

CSCI 4448 & 5448 Syllabus

Object-Oriented Analysis & Design

Fall 2022

Instructor	Bruce R. Montgomery, PhD, PMP	Piazza	https://piazza.com/colorado/fall2022/csci44485448/home
Office	Remote/Off-campus	E-mail	bruce.r.montgomery@colorado.edu
Office Hours	Mon: Noon – 1:00 PM Tue/Thur: 1:30 – 3:00 PM https://cuboulder.zoom.us/j/3844137608	Canvas	https://canvas.colorado.edu/courses/87273

I. Overview

Lectures: Monday/Wednesday/Friday, 10:10 AM to 11:00 AM. Note: I will be presenting all lectures remotely via Zoom conference. The Zoom conference link is <https://cuboulder.zoom.us/j/93194084475> and you must use a colorado.edu login to attend. More on this below.

Class Staff:

- TA Dwight Browne dwight.browne@colorado.edu
- CM Roshan Nellore Prasad rone7552@colorado.edu
- CM William (Max) Donovan wido1885@colorado.edu
- CM Gayathri Padmanabhan gayathri.padmanabhan@colorado.edu
- Grader Vardhini Balasubramanian vaba6239@colorado.edu

II. Description and Content

Object-Oriented Analysis and Design is a course that presents an introduction to the design and construction of software systems using techniques that view a system as a set of objects that work together to realize the system's functionality. This perspective stands in contrast to more traditional "procedural" or "structured" design techniques that viewed systems as a set of procedures that manipulate shared data structures. Proponents of object-oriented techniques point to the flexibility and extensibility of object-oriented systems along with other benefits such as increased modularity, abstraction, and encapsulation.

In this class, we will examine fundamental object-oriented analysis and design techniques and show how decisions made during analysis and design impact the implementation of software systems. This class does not focus on object-oriented programming; however, we will examine many examples of object-oriented systems written in Java, Python, and other languages. A primary focus will be the understanding and application of key object-oriented principles and design patterns.

By the end of the class, students will have been exposed to the major steps of object-oriented software development life cycles and will understand the tools and techniques that are used in such development. They will also have applied these skills to the development of projects and the analysis of real-world object-oriented systems.

III. Requirements and Format

Prerequisites:

This course involves extensive work in programming for projects and assessments and therefore requires knowledge of programming (this course will primarily use Java, along with some Python) and basic computer architecture. Corresponding CU Boulder courses includes CSCI 1300 and 2270. Both Java and Python are straightforward languages to install, read, and

apply, especially for those with existing background in other languages (like C, C++, or C#). They are also particularly suited to object-oriented design projects such as those in this class.

Note: neither Java nor Python programming will be taught in depth as an in-class topic, although examples and code snippets will be reviewed. Links for Java and Python tutorials and support materials will be provided for students to use as needed.

The class may also provide experience with other tools and languages, including but not limited to Git, HTML, UML, Amazon Web Services, various databases, and others. Prior experience in these tools is not required for the class.

Attendance and Participation:

Class lectures will start promptly at the scheduled class start time. Attendance at every class is encouraged as we will conduct individual and group classroom activities, and students are encouraged to participate in activities and class discussions of course topics. While we will be doing some in-class exercises, you will have other options for any bonus awards from such exercises if you cannot attend synchronously. You may take the class entirely asynchronously, as long as deadlines for submissions are met. Lectures will be recorded and posted on the class Canvas site for later viewing. Because of the remote nature of this semester, participation will primarily be graded based on Piazza contributions and comments. This will be detailed in class.

Class materials will be made available on Canvas along with any assignments. Students are expected to keep up with the course material and assignments as they are presented. If you fall behind, or experience personal issues which prevent participation, or you need other help, please schedule an appointment with the class staff as soon as possible.

Students are expected to complete assignments on time, extensions to class assignment dates will be very rare. In some cases, project assignments will be accepted late, but the grade earned on the assignment will be reduced – this allowance and reduction will be made clear for each assignment. Details of late policies will be reviewed in class as needed.

Canvas Web-based Instruction and Piazza Messaging:

Students must have access to and accounts for Canvas to find materials and recorded lectures, get class notices, submit homework, and take quizzes and/or exams. I will use the announcements feature of Canvas for posting information on assignments and class changes. Please ensure you can reach the class Canvas site (<https://canvas.colorado.edu/courses/87273>). You should also ensure that you sign up in Canvas account settings for notifications of news, class schedule or assignment changes, content postings, assignment and quiz due dates, and grade updates.

For messaging and postings of discussion materials, we will be using Piazza, which is available for the web as well as iOS and Android apps. Please sign up for your Piazza connection at: <https://piazza.com/colorado/fall2022/csci44485448/home>. The class staff will try to answer questions posted on Piazza as quickly as possible. We will also use Piazza for posting articles and links related to class subjects.

Remote Participation:

Due to class logistics, the majority of contact in the class, including lectures, will be via Zoom conferencing. To join the class lectures synchronously, use the following Zoom meeting ID & connection information:

Join Zoom Meeting: <https://cuboulder.zoom.us/j/93194084475>

Meeting ID: 931 9408 4475

One tap mobile

+13017158592,,93194084475# US (Washington DC)

+13092053325,,93194084475# US

Find your local number: <https://cuboulder.zoom.us/u/adURsddx6F>

For more information, visit the OIT Zoom website:

<https://oit.colorado.edu/services/conferencing-services/web-conferencing-zoom/help/getting-started>

For questions or comments regarding accessibility issues in Zoom, please contact the CU Digital Accessibility Office at digitalaccessibility@colorado.edu.

Readings:

Course materials include lecture slides, project guides, and other online materials, with frequent references to various texts and other resources. The textbook for the class is a required resource.

Textbook:

- **Head First Design Patterns**
 - By Freeman, Robson, Bates, & Sierra
 - O'Reilly Media, December 2020 (**2nd Edition**)
 - Available as a paper book (\$42) or e-book (\$21 rent, \$40 buy) via Amazon.
 - The e-book is also available via O'Reilly Safari (**free access at CU Library** online e-books here: <https://libguides.colorado.edu/strategies/ebooks> under the sciences tab).

Course lecture slides, course labs and project material, and links to other readings or web sites to support class topics and projects will be embedded in lecture slides and provided via Canvas.

Homework and Projects:

Homework and related project assignments will be provided covering material from class lectures. When indicated, students may collaborate on homework as presented in homework details; a group of students collaborating on a homework may turn in one group submission. All homework and reports must be legibly written or typed and must include all the students name(s) in the submission. All homework assignments should be turned in at the due date/time presented for the assignment on Canvas. Late homework may be accepted but will be penalized as detailed in class or assignment descriptions.

Code and reports are expected to be thorough work, including proper references to any supporting materials. Whether working as a team or leveraging software designs from books, magazines, the Internet, or other sources, students are expected and required to cite and credit the source of the information clearly and completely. **Plagiarism will not be tolerated** and will be reported to the CU Honor Code Office.

Other Assessments:

There will be scheduled quizzes most weeks over material presented; these will be provided via Canvas and will be performed outside of class. All quizzes must be completed prior to the Canvas due date/time. There will also be a mid-term and final examination. The quiz and exam assessments are to be done using individual effort alone. Mid-term and final exam logistics, content, times, and locations will be scheduled and announced.

Extra Credit:

From time to time, there may be opportunities for extra credit. Generally, extra credit opportunities come from two sources – classroom activities and project work. In most cases, classroom extra credit will supplement overall grades; distance and nonsynchronous students will be given equivalent opportunities for extra credit. Project extra credit will be described in project grading rubrics and will be awarded for individual or team projects when projects are graded.

IV. Evaluation and Grading Procedures

Grading will be based on total points accumulated from each type of assessment and assignment used in the class. All points from class activities have the same weight. A student earning less than 60% of the points possible will be given a failing grade. In all cases, grades may be assigned based on a curve determined by the instructor.

The following table shows percentage assignments for final posted class letter grades:

94 – 100	90 – 93	87 – 89	83 – 86	80 – 82	77 – 79	73 – 76	70 – 72	67 – 69	63 – 66	60 – 62	0 – 59
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Make-up Exam Policy: No make-up exams are given except for medical or other similar hardships where advanced arrangements are made with the instructor; or in case of non-selective medical emergencies with physician's note or documentation. Otherwise, failure to take the exam at the scheduled time will result in a zero grade in the exam.

The overall course grade will be based on participation and attendance, homework/projects, quizzes, and exams. The grade proportions are as follows (note they differ for graduate and undergraduate students):

Undergraduate students:

- Homework/projects 50% (500 points)
- Quizzes 20% (200 points)
- Mid-term and Final Exams 20% (200 points)
- Participation 10% (100 Points)

Graduate students:

- Homework/projects 40% (500 points)
- Quizzes 16% (200 points)
- Mid-term and Final Exams 16% (200 points)
- Participation 8% (100 points)
- Graduate research project 20% (250 points)

V. Campus-Wide Policies

Please note, the following statements in this section are mandated by CU Boulder for all instructors. Please see this Academic Affairs link for more information: <https://colorado.edu/academicaffairs/policies-customs-guidelines/required-syllabus-statements>

Classroom Behavior:

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the [classroom behavior](#) policy, the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

Requirements for COVID-19:

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require

accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). Should illness or quarantine impact your attendance or assigned work, please contact the instructor to arrange for any needed schedule changes or remedial work. Please note you are not required to state the nature of your illness or to provide "doctor's notes" for classes missed.

Accommodation for Disabilities:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

Preferred Student Names and Pronouns:

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code:

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the [Honor Code](#). Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution (honor@colorado.edu; 303-492-5550). Students found responsible for violating the [Honor Code](#) will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the [Honor Code website](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, protected-class discrimination and harassment, and related retaliation by or against members of our community on- and off-campus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these policies, and individuals who believe they have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, [reporting options](#), and support resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of any issues related to these policies regardless of when or where they occurred to ensure that individuals impacted receive information about their rights, support resources, and resolution options. To learn more about reporting and support options for a variety of concerns, visit [Don't Ignore It](#).

Religious Holidays:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please contact the instructor about schedule impacts at least two weeks prior to the conflict date. See the [campus policy regarding religious observances](#) for full details.

Course Concerns:

If you have any questions or concerns about the course, please discuss them with the class staff as soon as possible. If we cannot address your concern, the issue can be brought to the attention of the program advisors, faculty directors, or department chairs.

VI. Tentative Course Schedule:

Please note **this schedule can and likely will change**. As the instructor for this course, I reserve the right to adjust this schedule or related assignments in any way that serves the educational needs of the students enrolled in this course.

Monday, September 5 is a holiday, no class will be held that day.

OOAD Fall 2022 Classes						
Week	M		W		F	
1	8/22	Introductions	8/24	OO Paradigm	8/26	OO Fundamentals
2	8/29	Git	8/31	Java/Python	9/2	UML
3	9/5 Holiday/No Classes		9/7	UML	9/9	TDD
4	9/12	Patterns/Strategy	9/14	Observer	9/16	Problem-Solution
5	9/19	Decorator	9/21	Factory	9/23	Conceptual Modeling
6	9/26	Singleton	9/28	Command	9/30	Façade/Adapter
7	10/3	Expanding Horizons	10/5	Template	10/7	Iterator/Composite
8	10/10	MVC	10/12	Principles	10/14	State
9	10/17	Proxy	10/19	Bridge/Builder	10/21	tbd
10	10/24	Flyweight/Interp/CoR	10/26	Mediator/Memento	10/28	Prototype/Visitor
11	10/31	Expert Design	11/2	Design Techniques	11/4	ORMs
12	11/7	Refactoring	11/9	Dependency Injection	11/11	Reflection
13	11/14	Architecture	11/16	APIs	11/18	Philosophy
14	11/21 Fall Break/No Classes		11/23 Fall Break/No Classes		11/25 Fall Break/No Classes	
15	11/28	Anti-/Other Patterns	11/30	Graduate Presentations	12/2	Graduate Presentations
16	12/5	Other than OOAD	12/7	Final Review/Wrap-up		
	Reading day (no class): Fri 12/9					
	Finals: Sat 12/10 - Wed 12/14					

OOAD Projects				Exam/Quiz			Readings	Graduate Research		
	Assn	Due		Post Sat				Assn	Due	
Week	Wed	Wed	Points	Due Thur	Points			Fri	Fri	
1		1		Q1	20					
2		1.1	10	Q2	20			Proposal		
3		2	1.2	15 -						
4			2.1	20 Q3	20	Ch 1,2		Outline	Proposal	10
5		3	2.2	30 Q4	20	Ch 3,4				
6			3.1	25 Q5	20	Ch 5,6,7		Draft	Outline	20
7		4	3.2	50 Q6	20	Ch 8,9				
8			4.1	25 Midterm	100	Ch 12,10				
9		5	4.2	50 Q7	20	Ch 11,13,14		Peer Review	Draft	40
10				Q8	20	Ch 14				
11		6	5	100 Q9	20			Final/Present	Peer Review	30
12				Q10	20					
13		7	6	75 Q11	20					
14				-						
15				-					Present (Mon)	50
16			7	100 Final	100				Final	100
	Projects		500	Exam/Quiz	400				Graduate Work	250
				Participation	100				5448 only	