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Spring 2023

CS 673: Software Design and Production Methodology

Iulian Neamtiu

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Course Syllabus

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Course

Number: CS 673
Section: 002
Title: Software Design and Production Methodology

Instructor

Iulian Neamtiu, Professor, **https://web.njit.edu/~ineamtiu/ (https://web.njit.edu/~ineamtiu/)**
ineamtiu@njit.edu (mailto:ineamtiu@njit.edu)
Office hours (GITC 4417):
     Mondays, 10:05am--11:25am
     Wednesdays, 10:05am--11:25am

TA

Tahiatul Islam
ti54@njit.edu (mailto:ti54@njit.edu)
Office hours:
     Tuesday: 10am - 11am
     Wednesday: 10:30am - 11:30am

Whom to contact, and what for

Professor
     until requirement freeze, all issues
     after requirement freeze, all issues except project requirements

TA
     after freeze: project requirements, requirements grading

Exams

Structure: see samples on Canvas. Exams are open-book, open-note; hardcopy only, no electronics allowed.

Midterm: in-class, March 8.

Final: TBD
    non-cumulative (i.e., only material from after the midterm is on the final).

Make-up policy: no make-up. If you miss the midterm, your final will be comprehensive. No make-up for the final.

Textbook

[Fundamentals of Software Engineering (2nd edition)](https://www.amazon.com/dp/0133056996/ref=olp-opf-redir?aod=1&ie=UTF8&condition=used) ⤷
Authors: Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli
ISBN-13: 978-0133056990
ISBN-10: 0133056996

Prerequisites

(not enforced) CS 631

Course (learning) outcomes

1. An understanding of Software qualities and Software Engineering principles

2. The theory and hands-on practice, with the Software Production Process (e.g., Waterfall, Agile Development, Extreme Programming) and Product Line Engineering

3. Theory of Software Specification, both Operational (e.g., Petri Nets) and Behavioral (e.g., Logic Pre- and Post-conditions)

4. Theory and hands-on practice with Design and Software Architecture, (e.g., Design Patterns)

5. Theory of Software Verification (e.g., Testing, Program Analysis, Symbolic execution)

6. Hands-on experience with building a large, quasi commercial-grade software product

7. Hands-on experience with Tools and Environments, e.g., version control, multi-tier client- server architectures

Quizzes

There will be several unannounced quizzes at the beginning of class. Quizzes are designed to test students' understanding of the material assigned in advance for that class (section or chapter in the textbook) and to reinforce material studied in the previous lecture.

Statement on academic integrity:

- *"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf (http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf) .*

  *Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu (mailto:dos@njit.edu) "*

Grading policy

 Grading: raw score x = a weighted average of:

Midterm: 19%
Final: 27%
Project: 49% (24.5% for Milestone 0, 24.5% for Milestone 1)
Quizzes and class participation: 5%

Assuming *x* is your raw score, your grade will be:

x < 63 : F
63 ≤ *x* < 73 : C
73 ≤ *x* < 77 : C+
77 ≤ *x* < 83 : B
83 ≤ *x* < 87 : B+
87 ≤ *x* : A

I do not curve.

Absence/missed work excusals

https://www.njit.edu/dos/student-excusals ⤷ **(https://www.njit.edu/dos/student-excusals)**

Please contact the DOS who will verify the circumstances and inform the professor on your behalf.

"Students who miss class due to bereavement, medical concerns, military activity, legal obligations, or university-sponsored events must provide the Office of the Dean of Students (DOS) with official and verifiable documentation related to the absences within 14 days and complete the online **Student Absence Excuse Request Form.** ⤷ **(https://forms.gle/8ExUeswm24M4Tkaa9)**

Students can also stop by the Office of the Dean of Students located at 255 Campus Center or email **dos@njit.edu (mailto:dos@njit.edu)** .

Once the absence has been verified, the DOS will communicate on your behalf to your professor(s).

[...]

The DOS will not seek absence excusals for pre-planned vacations, trips, weddings, graduations, or non-NJIT activities."

Project

Date	Time	Weekday	Event
Feb. 2	5:00pm	Thu	Voluntary team assignment due
Feb. 3	5:00pm	Fri	Teams assigned
Feb. 6	5:00pm	Mon	Project rankings due
Feb. 7	5:00pm	Tue	Projects assigned
Feb. 10	5:00pm	Fri	Requirements' first token expires

Feb. 13	5:00pm	Mon	Requirements' second token expires, requirements frozen
March 8	in class	Wed	Midterm
March 27	5:00pm	Mon	Mid-quarter (Milestone 0) assessment due: milestone requirements, documentation, individual contribution sheet
March 30	5:00pm	Thu	Peer feedback due
April 27	5:00pm	Thu	Final assessment (Milestone 1) due: milestone requirements, documentation, individual contribution sheet
May 1	in class	Mon	Project presentations

Team Assignment

You have until Feb. 2@5:00p.m. (see Table 1) to form up a voluntary team core, of at most 5 members, as follows: one of the team core members must send the team core composition by email to the professor & the TA and cc the rest of the team core members. Team core composition is not official until confirmed by email by the professor—it is your responsibility to ensure you have a confirmed team core by the team core deadline. The rest of the team (if any, up to 5 members) is assigned by the professor. If, by Feb. 2, you do not belong to any team core yet, you will be randomly assigned to a team.

Project Assignment

After your team composition is known (on Feb. 3@5:00p.m. at the latest), the professor will disclose the projects list. You will have until Feb. 6 @5:00p.m. to send the professor a ranking of all projects in order of preference

One of the team members must send the list by email to the professor; cc the rest of the team members as well. A team's project ranking list is not official until confirmed by email by the professor.

The professor will then assign a project to each team; we will do our best to assign you a project toward the top of your list, but it is not guaranteed that you will get your #1 choice. If, by Feb. 6 @5:00p.m., you will not have sent us a ranking list, you will be randomly assigned one of the unclaimed projects.

Project Requirements, Requirement Confirmations, and Tokens

After the projects are assigned, you have to come up with the requirements and have the requirements confirmed by the professor. You have substantial latitude in designing requirements: as long as the requirements indicate a novel & substantial project, the professor will confirm them. The professor will provide feedback to nudge your requirements in the right direction.

You have two tokens, i.e., two tries, at writing the requirements. The first token expires Feb. 10 @5:00p.m. You do not necessarily have to use this token, however keep in mind that should you not use Token 1, you only have one token (one try) left. The second token expires Feb. 13 @5:00p.m.

If, by Feb. 13 @5:00p.m., you have not sent us the final version of the requirements, as approved by the professor, your project score is 0, which is an automatic F in this class, in addition to ruining Valentine's Day.

When sending the requirements, please use this email subject "CS 673: Team X: Token Y", of course with the appropriate team number and token.

Projects and Milestones

Each project's requirements will be split into two sets: Milestone 0 and Milestone 1. Milestone 0 requirements are supposed to be completed by the mid-quarter assessment. Milestone 1 requirements are supposed to be completed by the final assessment. Any Milestone 0 requirements not fulfilled by the mid-quarter assessment will impact your mid-quarter score negatively and will still be required for the final assessment.

Teamwork Ethics

As in all team-oriented coursework, be especially aware that you have a responsibility—not only toward yourself and the instructors (professor and TA), but also toward the other members of your team—to perform the required work in a professional and timely manner. Past experience suggests that a good team dynamic (which includes frequent team meetings, constant awareness of "who-does-what," and a

collaboration infrastructure to enable that, i.e., version control, feature/bug tracking), and regular meetings with the TA is just as essential as individual efforts to the successful completion of the project. To that end, each team member must act responsibly by checking email frequently, replying promptly, and making every effort to attend team meetings.

Team work has many advantages (mutual support, best use of individual skills, encouragement, camaraderie), but this is true only if everyone participates actively to the project. To ensure that every team member contributes fairly, each team will provide a status report on Canvas, every Thursday, starting with the fourth week of classes (Feb. 17). The reports, one or two paragraphs per member, must clearly state each team member's contribution to the team's activities.

At the end of each milestone, each team must submit a signed contribution sheet indicating the contribution of each member in percents. The professor will use these evaluation forms, together with his assessment of students' effort, to determine the grade.

All documents must be submitted in PDF format. *Except for individual issues, when communicating with the instructors be email, please cc all your teammates.*

Weekly Contribution Log

By 5:00p.m. every Thursday, starting Feb. 16, each team (i.e., one of the team members) must submit a weekly contribution log as a PDF file on Canvas. The log must contain, *for each team member*, the progress that member made toward completing the project; details matter, so we expect at least one paragraph per person. Failure to submit a contribution log each Thursday by 5p.m., or submitting an incomplete/uninformative log will result in points being deducted from that team's project score. The document's header should look like this: "CS 673 Weekly Contribution Log: Team 2, week 02/10–02/16"; of course, substitute in the appropriate team number and week.

The instructors read these logs and look for red or green flags to gauge that genuine progress has been made by each team member. Here are some examples of red and green flags.

Red flags: AVOID, as they indicate no work done	Green flags: suggest actual work
Searched/researched/familiarized myself with	Set up Git repository at github.com/…
Looked into	Evaluated three frameworks: Angular, React, JQuery, and chose JQuery
Discussed	Wrote tests for feature X, or fixed bug Y

I have coded	Implemented part Y of feature X

Individual Contribution Sheet

When an assessment is due (i.e., on March 27 and April 27, respectively), each team must submit an individual contribution sheet in two copies: a signed hard copy to the TA and a PDF on Canvas (part of the M0 documentation PDF; the Canvas copy doesn't need to be signed). The sheet must explain how the team divided the work, researched, and prepared the assessment. The sheet should clearly reflect the contributions of each team member to the assignment, in percents. An ideal contribution proportion would be 100%/(team size) from each member, but we prefer that your analysis be honest, rather than ideal. Each student's contribution (called team size IndividualContribution) will be factored into that student's score. Each member of the team will indicate at the bottom of the sheet that he or she has read the project documentation and the contribution sheet and agrees with the contents of both.

Each member should be responsible for a part of the project; all members of a team will receive the same number of points (called *TeamScore*) for the contents and quality of the overall project. Only participation points will vary across members of the team. In order to receive all of the participation points, the overall contributions of each member must be equal; see section "How Are Project Scores Computed?". Since each member is required to sign-off on the contribution sheet, teams must prepare and review the sheet before the due date. Again, if a team cannot agree on, or fails to submit a proper contribution sheet for an assessment before the due date, that team's score will be 0 (zero) for the respective assessment.

Peer Feedback

Part of the mid-quarter assessment score is based on the quality of a peer feedback document. Each team will read, evaluate, and suggest improvements to its peer team's project documentation. Feedback assignments (e.g., team X evaluates team Y's documentation) will be disclosed by the TA, shortly after the Milestone 0 documentations are due, i.e., on March 28. The professor will provide tips on how to write an effective peer feedback document.

Milestone Delivery

Each delivery (Milestone 0 and Milestone 1) delivery will consist of two parts:

- Requirements completion. Arrange a meeting with the TA by sending your team's joint availability at least one week in advance of the milestone deadline. During the meeting you will demo the features required for that milestone. Failure to arrange a meeting will lead to a score of 0 (zero) for that milestone's requirements part.

- Documentation. A single PDF must be turned in on Canvas by the deadline.

In-class Presentation

Part of the final assessment score is based on the quality of the in-class presentation (which will take place on May 1). Each presentation will take about 20 minutes, consisting of a project demo and several slides about the team's development process and experience. Each team member is expected to participate in the presentation/demo. The professor will provide presentation guidelines and hints.

Grading

The 49% project score is split as follows:

• 24.5% for the mid-quarter assessment, due March 27 (peer feedback due March 30, see Table).

• 24.5% for the final assessment, due April 27.

The grading criteria differ for midterm and final assessments.

Mid-quarter aka Milestone 0 assessment grading criteria:

1. Completion of Milestone 0 requirements (80%).
2. Project documentation (15%).
3. Quality of peer feedback (5%).
4. Individual contribution sheet, hard-copy, signed by each member.

Final assessment aka Milestone 1 grading criteria:

1. Completion of Milestone 1 requirements, project documentation (85%).
2. Quality of in-class presentation (15%).
3. Individual contribution sheet, hard-copy, signed by each member.

The absence of a signed individual contribution sheet for a team will automatically get that team a score of 0 (zero) for the respective assessment. If, due to extenuating circumstances, one of the team members cannot physically sign the sheet, the circumstances must be disclosed *in advance*, and agreed upon by the professor. Note that submitting the contribution sheet (albeit without all signatures) is still mandatory.

How Are Project Scores Computed?

Each student's mid-quarter and final scores will be computed based on (1) that team's project score (*TeamScore*), which is the same for all team members, and (2) the student's contribution to the project (*IndividualContribution*) divided by the expected contribution (*ExpectedContribution*) . The exact formula is:

IndividualScore = 0   if *IndividualContribution=0*
IndividualScore = *TeamScore* x *IndividualContribution/ExpectedContribution* if *IndividualContribution >*
0; at most 100 points.

Implementation

Teams are free to complete the project in any programming language(s) the members are most comfortable with/proficient in. Use of existing free or open source software components, libraries, frameworks, toolkits, etc. is permitted as long as this use is prominently disclosed in the project documentation.

Frequently Asked Questions

- *Q: Is the CS 631 prerequisite enforced?*
  A: No.

- *Q (class): Why is some of the lecture material disconnected from the project material?*
  A: The lecture covers the theory (principles), while the project covers the practice.

- *Q (class): Why does the project require such a significant effort and moving at a fast pace?*
  A: This class project is a breeze compared to what professional software engineers face.

- *Q (project): What if team members cannot agree on individual contributions?*
  A: Failing to submit a completed contribution sheet will result in all team members receiving a 0 (zero) for that assessment.

- *Q (project): What if one of the team members is not communicating, or not contributing enough, hence dragging the whole team down?*
  A: Inform the professor ASAP if such a situation occurs. While the score computation formula is designed to account for such cases, early resolution is key.

- *Q: We sent the instructors an email, but haven't heard back.*
  A: Barring unforeseen circumstances, the instructors will respond pretty quickly. Unfortunately, we receive a large number of emails that fail to follow procedure. **These emails will not be answered**. Frequent examples: sending a team core composition or a project ranking without cc'ing all team

members; sending a project ranking that does not include all projects. So if you're not receiving a quick response, please double-check the syllabus and make sure you are following procedure.

Course Summary:

Date	Details	Due
Thu Feb 17, 2022	📝 **Weekly contribution log 02.11--02.17 (https://njit.instructure.com/courses/26738/assignments/296942)**	due by 5pm
Thu Feb 24, 2022	📝 **Weekly contribution log 02.18--02.24 (https://njit.instructure.com/courses/26738/assignments/296943)**	due by 5pm
Thu Mar 3, 2022	📝 **Weekly contribution log 02.25--03.03 (https://njit.instructure.com/courses/26738/assignments/296944)**	due by 5pm
Thu Mar 10, 2022	📝 **Weekly contribution log 03.04--03.10 (https://njit.instructure.com/courses/26738/assignments/296945)**	due by 5pm
Thu Mar 24, 2022	📝 **Weekly contribution log 03.21--03.24 (https://njit.instructure.com/courses/26738/assignments/296946)**	due by 5pm
Mon Mar 28, 2022	📝 **M0 documentation (due Monday March 28 at 5pm) (https://njit.instructure.com/courses/26738/assignments/296925)**	due by 5pm
Thu Mar 31, 2022	📝 **Peer Feedback (due Thursday March 31 at 5pm) (https://njit.instructure.com/courses/26738/assignments/296935)**	due by 5pm
	📝 **Weekly contribution log 03.25--03.31 (https://njit.instructure.com/courses/26738/assignments/296947)**	due by 5pm

Date	Details	Due
Thu Apr 7, 2022	📝 **Weekly contribution log 04.01--04.07 (https://njit.instructure.com/courses/26738/assignments/296948)**	due by 5pm
Thu Apr 14, 2022	📝 **Weekly contribution log 04.08--04.14 (https://njit.instructure.com/courses/26738/assignments/296949)**	due by 5pm
Thu Apr 21, 2022	📝 **Weekly contribution log 04.15--04.21 (https://njit.instructure.com/courses/26738/assignments/296950)**	due by 5pm
Fri Apr 29, 2022	📝 **M1 documentation (due Friday April 29 at 5pm) (https://njit.instructure.com/courses/26738/assignments/296929)**	due by 5pm

📝 **Weekly contribution log 04.01--04.07 (https://njit.instructure.com/courses/26738/assignments/296948)**

Date	Details	Due
	📝 **[Final](https://njit.instructure.com/courses/26738/assignments/296923)**	

Date	Details	Due
	📝 **Final Copy** (https://njit.instructure.com/courses/26738/assignments/296924)	
	📝 **M0 Individual Score** (https://njit.instructure.com/courses/26738/assignments/296926)	
	📝 **M0 requirements** (https://njit.instructure.com/courses/26738/assignments/296927)	
	📝 **M0 TeamScore** (https://njit.instructure.com/courses/26738/assignments/296928)	
	📝 **M1 Individual Score** (https://njit.instructure.com/courses/26738/assignments/296930)	
	📝 **M1 Presentation** (https://njit.instructure.com/courses/26738/assignments/296931)	
	📝 **M1 Requirements** (https://njit.instructure.com/courses/26738/assignments/296932)	
	📝 **M1 TeamScore** (https://njit.instructure.com/courses/26738/assignments/296933)	
	📝 **Midterm** (https://njit.instructure.com/courses/26738/assignments/296934)	
	📝 **Quiz 1** (https://njit.instructure.com/courses/26738/assignments/296936)	
	📝 **Quiz 2** (https://njit.instructure.com/courses/26738/assignments/296937)	
	📝 **Quiz 3** (https://njit.instructure.com/courses/26738/assignments/296938)	
	📝 **Quiz 4** (https://njit.instructure.com/courses/26738/assignments/296939)	
	📝 **Quiz 5** (https://njit.instructure.com/courses/26738/assignments/296940)	

Date	Details	Due
	📝 **Quiz A** **(https://njit.instructure.com/courses/26738/assignments/296941)**	

📝 **Quiz A**
(https://njit.instructure.com/courses/26738/assignments/296941)