

# CS 160 Sections 1 and 2

## Software Engineering

GREEN SHEET  
Spring Semester 2016

Department of Computer Science  
San José State University  
Instructor: Ron Mak

CS 160-01	TuTh	9:00 - 10:15 AM	MH 422
CS 160-02	TuTh	10:30 - 11:15 AM	MH 422

**Office hours:** TuTh: 4:30 – 5:30 PM  
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### Course catalog descriptions

“Software engineering principles, requirements elicitation and analysis, design, configuration management, quality control, project planning, social and ethical issues. Required team-based software development, including written requirements specification and design documentation, oral presentation, and tool use.” *3 units*

### Goals

Become familiar with **industry standard processes and practices** to develop a software product.

The instructor will share decades of experience working as a software developer and project manager in industry, government, and scientific research institutions.

***This is a challenging course that will demand much of your time and effort throughout the semester.***

### Learning outcomes

- LO 1: **Software process:** Reason about and apply the entire software development process. Create a software project schedule and use project scheduling like Microsoft Project. Use version control tools like Git.
- LO 2: **Requirements engineering:** Solicit, elaborate, and validate software product specifications and generate meaningful use cases.
- LO 3: **Software design:** Understand what software design architectures are suitable for various software projects. Apply appropriate software designs to a

- team project. Explain and defend design decisions. Use appropriate software design tools.
- LO 4: **Software verification and validation (V&V)**: Understand the software validation process and use issue-tracking tools. Create and execute test plans.

## Course learning outcomes

Acquire **critical job skills** that are immediately applicable in the software industry:

- CLO 1: Work together in a small programming team.
- CLO 2: Understand the challenges of software engineering and its methodologies and processes.
- CLO 3: Recognize people and team management issues.
- CLO 4: Solicit and analyze product requirements and generate use cases.
- CLO 5: Write functional specifications at a level of detail sufficient for software design.
- CLO 6: Make correct architectural and design choices.
- CLO 7: Develop and document a software design at a level of detail sufficient for implementation.
- CLO 8: Draw meaningful UML class and sequence diagrams.
- CLO 9: Do oral presentations to explain and defend design decisions.
- CLO 10: Formulate and execute a test plan.
- CLO 11: Carry out code reviews in a team setting.
- CLO 12: Generate a project schedule with achievable milestones.
- CLO 13: Create Gantt charts from a work breakdown structure.
- CLO 14: Identify task dependencies and critical paths.
- CLO 15: Track issues and measure development progress.
- CLO 16: Use revision control software.
- CLO 17: Automate the build and deploy process for a software project.

You will work together on a team to **build and deploy a web application** using the full-stack **Ruby on Rails** framework, which supports important client-server concepts:

- Model-view-controller (MVC) architecture
- Representational State Transfer (REST) architecture
- Object-relational mapping (ORM) and the active record design pattern

## Procedure

We will break the class into project teams of about 3 students each. **Team membership is mandatory for this class.** During the semester, each team will experience a realistic industry-level software development project by participating in the various development activities and creating **project artifacts**, including:

- Requirements specification
- Functional specification
- Design document
- Test plan
- Project schedule

Each team will also give several **oral presentations** to the class in conjunction with the project artifacts:

- Product pitch
- Design review
- Code review
- Product demo

During an oral presentation, the members of the rest of the class will play the roles of project advisors and potential customers for the presenting team. *Class attendance is especially important during oral presentation days.*

Team members will assume various **development team member roles**, such as:

- Project lead
- Chief architect
- User interface developer
- Server logic developer
- Database developer/administrator
- Software quality assurance engineer
- Documentation writer

A key skill to learn is how to make a complete project schedule with achievable milestones. The goal of this course is not to produce a winning product in one semester (although that could be a very lucrative bonus for the team members!) but to learn team-based software engineering methodologies, processes, and tools.

## Prerequisites

CS 146	Data structures and algorithms	<i>grade C- or better</i>
CS 151	Object-oriented design	<i>grade C- or better</i>
CS 100W	Technical writing	<i>grade C or better</i>

**The Departments of Computer Science strictly enforces prerequisites.** A student not meeting any prerequisites must fill out an Add Form provided by the instructor at the beginning of the semester to explain his or her justifications to take the course, and it will be the instructor's and the department's decision whether or not to allow the student to enroll.

## Required texts

Title:	<b>Beginning Software Engineering</b>
Author:	Rod Stephens
Publisher:	Wrox/Wiley, 2015
ISBN-13:	978-1118969144
Title:	<b>Rails Crash Course: A No-Nonsense Guide to Rails Development</b>
Author:	Anthony Lewis
Publisher:	No Starch Press, 2015
ISBN-13	978-1593275723

## Software to install

As described in **Rails Crash Course**, you will need to download and install on your Mac, Windows, or Linux platform the following software: Ruby, Rails, Git, Heroku.

Updated Windows installation instructions for Ruby:  
<http://www.cs.sjsu.edu/~mak/CS160/RCC-Windows-install>

Download and install either of the following:

- SQLite Studio: <http://sqlitestudio.pl/?act=download>
- SQLite Manager (Firefox add-on):  
<https://addons.mozilla.org/en-US/firefox/addon/sqlite-manager/>

Also download and install:

- GanttProject: <http://www.ganttproject.biz>

There may be other software packages announced during the semester.

## Schedule

Subject to change with fair notice.

Chapters: BSE = **B**eginning **S**oftware **E**ngineering  
RCC = **R**ails **C**rash **C**ourse

*Each project team will make several oral presentations to the rest of the class.*  
Brevity will be crucial!

Week	Dates	Topics and activities	Chapters
1	Jan 28	What is software engineering? The team projects <i>Form project teams</i>	BSE 1
2	Feb 2, 4	Ruby fundamentals Rails fundamentals The model-view-controller (MVC) architecture Object-relational mapping (ORM) <ul style="list-style-type: none"><li>The active record design pattern</li></ul>	RCC 1 RCC 2
3	Feb 9, 11	Models Controllers	RCC 3 RCC 4
4	Feb 16, 18	Views Version control with Git Application deployment with Heroku Document management	RCC 5 RCC 6  BSE 2
5	Feb 23, 25	Conceptual design Use cases <ul style="list-style-type: none"><li>Use case diagrams</li></ul> Requirements <ul style="list-style-type: none"><li>Gathering</li><li>Functional</li><li>Non-functional</li></ul> Conceptual design review preparation	BSE 4
6	Mar 1, 3	<i>Conceptual design reviews and prototype demos</i>	
7	Mar 8, 10	Relational databases Data modeling <ul style="list-style-type: none"><li>Entity-relationship (ER) diagrams</li><li>Relational schemas</li></ul> Structured Query Language (SQL)	
8	Mar 15, 17	Project management Project scheduling with Gantt charts Risk management <b>Midterm exam Thursday, March 17</b>	BSE 3
9	Mar 22, 24	Application architecture Object-oriented design Unified Modeling Language (UML) <ul style="list-style-type: none"><li>Class diagrams</li><li>Sequence diagrams</li></ul> Database normalization	BSE 5, 6

		Application design review preparation	
	Mar 28 Apr 1	Spring break	
10	Apr 5, 7	<i>Application design reviews</i>	
11	Apr 12, 14	Application development <ul style="list-style-type: none"> <li>• Development tools</li> <li>• Top-down design</li> </ul> Software quality assurance (SQA) Verification and validation (V&V) Testing <ul style="list-style-type: none"> <li>• Test-driven development (TDD)</li> <li>• Unit testing</li> <li>• Stress and performance testing</li> <li>• Regression testing</li> </ul> Test plans	BSE 7  BSE 8
12	Apr 19, 21	Application deployment Software metrics Application maintenance Code review preparation	BSE 9 BSE 10 BSE 11
13	Apr 26, 28	<i>Code reviews</i>	
14	May 3, 5	Process models <ul style="list-style-type: none"> <li>• The Rational Unified Process (RUP)</li> <li>• Extreme Programming (XP)</li> </ul> Social, ethical, and legal issues Demo preparation	BSE 12 BSE 13 BSE 14
15	May 10, 12	<i>Application demos</i>	
	May 16	<b><i>Final projects due Monday, May 16</i></b>	
	May 18 <b>CS 160-02</b>	<b><i>Final exam Wednesday, May 18</i></b> 9:45 – 12 noon, MH 422	
	May 19 <b>CS 160-01</b>	<b><i>Final exam Thursday, May 19</i></b> 7:15 – 9:30 <b>AM</b> , MH 422	

## Team projects

A major portion of the coursework will be the team projects. Each project will provide opportunities for team members to apply immediately the material taught in the lectures and in the textbooks.

Students will form project teams of 4 members each. A student who is not initially part of a team can advertise his or her skills and interests in order to get “hired” by an existing team. A team that needs additional members can “recruit” students who are not already part of a team. *Choose your teams wisely!* Once teams are formed, students may not move from one team to another.

Each team will choose its own web application to develop, but it must fit the architectural framework described above. Each team must use the assigned project management tools and track its own progress. The final web application must be buildable from the command line using an Ant script.

At the end of the semester, *all the members of a project team will each receive the same project score*. The project grade will be determined by the overall quality of the final version of the project team's artifacts and by how well the team achieved its goals to create a successful web application.

## **Course requirements and assignments**

The assignments during the semester will be to create the various project artifacts. As described above, some of the assignments will include oral presentations. A project team turns in one copy of each artifact or gives each presentation, and *all members of the team will each receive the same score for each assignment*.

Each assignment will receive up to 100 points. Late assignments will lose 20 points and an additional 20 points for each 24 hours after the due date.

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

NOTE that University policy F69-24 at <http://www.sjsu.edu/senate/docs/F69-24.pdf> states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

## **Postmortem report**

At the end of the semester, each student must also turn in a short (1 or 2 pages) **individual postmortem report** that includes:

- A brief description of what you learned in the course.
- An assessment of your accomplishments for your project team on the assignments and the web application project.
- An assessment of each of your other project team members.

## **Exams**

The midterm and final examinations will be open book, notes, and laptops. Instant messaging, e-mails, texting, tweeting, or other communication with anyone else during the exams will be strictly forbidden.

There can be no make-up midterm examination unless there is a documented medical emergency. Make-up final examinations are available only under conditions dictated by University regulations.

## Class grade

Your individual class grade will be weighted as follows:

30%	Assignments*
35%	Project*
15%	Midterm exam**
20%	Final exam**
	* <i>project team scores</i>
	** <i>individual scores</i>

Each assignment and exam will be scored (given points) but not assigned a letter grade. The mean score and standard deviation will be announced after each assignment and exam. Final individual class grades will be assigned based on the class curve. Your final class grade can be adjusted up or down depending on your level and quality of participation on your project team as determined by the project tracking tools and your team members' assessments of your performance.

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See [University Policy F13-1](http://www.sjsu.edu/senate/docs/F13-1.pdf) at <http://www.sjsu.edu/senate/docs/F13-1.pdf> for more details.

## Classroom protocol

It is very important for each student to attend classes and to participate. Cell phones in silent mode, please.

## University policies

### General expectations, rights and responsibilities of the student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. See [University Policy S90-5](http://www.sjsu.edu/senate/docs/S90-5.pdf) at <http://www.sjsu.edu/senate/docs/S90-5.pdf>. More detailed information on a variety of related topics is available in the [SJSU catalog](http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html), at <http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html>. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

### Dropping and adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the

current academic year calendars document on the [Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars/) at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy/) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising/) at <http://www.sjsu.edu/advising/>.

### **Consent for recording of class and public sharing of instructor material**

[University Policy S12-7](http://www.sjsu.edu/senate/docs/S12-7.pdf), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- “Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”
  - It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
  - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

### **Academic integrity**

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

### **Campus policy in compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.