

Syllabus

This is a single, concatenated file, suitable for printing or saving as a PDF for offline viewing. Please note that some animations or images may not work.

Description

This [module](#) is also available as a concatenated page, suitable for printing or saving as a PDF for offline viewing.

MET CS 665

Software Design and Patterns

This course is an introduction to software design and patterns. You will learn about general software development principles and software design patterns. A design pattern is a general reusable solution to a commonly occurring problem within a given context in software design. Patterns are formalized best practices that the programmers should implement in the applications. This course covers the most common object-oriented software design patterns. For each pattern, it will discuss the underlying object-oriented design principle it is based on; the specific object-oriented design problem it solves; the context it can be applied and the consequences of applying it; how the different components of the pattern collaborate with each other.

Course Prerequisites: Student should have a solid background in object-oriented programming. The following classes are required/recommended:

- MET CS 341 or MET CS 342 (Data Structures with C++ or Java) is required for understanding the contents of this course.
- MET CS 520 or MET CS 521
- MET CS 526 (Data Structures and Algorithms) or MET CS 622 Advanced Programming Techniques

The course emphasizes the object-oriented design pattern concepts independent of programming language. All examples in class use Java, C++, and Python programs. Students need to know Java programming language to implement the homework or project assignments.

Technical Notes

The table of contents expands and contracts (+/- sign) and may conceal some pages. To avoid missing content pages, you are advised to use the next/previous page icons in the top right corner of the learning modules.

This course requires you to access files such as word documents, PDFs, and/or media files. These files may open in your browser or be downloaded as files, depending on the settings of your browser.

Learning Objectives

By successfully completing this course, you will be able to:

1. Identify and retain the goals of software design
2. Apply the principle design patterns in software design projects
3. Implement procedures reliably and flexibly

4. Perform object-oriented analysis and design

Materials

Recommended Books

Eric, J. Braude. (2003). *Software Design: From Programming to Architecture.*

Publisher: Wiley

ISBN-13: 978-0471204596

ISBN-10: 0471204595

This book can be purchased from [Barnes and Noble at Boston University.](#)

Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Grady Booch. (1994). *Design Patterns: Elements of Reusable Object-Oriented Software.*

Publisher: Addison-Wesley Professional

ISBN-13: 978-0201633610

ISBN-10: 0201633612

This book can be purchased from [Barnes and Noble at Boston University.](#)

Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra. (2004). *Head First Design Patterns.*

Publisher: O'Reilly

ISBN-13: 978-0596007126

ISBN-10: 0596007124

This book can be purchased from [Barnes and Noble at Boston University.](#)

Robert C. Martin. (2008). *Clean Code: A Handbook of Agile Software Craftsmanship.*

Publisher: Prentice Hall

ISBN-13: 978-0132350884

ISBN-10: 0132350882

This book can be purchased from [Barnes and Noble at Boston University.](#)

Boston University Library Information

Boston University has created a set of videos to help orient you to the online resources at your disposal. An introduction to the series is below:

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All of the videos in the series are available on the [Online Library Resources](#) page, which is also accessible from the Campus Bookmarks section of your Online Campus Dashboard. Please feel free to make use of them.

As Boston University students, you have full access to the BU Library. From any computer, you can gain access to anything at the library that is electronically formatted. To connect to the library, use the link <http://www.bu.edu/library>. You may use the library's content whether you are connected through your online course or not, by confirming your status as a BU community member using your Kerberos password.

Once in the library system, you can use the links under “Resources” and “Collections” to find databases, eJournals, and eBooks, as well as search the library by subject. Some other useful links follow:

Go to <http://www.bu.edu/library/research/collections> to access eBooks and eJournals directly.

If you have questions about library resources, go to <http://www.bu.edu/library/help/ask-a-librarian> to email the library or use the live-chat feature.

To locate course eReserves, go to <http://www.bu.edu/library/services/reserves>.

Please note that you are not to post attachments of the required or other readings in the water cooler or other areas of the course, as it is an infringement on copyright laws and department policy. All students have access to the library system and will need to develop research skills that include how to find articles through library systems and databases.

Study Guide

Module 1 Study Guide and Deliverables

Module Themes:

- Introduction and Design Principles
- Unified Modeling Language (UML)

- Class Diagram, Sequence, Use Case, State

Readings: • Module 1 online content - Appendices section is optional

Assessments: Quiz 1 due Wednesday, February 29, at 6:00 AM ET

Assignments: Assignment 1 due Wednesday, February 5, at 6:00 AM ET

Module 2 Study Guide and Deliverables

Module Themes:

- Introduction to Design Patterns
- Strategy Pattern, Observer Pattern
- Abstract Factory Pattern
- Pattern Categories

Readings: • Module 2 online content

Assessments: Quiz 2 due Wednesday, February 12, at 6:00 AM ET

Assignments: Assignment 2 due Wednesday, February 19, at 6:00 AM ET

Module 3 Study Guide and Deliverables

Module Themes:

- Creational Design Patterns
- Factory, Abstract Factory, Singleton and Prototype Pattern

Readings: • Module 3 online content

Assessments: Quiz 3 due Wednesday, February 26, at 6:00 AM ET

Assignments: Assignment 3 due Wednesday, March 4, at 6:00 AM ET

Module 4 Study Guide and Deliverables

Module Themes:

- Structural Design Patterns
- Facade, Decorator, Composite, Adapter, Flyweight and Proxy Patterns

Readings: • Module 4 online content

Assessments: Quiz 4 due Wednesday, March 11, at 6:00 AM ET

Assignments: Assignment 4 due Wednesday, March 18, at 6:00 AM ET

Module 5 Study Guide and Deliverables

Module Theme:

- Behavioral Design Patterns
- Observer, Visitor, State, Template and Strategy Patterns
- Combination of design patterns
- Software Architecture and Frameworks
- Software Libraries

Readings: • Module 5 online content

Assessments: Quiz 5 due Wednesday, March 25, at 6:00 AM ET

Assignments: Assignment 5 due Wednesday, April 1, at 6:00 AM ET

Module 6 Study Guide and Deliverables

Module Theme: • Refactoring and Code Cleaning

Readings: Module 6 online content

Assessments: Quiz 6 due Wednesday, April 8, at 6:00 AM ET

Assignments: • Assignment 6 due Wednesday, April 15, at 6:00 AM ET
 • Class Project due Wednesday, April 29, at 6:00 AM ET

Final Exam Details

The Final Exam will be on **Wednesday, May 6 at 6:00 PM ET.**

The Final Exam will be **closed book/closed notes.**

Final Exam duration: **three hours**

The exam features a combination of multiple-choice (choose one), choose-multiple (choose zero or more), and true/false questions.

Grading Information

Grading Structure and Distribution

The grade for the course is determined by the following:

Overall Grading Percentages

Assignments	30
Weekly Quizzes	20
Final Class Project	20
Proctored Final Exam	30

Translation between letter grades and percentages.

A (Excellent)	95-100
A- (Excellent; minor improvement evident)	90-94.99
B+ (Very good)	87-89.99
B (Good)	83-86.99
B- (Good mostly some significant improvements needed)	80-82.99
C+ (Satisfactory; some significant improvements needed)	77-79.99
C (Satisfactory; significant improvements needed)	73-86.99
C- (Satisfactory; significant improvements required)	70-82.99
D Many improvements required	65
Fail	0

Graded Items:

- **Assignments:** There are a total of 6 assignments. Assignments are software design and implementation assignments using **UML diagrams** and **JAVA programming languages**.
 - We will also use some additional tools and framework like **Apache Maven, Findbugs, CheckStyle and JUnit**. You will learn about these tools in this course.
 - You can access and submit the assignment in the "Assignments" area.
- **Final Class Project:** The Final Class Project is similar to the assignments, but the topic is open and you can develop your own ideas.
 - One part of the final project is to present your final project and record a presentation video.
 - Submission direction: Access and submit the Final Class Project in the "Assignments" area.
- **Quizzes:** Quizzes are designed to assess your understanding of the material, on a module-by-module basis. There is one graded quiz in each of the six modules.

Quiz taking direction:

- The results for your quiz will be released as soon as possible after the quiz closes. When the quiz results are released, you will be able to see the questions, your answers, and the correct answers
 - Access and take the quiz in the "Assessments" area.
- **Proctored Final Exam:** There will be a proctored Final Exam in this course using a proctor service called Examity. Detailed instructions regarding your proctored exam will be forthcoming from the Assessment Administrator. You will be responsible for scheduling your own appointment.

Final Exam access direction:

- Access and take the Final Exam in the "Assessments" area.

Lateness

We recognize that emergencies occur in professional and personal lives. If one occurs that prevents your completion of homework by a deadline, please make this plain to your instructor. This must be done in advance of the deadline (unless the emergency makes this impossible, of course), and should be accompanied by

particulars that back it up. Additional documentation may be requested. Late submissions without reasons will result in grade deduction: we want to be fair to everyone in this process, including the vast majority of you who sacrifice so much to submit your homework on time in this demanding schedule.

Academic Conduct Policy

Please visit Metropolitan College's website for the full text of the department's [Academic Conduct Code](#).

A Definition of Plagiarism

“The academic counterpart of the bank embezzler and of the manufacturer who mislabels products is the plagiarist: the student or scholar who leads readers to believe that what they are reading is the original work of the writer when it is not. If it could be assumed that the distinction between plagiarism and honest use of sources is perfectly clear in everyone’s mind, there would be no need for the explanation that follows; merely the warning with which this definition concludes would be enough. But it is apparent that sometimes people of goodwill draw the suspicion of guilt upon themselves (and, indeed, are guilty) simply because they are not aware of the illegitimacy of certain kinds of “borrowing” and of the procedures for correct identification of materials other than those gained through independent research and reflection.”

“The spectrum is a wide one. At one end there is a word-for-word copying of another’s writing without enclosing the copied passage in quotation marks and identifying it in a footnote, both of which are necessary. (This includes, of course, the copying of all or any part of another student’s paper.) It hardly seems possible that anyone of college age or more could do that without clear intent to deceive. At the other end there is the almost casual slipping in of a particularly apt term which one has come across in reading and which so aptly expresses one’s opinion that one is tempted to make it personal property.”

“Between these poles there are degrees and degrees, but they may be roughly placed in two groups. Close to outright and blatant deceit—but more the result, perhaps, of laziness than of bad intent—is the patching together of random jottings made in the course of reading, generally without careful identification of their source, and then woven into the text, so that the result is a mosaic of other people’s ideas and words, the writer’s sole contribution being the cement to hold the pieces together. Indicative of more effort and, for that reason, somewhat closer to honest, though still dishonest, is the paraphrase, and abbreviated (and often skillfully prepared) restatement of someone else’s analysis or conclusion, without acknowledgment that another person’s text has been the basis for the recapitulation.”

The paragraphs above are from H. Martin and R. Ohmann, *The Logic and Rhetoric of Exposition, Revised Edition*. Copyright 1963, Holt, Rinehart and Winston.

Academic Conduct Code

I. Philosophy of Discipline

The objective of Boston University in enforcing academic rules is to promote a community atmosphere in which learning can best take place. Such an atmosphere can be maintained only so long as every student believes that his or her academic competence is being judged fairly and that he or she will not be put at a disadvantage because of someone else’s dishonesty. Penalties should be carefully determined so as to be no more and no less than required to maintain the desired atmosphere. In defining violations of this code, the intent is to protect the integrity of the educational process.

II. Academic Misconduct

Academic misconduct is conduct by which a student misrepresents his or her academic accomplishments, or impedes other students' opportunities of being judged fairly for their academic work. Knowingly allowing others to represent your work as their own is as serious an offense as submitting another's work as your own.

III. Violations of this Code

Violations of this code comprise attempts to be dishonest or deceptive in the performance of academic work in or out of the classroom, alterations of academic records, alterations of official data on paper or electronic resumes, or unauthorized collaboration with another student or students. Violations include, but are not limited to:

- A. **Cheating on examination.** Any attempt by a student to alter his or her performance on an examination in violation of that examination's stated or commonly understood ground rules.
- B. **Plagiarism.** Representing the work of another as one's own. Plagiarism includes but is not limited to the following: copying the answers of another student on an examination, copying or restating the work or ideas of another person or persons in any oral or written work (printed or electronic) without citing the appropriate source, and collaborating with someone else in an academic endeavor without acknowledging his or her contribution. Plagiarism can consist of acts of commission-appropriating the words or ideas of another-or omission failing to acknowledge/document/credit the source or creator of words or ideas (see below for a detailed definition of plagiarism). It also includes colluding with someone else in an academic endeavor without acknowledging his or her contribution, using audio or video footage that comes from another source (including work done by another student) without permission and acknowledgement of that source.
- C. **Misrepresentation or falsification of data** presented for surveys, experiments, reports, etc., which includes but is not limited to: citing authors that do not exist; citing interviews that never took place, or field work that was not completed.
- D. **Theft of an examination.** Stealing or otherwise discovering and/or making known to others the contents of an examination that has not yet been administered.
- E. **Unauthorized communication during examinations.** Any unauthorized communication may be considered prima facie evidence of cheating.
- F. **Knowingly allowing another student to represent your work as his or her own.** This includes providing a copy of your paper or laboratory report to another student without the explicit permission of the instructor(s).
- G. **Forgery, alteration, or knowing misuse of graded examinations, quizzes, grade lists, or official records of documents,** including but not limited to transcripts from any institution, letters of recommendation, degree certificates, examinations, quizzes, or other work after submission.
- H. **Theft or destruction of examinations or papers** after submission.
- I. **Submitting the same work in more than one course** without the consent of instructors.
- J. **Altering or destroying another student's work or records,** altering records of any kind, removing materials from libraries or offices without consent, or in any way interfering with the work of others so as to impede their academic performance.
- K. **Violation of the rules governing teamwork.** Unless the instructor of a course otherwise specifically provides instructions to the contrary, the following rules apply to teamwork: 1. No team member shall intentionally restrict or inhibit another team member's access to team meetings, team work-in-progress, or other team activities without the express authorization of the instructor. 2. All team members shall be held responsible for the content of all teamwork submitted for evaluation as if each team member had individually submitted the entire work product of their team as their own work.
- L. **Failure to sit in a specifically assigned seat during examinations.**
- M. **Conduct in a professional field assignment that violates the policies and regulations of the host school or agency.**

- N. **Conduct in violation of public law occurring outside the University that directly affects the academic and professional status of the student, after civil authorities have imposed sanctions.**
- O. **Attempting improperly to influence the award of any credit, grade, or honor.**
- P. **Intentionally making false statements to the Academic Conduct Committee or intentionally presenting false information to the Committee.**
- Q. **Failure to comply with the sanctions imposed under the authority of this code.**

Microsoft Azure Dev Tools for Teaching

Microsoft Azure Dev Tools for Teaching a Microsoft program that supports technical education by providing access to Microsoft software for learning, teaching, and research purposes. Our membership allows faculty and students currently enrolled in MET courses to obtain certain Microsoft products free of charge. All MET students are granted access to download the software for the duration of their study at MET College.

FAQ and basic information are at [Microsoft Azure Dev Tools for Teaching](#) (You may have to enter your personal BU login credentials to access this page.)

Disability Services

In accordance with University policy, every effort will be made to accommodate unique and special needs of students with respect to speech, hearing, vision, or other disabilities. Any student who feels he or she may need an accommodation for a documented disability should contact [Disability & Access Services](#) at (617) 353-3658 or at access@bu.edu for review and approval of accommodation requests.

Netiquette



The Office of Distance Education has produced a netiquette guide to help you understand the potential impact of your communication style.

Before posting to any discussion forum, sending email, or participating in any course or public area, please consider the following:

Ask Yourself...

- How would I say this in a face-to-face classroom or if writing for a newspaper, public blog, or wiki?
- How would I feel if I were the reader?
- How might my comment impact others?

- Am I being respectful?
- Is this the appropriate area or forum to post what I have to say?

Writing

When you are writing, please follow these rules:

- **Stay polite and positive in your communications.** You can and should disagree and participate in discussions with vigor; however, when able, be constructive with your comments.
- **Proofread your comments before you post them.** Remember that your comments are permanent.
- **Pay attention to your tone.** Without the benefit of facial expressions and body language, your intended tone or the meaning of the message can be misconstrued.
- **Be thoughtful and remember that classmates' experience levels may vary.** You may want to include background information that is not obvious to all readers.
- **Stay on message.** When adding to existing messages, try to maintain the theme of the comments previously posted. If you want to change the topic, simply start another thread rather than disrupt the current conversation.
- **When appropriate, cite sources.** When referencing the work or opinions of others, make sure to use correct citations.

Reading

When you are reading your peers' communication, consider the following:

- **Respect people's privacy.** Don't assume that information shared with you is public; your peers may not want personal information shared. Please check with them before sharing their information.
- **Be forgiving of other students' and instructors' mistakes.** There are many reasons for typos and misinterpretations. Be gracious and forgive other's mistakes or privately point them out politely.
- **If a comment upsets or offends you, reread it and/or take some time before responding.**

Important Note

Don't hesitate to let your instructor or your faculty and student support administrator know if you feel others are inappropriately commenting in any forum.

All Boston University students are required to follow academic and behavioral conduct codes. Failure to comply with these conduct codes may result in disciplinary action.

Technical Support

Experiencing Issues with BU Websites or Blackboard?

It may be a system-wide problem. Check the BU Information Services & Technology (IS&T) [news page](#) for announcements.

Boston University technical support is available via email (ithelp@bu.edu), the [support form](#), and phone (617-353-4357). Please note that the IT Help Center has multiple locations. All locations can be reached through the previously mentioned methods. For IT Help Center hours of operation, please visit their [contact page](#). For other times, you may still submit a support request via email, phone, or the support form, but your question won't receive a response until the following day. If you aren't calling, it is highly recommended that you submit your

support request via the technical-support form, as this provides the IS&T Help Center with the best information in order to resolve your issue as quickly as possible.

Examples of issues you might want to request support for include the following:

- Problems viewing or listening to sound or video files
- Problems accessing internal messages
- Problems viewing or posting comments
- Problems attaching or uploading files for assignments or discussions
- Problems accessing or submitting an assessment

To ensure the fastest possible response, please fill out the online form using the link below:

IT Help Center Support

617-353-4357 or [Web](#)

Check your open tickets using [BU's ticketing system](#).

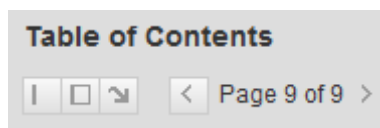
Navigating Courses

For best results when navigating courses, it is recommended that you use the Mozilla [Firefox](#) browser.

The Table of Contents may contain folders. These folders open and close (+ and – signs) and may conceal some pages. To avoid missing content pages, you are advised to use the next- and previous-page buttons (and icons) in the top-right corner of the learning content.

Please also familiarize yourself with the navigation tools, as shown below; these allow you to show and hide both the Course Menu and the Table of Contents on the left. This will be helpful for freeing up screen space when moving through the weekly lecture materials.

Navigation tools for the Table of Contents are shown in the image below:



Clicking the space between the Course Menu and the Table of Contents allows you to show or hide the Course Menu on the left:



Web Resources/Browser Plug-Ins

To view certain media elements in this course, you will need to have several browser plug-in applications installed on your computer. See the Course Resources page in the syllabus of each individual course for other specific software requirements.

- Check your computer's compatibility by reviewing Blackboard's [System Requirements](#)
- Check your browser settings with Blackboard's [Connection Test](#)
- Download most recent version of [Adobe Flash Player](#)
- Download most recent version of [Adobe Acrobat Reader](#)

How to Clear Your Browser Cache

The IT Help Center recommends that you periodically [clear your browser cache](#) to ensure that you are viewing the most current content, particularly after course or system updates.

This page is also found within the "How to..." section of the [online documentation](#), which contains a list of some of the most common tasks in Blackboard Learn.