Northeastern University
College of Engineering

Multidisciplinary Graduate Engineering
Course Syllabus

Course Information
CSYE 7374 Design Patterns
CSYE 7374
Spring 2024
4.0
Boston Campus

Instructor Information
Daniel Peters
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TA Information
N.A.

About Canvas
This course is on Canvas and all student submissions will be submitted to Canvas. Blackboard will not be utilized.

Technical/Course Materials Requirements

A software development platform (e.g. desktop or laptop computer) is required for this course and must be set-up and maintained by the student with the following installed software:
1. Java SE Development Kit 8
2. Eclipse IDE for Java Developers (2020-6 version or newer)
3. NetBeans IDE (version 8.2 or newer)

Supplemental Materials (Recommended but NOT Required)

1. **Design Patterns: Elements of Reusable Object-Oriented Software** by *Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides*, 1st Edition, Addison-Wesley Professional Computing Series (ISBN-10: 020-1633612 ISBN-13: 978-020-1633610)
2. Java The Comploete Reference by Herbert Schildt, 9th Edition, McGraw-Hill Professional Publishing (ISBN-10: 0071808558 ISBN-13: 9780071808552)
3. *Thinking in Java* by Bruce Eckel, 4th Edition, Prentice Hall (ISBN-13: 978-0131872486 ISBN-10: 0131872486)
4. *Effective Java* by Joshua Bloch, 2nd Edition, Addison-Wesley (ISBN-13: 860-1300201986 ISBN-10: 0321356683)
5. *Head First Design Patterns* by Eric Freeman, Bert Bates, Kathy Sierra, Elisabeth Robson, 1st Edition, O'REILLY (ISBN-13: 000-0-596-00712-4 ISBN-10: 0-596-00712-4)

Course Description/Prerequisite

Introduces Design Patterns: Building Blocks of the Best Software Architectures and Designs.

Use Factory and Command Patterns for abstraction over object creation and execution and thereby design and write software that is extensible, maintainable and cost effective because it is loosely coupled. Employ the Decorator Pattern to design and write software that can be dynamically constructed without recompilation.

As industry standard best practice, each design pattern is studied to show how it solves a real-world problem with a proven, well established and well-known solution.

Students will learn from a pragmatic teach-by-example/learn-to-do methodology.

Lectures are specifically designed with Java code examples so students can master fundamental concepts while developing their own critical skills in a demystifying and easy to absorb format.

As each student incorporate design patterns into their software, they will learn invaluable design concepts and methodologies used in modern software architecture and design.

Concepts like Abstraction for Functionality Hiding, Loose Coupling for design extensibility and S.O.L.I.D. design principles are all characteristic of the very best software architectures and designs.

Elegant and pragmatic: these key concepts simplify software, allow for its reuse and reduces software development cost.

Upon successful completion students will be prepared to master the interview and produce on the job.

Applicable to any object-oriented language, this course will teach the student implementations in Java with references to C++ and C#.

This course will teach object-oriented software design patterns from the design process through its application and implementation in modern object-oriented software. Requires a course project. Requires knowledge of Java programming.

Student Learning/Course Outcomes (SLOs)

Specialized Knowledge	Broad and Integrative Knowledge	Applied and Collaborative Learning	Civic and Global Learning	Experiential Learning

Understand the pragmatic use and benefits of Objects Oriented Design				
Gain a working knowledge of Encapsulation, Data Abstraction and Polymorphism				
Learn design decomposition for distributed and managed software development				
Learn the use of Design Patterns and SOLID design principles				
Learn the Design and use of an Application Programming Interface (API) for a robust and extensible design.				
Understand Functionality Hiding as implemented by Design Patterns				
Develop familiarity with Eclipse IDE				
Gain a working, pragmatic knowledge of the design and implementation of Industry Standard Design Patterns				

Attendance Policy

Students are expected to complete course readings, participate in class discussions or other learning activities during the unit, and complete written assignments for each unit during the time of that unit. It is understood that there might be one week when active participation in ongoing class conversations and learning activities might be delayed.

Beyond one week time, if there is an absence or lateness in participation (1) faculty must be notified in advance; (2) grades will be adjusted accordingly.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus.

Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late.

Work submitted late without prior communication with faculty will not be graded.

Grading/Evaluation Standards

Each student will be graded based on their learning as demonstrated in take home assignments and projects as well as in-class quizzes and exams.

Grade Scale

95-100%	A	87-89.9%	B+	77-79.9%	C+		
		84-86.9%	B	74-76.9%	C	69.9% or below	F
90-94.9%	A-	80-83.9%	B-	70-73.9%	C-		

Grade Breakdown:

Attendance and class participation – 10 %

Assignments, Quizzes, Projects – 40 %

Mid-term Exam – 25 %

Final Exam – 25 %

Course Schedule (Wednesday May 12, 2021 thru Wednesday August 20, 2021)

Week	Topic	Reading
1	INTRODUCTION to Design Patterns • Java Classes & Objects • UML, Object Oriented Design Principles • S.O.L.I.D. Design Principles	
2	INHERITANCE , POLYMORPHISM • Abstract, Derived Classes, Interfaces • API Data Abstraction	

	• Method Overloading, Overriding S.O.L.I.D. DESIGN PRINCIPLES • Best Design Practices	
3	Singleton, Factory Design Pattern • Gang of Four	
4	Adapter & Builder Design Pattern • Gang of Four	
5	Strategy & Flyweight Design Pattern • Gang of Four	
6	Decorator & Composite Design Pattern • Gang of Four	
7	Bridge Design Pattern • Gang of Four	
8	MIDTERM EXAM	
9	Prototype Design Pattern • Gang of Four	
10	Command Design Pattern • Gang of Four	
11	Template Method & State Design Pattern • Gang of Four	
12	Facade Design Pattern • Gang of Four	
13	Observer Design Pattern • Gang of Four	
14	FINAL EXAM	
15	PROJECT PRESENTATIONS	

Week	Topic	Reading
1		
2		
3		
4		
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12		
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15		

Recording of Classes

Classes will be recorded to enable all students to review material covered in synchronous classes. Please contact me if you have any concerns.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit http://www.northeastern.edu/drc/getting-started-with-the-drc/.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for Education specific resources, visit http://subjectguides.lib.neu.edu/edresearch.

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus. In the classroom, member of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice. It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

TITLE IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff.

In case of an emergency, please call 911.

Please visit www.northeastern.edu/titleix for a complete list of reporting options and resources both on- and off-campus.