Definition, Role, and Importance of Requirements Engineering
  - Requirements Engineering Activities and Processes
  - Types of Requirements (Functional vs. Non-Functional)
  - Techniques for Writing High-Quality Requirements

- **Part II: Requirements Inception, Elicitation, and Documentation**
  - Domain Understanding, Product Vision, and Scope
  - Elicitation Approaches and Techniques
  - Business Events, Viewpoints, and Stakeholders
  - Requirements Evaluation and Risk Management
  - Software Requirements Specification (SRS) Documentation Standards and Templates

- **Part III: Requirements Analysis, Modeling, and Specification**
  - Description vs. Specification
  - Modeling Techniques and Diagrammatic Notations (UML, OCL, etc.)
  - Use Case Modeling and Scenario Descriptions
  - Object-Oriented Analysis for Understanding the Domain and Requirements
  - Formal Specification

- **Part IV: Requirements Verification and Validation**
  - Verification vs. Validation
  - Techniques for Inspection, Verification, and Validation
  - Detection of Conflicts, Inconsistencies, and Completeness

- **Part V: Requirements Evolution and Management**
  - Requirements Traceability
  - Priorities, Changes, Baselines
  - Reusing Requirements
• Part VI: Advanced Topics
  – Hazard Analysis and Safety-Critical System Requirements
  – Threat Modeling and Security-Critical System Requirements
  – Tool Support for Requirements Engineering
  – Open Research Problems in Requirements Engineering

Instructor Expectations, Policies, and Notes

1. Missed assignment, lab, or exam: As stated in the Academic Regulations of the University, students who claim illness, injury, or other extraordinary circumstances beyond their control as a reason for missed term work are responsible for immediately informing the instructor and for making alternate arrangements with the instructor. This must occur no later than three (3) working days after the term work was due.

2. Labs: Each group will have a three (3) hour lab session per week. Attendance at lab sessions is compulsory. You must attend your assigned session of the lab.

3. The instructor reserves the right to assign extra grades for extra work done by willing students. However, the work subject to extra grades will be advertised during the lectures to provide the opportunity to all students.

4. A regrading request of an assignment, quiz, or exam is considered by the TAs and the instructor only if it is made within the two weeks that follow the return date of the majority of the concerned assignment, lab, quiz, or exam.

5. No responsibility for loss of assignments or labs can be assumed by either the instructor or the TAs. Keep copies of your own assignments and labs.

6. Students are responsible for ensuring that their assignments and labs are submitted correctly and without corruption.

7. Calculators are not needed for this course and their use will not be permitted during exams.

8. The lectures will not necessarily follow the order in which the topics are presented in the detailed course outline. Regular class attendance is required.

9. Significant study, reading, and group discussions outside of class are required. Looking at, or only reading the slides that are provided may not be enough to achieve the level of understanding required for the assignments and exams.

10. Students are expected to show professional behaviour. This includes being on-time for lecture and lab sessions, meeting assignment deadlines, and maintaining a suitable level of professionalism in oral and written (email) correspondence with the instructor and TAs.

11. Students that are having difficulty with the course content are expected to seek help early. Students are encouraged to ask questions in class and/or seek help during the instructor’s office hours.

12. Suggestions on how to improve the course and the instructor’s teaching methods are always welcomed.

Important Warning

The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their Carleton email and cuLearn weekly during the term and to note any changes.
Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy Obligation:** Write to the course instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Student Guide to Academic Accommodation.

**Religious Obligation:** Write to the course instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Student Guide to Academic Accommodation.

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send the course instructor your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with the course instructor to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Academic Integrity & Plagiarism

Students are reminded that they should read and comply with Carleton University’s Academic Integrity Policy. Academic dishonesty, in any form, is a serious instructional offence and will not be tolerated. It is the student’s responsibility to understand what constitutes academic dishonesty (refer to Section VI “Academic Integrity Standards” of the Academic Integrity Policy). Students who infringe the Policy may be subjected to one of several penalties including: expulsion; suspension from all studies at Carleton University; suspension from full-time studies; and/or a reprimand; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

Discrimination & Harassment

Carleton University is concerned with ensuring an environment that is free of all adverse discrimination and harassment. Individuals are reminded to refer to the the Carleton University Human Rights Policies and Procedures to deal with allegations of discrimination and harassment, including sexual harassment.

Health & Safety

Students are reminded to consult the Laboratory Health and Safety Manual should they, at any time have any questions or concerns regarding Health and Safety.