



**ECE 1145**

**Software Construction and Evolution**

**Fall 2021**

**Description:** In this course, students will learn about software engineering principles related to software construction, maintenance, and evolution, focusing on standards and techniques for developing maintainable, flexible software. Topics covered include: version control and branching, test-driven development, design patterns, coding standards and documentation, exception handling, refactoring, and code review. Students will apply knowledge of these topics in assignments, peer code reviews, and a course project with multiple iterations.

**Objectives:** After completing this course, students will be able to:

1. Design and implement testable software systems
2. Refactor software developed by themselves and others
3. Utilize version control and branching workflows for individual and team software development
4. Apply coding standards for maintainability and flexibility
5. Apply software design patterns and maintain patterns in existing software systems
6. Develop fault-tolerant software with exception handling
7. Conduct effective peer code reviews

**Instructor:** Dr. Kara Bocan  
Office Hours: Tu/Th 10:00 AM – 11:00 AM, or by appointment  
Location: 1206 Benedum Hall, or online (see links provided on Canvas)  
Email: [knb12@pitt.edu](mailto:knb12@pitt.edu) (Include “ECE 1145” in the subject line)

**Graduate Teaching Assistant:**  
Evan McKinney  
Office Hours: TBD

**Website:** [canvas.pitt.edu](https://canvas.pitt.edu)

**Lectures:** M/W 3:00 – 4:15 PM 1239 Benedum Hall

**Prerequisites:** ECE 0302: Data Structures and Algorithms

**Textbook:** Available free online via the Pitt library:  
[https://pitt.primo.exlibrisgroup.com/permalink/01PITT\\_INST/1sjtb5p/alma9998550973506236](https://pitt.primo.exlibrisgroup.com/permalink/01PITT_INST/1sjtb5p/alma9998550973506236)

*Flexible Reliable Software: Using Patterns and Agile Development, Henrik B. Christensen, Andrew McGettrick, and John Impagliazzo, 2010 CRC Press LLC (ISBN: 978-1-4200-9362-9)*

<b>Grading:</b>	Code Reviews	5%
	Midterm	12%
	Final	13%
	Project (Iterations 1 - 8)	70%
	Iteration 1	5%
	Iteration 2	5%
	Iteration 3	8%
	Iteration 4	8%
	Iteration 5	10%
	Iteration 6	10%
	Iteration 7	12%
	Iteration 8	12%

**Code Reviews:** Students will be assigned to review sample code and code written by their peers and to revise/refactor code based on feedback.

**Exams:** There will be one midterm and one final exam related to the course project and concepts covered in class. The exams will be submitted online and also discussed with the instructor. See the schedule below and any updates on Canvas. Make-up exams will only be given in the event of an emergency and only if advance notification is provided.

**Project:** The course project is completed in a series of nine iterations (0 – 8) over the course of the semester. Each iteration 1 – 8 counts toward the total project grade.

**Late Work Policy:** Late work will be accepted up to 48 hours after the initial due date with a 30% penalty, unless an extension request is approved **prior to the assignment due date**. Extensions are granted at the instructor’s discretion.

**Disability Services:** If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, [drsrecep@pitt.edu](mailto:drsrecep@pitt.edu), (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course. <https://www.diversity.pitt.edu/disability-access/disability-resources-and-services> .

**Student Opinion of Teaching Surveys:** Students in this class will be asked to complete a Student Opinion of Teaching Survey. Surveys will be sent via Pitt email and appear on your Canvas landing page during the last three weeks of class meeting days. Your responses are anonymous. Please take time to thoughtfully respond, your feedback is important to me and is valuable for future iterations of this course. Visit the University Center for Teaching and Learning website to learn more about Student Opinion of Teaching Surveys.

**Religious Observance:** The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. If at all possible, please contact me within the first two weeks of the semester to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.

**Diversity and Inclusion:** All members of this class are expected to contribute to a respectful and supportive environment for every other member of the class. The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital

status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: <https://www.diversity.pitt.edu/>.

If there are instances of these issues listed above, please contact the Title IX Coordinator by calling 412-648-7860 or emailing [titleixcoordinator@pitt.edu](mailto:titleixcoordinator@pitt.edu). Reports can also be filed online: <https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form>. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

**COVID-19 Statement:** During this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. While in class, at a minimum, you must wear a face covering that covers your nose and mouth; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit [coronavirus.pitt.edu](https://coronavirus.pitt.edu) and check your Pitt email for updates before each class.

**Communication with Instructor Pertaining to Illness:** As in any situation regarding class absence (remote or in person), a student who becomes ill (COVID-19 related or not) is responsible for communicating with the instructor regarding course absences. Please contact the instructor via email as soon as possible when absences affect quizzes/exams.

**Academic Integrity:** Students are expected to submit their own work, follow instructions on allowed resources for each assignment, and to acknowledge references and assistance. All students and faculty are expected to adhere to the standards of professional conduct and academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the SSOE Academic Integrity Policy found at: <https://www.engineering.pitt.edu/Academic-Integrity-Guidelines/>.

**Statement on Classroom Recording:** Students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

**ABET:** This course is designed to meet ABET accreditation requirements and contribute to student attainment of the following ABET outcomes:

2. an ability to apply **engineering design** to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering

sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for the purpose of obtaining a high-quality solution under the given circumstances. For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

3. an ability to communicate effectively with a range of audiences
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

**Lecture Schedule:** The table below lists topics that will be covered in each lecture. A detailed schedule will be posted and updated on Canvas.

Lecture Topic	Textbook Reference
Software Evolution, Quality, Maintainability	CH 1, 3, 10
Project Overview, Tools and Environment	CH 36.1, 36.2
Test-Driven Development	CH 2, 4, 5
Configuration, Build, and Release Management	CH 6, 33
Design Patterns Overview, Strategy Pattern	CH 7, 8, 9
Refactoring and Integration Testing	CH 8
Coding Standards, Documentation, Maintainability	CH 3, 10
Code Review	
Variability Management, State Pattern, Test Stubs	CH 11, 12
<b>Midterm</b>	
Abstract Factory Pattern, Pattern Fragility	CH 13, 14
Compositional Design, Roles and Responsibility	CH 15, 16
Multi-Dimensional Variability	CH 17, 18
Design Pattern Catalog	CH 19 – 23, 25, 27
Systematic Testing	CH 34
Code Coverage	
More Design Patterns (Composite, Observer, MVC, Template)	CH 26, 28, 29, 31
Framework Theory, Project GUI	CH 30, 32
Exception Handling	
<b>Final</b>	