

CS460: Software Engineering
Spring 2021 Semester

Instructor:

Soraya Abad Mota (email: soraya@unm.edu)
Office: Farris Engineering Center 2040. Phone: 277-3052
Office hours: Tuesday 3:45-5:00 pm, Wednesday 10:00am-12:00 pm
for all my classes, but
Special office hours will be determined with each team in this class.

Teaching Assistant:

Aislinn Handley (email: ahandley@unm.edu)

Office Hours: tbd

Class meets remotely: Tuesday and Thursday 2:00 - 3:15 pm, zoom link provided on learn

1 Course Description

Most of our computer programming classes go directly to solve a problem with a program, without having to determine the requirements, students are given the requirements. In this course we complete the phases of *the software engineering process* by highlighting other phases of the process:

1. The requirement elicitation phase of the SE Process (RDD).
2. Then the detailed specification of the requirements (SRS).
3. Producing a design that is appropriate to satisfy those requirements (SAD).
4. Finally implementing the design as specified and conceived.

The UNM catalog entry for this course states: “Software engineering principles will be discussed and applied to a large team developed project. Other topics relevant to the production of software will also be covered, including ethics, legalities, risks, copyrights and management issues. Prerequisite: 351L.”

To implement the goal stated above and to comply with the ABET certification requirements, Dr. Catalin Roman has designed this class with “state-of-the-art, industrially tested, specification and design techniques” which are “presented, illustrated on small examples, and applied to realistic problems.” From his description, t“he objective of the course is to develop an understanding of the technical and organizational complexities involved in software development and to teach key concepts and techniques used to manage these complexities. The students are required to design and build systems through team effort. Emphasis is placed on emulating the realities of

an industrial organization. The classes are conducted in an intensive workshop atmosphere. The projects cover the principal system development life-cycle phases from requirements analysis, to software design, and to final implementation. Issues relating to human factors, dependability, performance, operating costs, maintainability and many others are addressed and resolved in a reasonable manner.”

Details of the core design of this class are given in the next two subsections, 1.1 and 1.2; students can use these to know what is expected from them to bring to this class and what are their expected learning outcomes.

1.1 Desirable Entry Level Skills

This section provides examples of skills required or desirable for this class. These are skills that students should have acquired by now. They are grouped into basic requirements and elementary software engineering skills.

Basic

- programming proficiency (e.g. 100-300 lines of dependable code in Java or C++)
- operating systems principles (drivers, mutual exclusion, scheduling)
- database systems
- socket-based communication
- specification, design, implementation distinctions
- basic technical writing abilities
- low-level code documentation (headers, in-line assertions)
- sets, functions, predicates, state machines
- semantic models

Elementary software engineering skills

Basic functional design: *data structures:* high-level description using words and pictures, initial state, commonly used operations;

procedure: high-level algorithm specification, pseudocode (10/1 ratio of code to text);

procedural abstraction: axiomatic specification (pair of assertions), operational specification (pseudocode), functional decomposition and recursion.

Object-oriented concepts: simple objects, proper encapsulation of data structures and devices, clean abstraction (application-oriented), specification: abstract state, operations over the abstract state, design documentation: data structures and procedures.

1.2 Learning Outcomes

At the end of the term, the student should have acquired the following software engineering skills.

Object-oriented design: composite objects, design diagrams, design strategies, design patterns, accommodating languages (e.g., C++ vs. Java), coping with design constraints (e.g., off-the-shelf packages), factoring performance, generalization (classes and templates).

System level design: design rules, processing and data allocation, design and specification of system interfaces, distributed algorithms design and verification, performance evaluation and estimation, feasibility analysis.

System level requirements: elicitation strategies, models, documentation methods, validation, formal specification, human interface design.

Technical management of large software projects: life-cycle, software development strategies (macro-level), technical reviews, written and oral communication, planning and commitments, group and corporate dynamics, system integration.

2 Specific logistics for the Spring 2021 Semester

All work this semester will be done in **teams**. The characteristics of the teams are:

- 6 students on each;
- one manager per team, with coordination responsibilities.

Each student must fill out a student profile form and make it public in the Learn page. We will provide the prompt for this profile and will be entered as a discussion board entry. Students get organized in teams, using the information contained in the student profile, this shall be done on the first lecture.

Team work puts emphasis on cooperative work. Industrial success is based on team performance and communication. One of the goals of process reviews is to avoid reliance on individuals. A team must blend and exploit the strengths of the individuals.

The instruction schedule is as follows:

- Concentrated lectures in the first 4 weeks.
- Workshops: starting on week 5, students will participate in these activities every week.
 - Each team will have to give at least two formal presentations during the semester. One for a design phase of one of the projects, the other one will be the final presentation of the second project which includes a demo of the prototype/simulator implemented for the second project.

- Each team will meet frequently (at least once per week) to plan the work or discuss specific aspects of the work. Each student of each team must invest between 6 and 9 hours per week of effective work to the current project. A portion of the grade depends on how much effort is invested in the project. To facilitate the evaluation of this aspect, by the instructor, the TA, and by the team coordinator, each student must record their time in a timesheet. The timesheets will be submitted to the coordinator who will register each team member's total of hours per week and total hours per project.

During the semester, there will be two projects. These will serve as the *Case Studies* in which students will practice the skills being developed. Tentatively, the two projects are:

1. Community Gate Keypad (CGK)
2. Elevator Control System (ECS)

Each student is required to invest between 6 to 9 hours per week in the projects of this class. This time is outside the lecture or workshop attendance. This is the equivalent to 2-3 hours per credit hour per week. We suggest that each student reports to the manager of the team in a timesheet, the activities performed for the projects and the time invested each week.

3 Grading

Most of the work in this class is done in teams, there are no tests or exams. Student input will be sought regarding the grades of the teammates. Presence in the zoom lectures and workshops are compulsory, with a camera turned on. In-class participation is part of the grade. Appropriate time invested in the course is part of the grade.

Everyone starts with a B in the class. Students' final grade may go up or down according to the following grading guidelines:

- A - exceptional individual contributions OR outstanding team work
- B - good work - but the minimum expected
- C - neglectful in responsibilities toward the team or low quality work on the projects

4 UNM learn platform

For all announcements and submissions of assignments we will use UNM learn available with your Net ID at learn.unm.edu. When you register for this class your UNM id is automatically included in the course platform list and this will allow you access to all the course materials. There will be no other formal website for this class. Students should be up to date with the announcements and material published in this platform.

5 Course and UNM Policies

This section contains the most important policies students are expected to comply with.

5.1 Specific Course Policies

1. Communication with instructor and TA will always be respectful. The instructor requires that you use the email address soraya@unm.edu and **add CS460 to the subject line**.
2. Assignments will be handed out and collected using UNM Learn; assignments should only be submitted through learn, not email or other means. If you are unable to submit assignments on Learn due to technical difficulties, please email me the submission on time and we will coordinate later submission through Learn once the technical difficulties are resolved.
3. This course falls under all UNM policies for last day to drop courses, as described at <http://www.unm.edu/studentinfo.html> and in the UNM Course Catalog. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.
4. Any requests to drop the class or change grade mode (e.g. audit, CR/NC) with instructor permission must be made on or before the last regular class/lab meeting. Such request made after this date will not be approved except in the case of documented, extraordinary circumstances.

5.2 Academic Honesty

The university policy on academic honesty is contained in the Pathfinder; you should review this policy if you are unfamiliar with it. Any academic dishonesty will result in an automatic F for the entire semester and will be referred to the UNM Dean of Students for further disciplinary action as they deem appropriate. There will be no second chances or extra warnings.

5.3 Copyright issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

5.4 Title IX

Our classroom and our university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to you on campus, especially the LoboRESPECT Advocacy Center and the support services listed on its website (<http://loborespect.unm.edu/>). Please note that, because UNM faculty, TAs, and GAs are considered "responsible employees" by the Department of Education, any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct, please see: <https://policy.unm.edu/university-policies/2000/2740.html>.

5.5 ADA

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.

5.6 Citizenship and/or Immigration Status

All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: <http://undocumented.unm.edu/>.

Tentative Calendar CS460 - Spring 2021

Week	Tuesday	Thursday
1 January	19 (L1) Introduction. Syllabus discussion. Team constitution. Assign Project 1.	21 (L2) Software Life Cycle. Requirements Definition Doc
2 RDD P1	26 (L3) Requirements Engineering (1): Process, products. Methods.	28 (L4) The Software Requirement Specification document (SRS)
3 February	2 (L5) Software Architecture Design (1) and the SAD document	4 (L6) Software Architecture Design (2)
4 SRS-P1	9 (L7) Software Development Process: Methodologies	11 (L8) Agile Methodologies
5 SAD-P1	16 Workshop #1	18 Workshop #2
6	23 Implementation	25 Implementation Peer evaluations P1 due
7 March	2 Assign Project 2	4 Workshop #3
8	9 Workshop #4: RDD P2	11 Workshop #5: RDD P2
Break	16 Spring Break	18 Spring Break
9	23 Workshop #6	25 Workshop #7
10 Mar/Apr	30 Workshop #8 SRS P2	1 Workshop #9 SRS P2
11 April	6 Workshop #10	8 Workshop #11
12	13 Workshop #12: SAD P2 + Implementation plan	15 Workshop #13 SAD P2 + Implementation plan
13	20 Workshop #14	22 Workshop #15
14	27 Implementation	29 Implementation
15 May	4 Final Presentations	6 Final presentations