CSCI4448 - Object Oriented Analysis and Design Syllabus

Spring 2014

Course Information

- Meeting Time: TuTh 3:30 - 4:45 PM
- Class Location: ECEE 1B32
- Instructor: Dana Hughes
- Email: Dana.Hughes@colorado.edu
- Office: ECCS 102 (during official office hours only)
- Office Hours: Monday 1:30-2:45 PM, Thursday 2:00 - 3:15 PM, or by appointment
- Final Exam: Saturday, May 3, 7:30 - 10:00 PM

Course Description

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 Ruby.

Topics Covered

- **Object Oriented Paradigm:** Capabilities of objects and forms of interaction.
- **Unified Modeling Language:** Structure, behavior and interaction diagrams.
- **Object Oriented Analysis and Design:** Software development from use cases.
- **Design Heuristics**
- **Design Patterns:** Behavioral, Structural and Creational patterns, other types if time permits.
- **Test Driven Development:** Unit tests in initial development and for software verfication.
- **Refactoring:** Primarily refactoring to patterns.

Resources

Textbook

There is no required textbook for this course. If you would like to have a book to read from, I will recommend readings from the following books

- **Design Patterns Explained: A New Perspective on Object Oriented Design** (Second Edition)
  Alan Shalloway and James R. Trott
  ISBN 0-321-24714-0

- **Design Patterns: Elements of Reusable Object-Oriented Software**
  Erich Gamma, Richard Helm, Ralph Johnson and John Vissides
  ISBN 0-201-63361-2

- **Refactoring: Improving the Design of Existing Code**
  Martin Fowler, Kent Beck, John Brant, William Opdyke and Don Roberts
  ISBN 0-201-48567-2

- **Refactoring to Patterns**
  Joshua Kerievsky
  ISBN 0-321-21335-1

Software

- **Programming Language:** You will need to be proficient in at least one object-oriented programming language of your choice. Java is suggested, but C++, C#, Objective-C, Python, and Ruby are other valid choices. Please check with me if you wish to use a language not listed here, and note that I have varying levels of proficiency with the languages listed.

- **UML Modeling Software:** It is recommended that you become familiar with some UML modeling tool. I use Umbrello, as it is free and easily installed from the Ubuntu repositories. Using a UML tool is entirely optional, you may hand draw UML diagrams if you wish.

- **Version Control / Source Code Management:** For the group project, you'll need to use some source code management system (e.g., Git or Mercurial) and online repository (e.g., Github or Bitbucket).

Web Resources

- **Piazza:** A course page is available on Piazza. This site contains course information, assignments and resources, as well as providing a means to communicate outside the class
  `http://www.piazza.com/colorado/spring2014/csci4448/home`

- **Course Webpage:** Assignments and course resources will be available on this page
  `http://csel.cs.colorado.edu/~dahu6681/courses/csci4448/`

- **Github / Bitbucket / Other:** It is *highly* encouraged that students set up an account on Github, Bitbucket, or other code repository website for the project.

Course Logistics

Prerequisites

The official prerequisite for this course is *CSCI3155 - Principles to Programming Languages*, or to have experience with one or more object-oriented programming languages. This implies that you are familiar with procedural and functional programming paradigms, discrete mathematics and data structures. In addition, you should be able to learn a new programming language independently or with relatively little guidance, and should be able to learn and use CASE tools.

If you are concerned about the expected level of knowledge going into this course, please contact me.

Grading Criteria

Students will be evaluated using the following criteria

- **Class Participation** - 5%

- **Homework** - 25%

- **Quizzes** - 10%

- **Midterm Exams** - 30%

- **Group Project** - 30%

Final letter grades will be determined from the overall final score:
90% - 100% - A, 80% - 90% - B, 70% - 80% - C, 60% - 70% - D, < 60% - F.

Class Participation

Class participation will be based on your participation in class, on Piazza, and completion of surveys, etc. Attendence will not be taken on a regular basis; your presence in class will be determined based primarily on taking quizzes. The remainder of the participation credit is based on requested posts on Piazza (e.g., an introduction) and responses to surveys.

Homework

Homework will be assigned every 2 - 3 weeks. See the Late Policy regarding the grading and resubmission of assignments.

Quizzes and Exams

Quizzes will be assigned every 2 - 3 weeks. Quizzes and exams will be administered in class. Quizzes will be roughly 20 minutes in length; exams will take the entire class period.

If you know you will not be able to make it to a quiz or exam, please let me know *prior* to the quiz or exam date. Making up quizzes or exams without prior notification will only be considered in the event of an unforseen emergency. I reserve the right to decide if an exam or quiz will be allowed to be made up, and assigning a different exam or quiz.

Group Project

A group project will be assigned in the second half of the course. Groups will be 2 to 4 students. I will consider individual projects and groups of up to 6, but these will need to be approved prior to beginning the project. Projects domains and implementation will be open-ended, however I will provide some suggestions and examples.

Projects will need to be managed through some online repository (e.g., Github, Bitbucket, etc.), which I will need access to. Alternatives to Github, Bitbucket, etc., will be considered if individual contributions can be tracked. Check with the instructor first.

Groups will make appointments during the scheduled final exam to present their final project.

Late Policy

Homework assignments will be accepted after the deadline up to 72 hours. Every 24 hours, the maximum possible points for the homework assignment will be reduced by 15%. For example, if an assignment is due Tuesday at 12:00pm and is worth 100 point, it will be accepted until Wednesday at 12:00pm for a maximum of 85 points, Thursday at 12:00pm for a maximum of 70 points, and Friday at 12:00pm for a maximum of 55 points. After this deadline, submissions will not be accepted.

In order to encourage mastery of the material, you may resubmit each homework assignment once up to a week before the end of the semester. Resubmitted assignments will be regraded, and your grade for the assignment will be updated with 50% of the difference. For example, if you receive a grade of 70 on an assignment, and resubmit the assignment for a new grade of 90, your grade for the assignment will be 80. In order to resubmit the assignment, you must have initially submitted the assignment within 72 hours of the initial due date with significant effort put into the assignment.

Exams and quizzes will not be accepted late. Please see the Quizzes and Exams section for my policy on missing exams and quizzes.

Collaboration Policy

You are encouraged to actively discuss the course material, assignments and solutions with your classmates and instructor. The assignments that you turn in, however, must be entirely written on your own. Basically, you may work in pairs or a group on an assignment, but I shouldn't see two or more submissions with only the name changed. If you work with others on an assignment or cite a webpage, book or article, please indicate so on your assignment submissions.

Tenative Schedule

The following is a *tenative* schedule of topics covered in the course, and is subject to change as the semester progresses. An up-to-date version of this schedule is available on the course website and Piazza.

Important Dates

- Thursday, February 20 - First Midterm
- Tuesday, March 18 - Second Midterm

Week	Tuesday	Thursday
01/13	Introduction and Overview	Fundamentals of Object Oriented Paradigm
01/20	Fundamentals of Object Oriented Paradigm	Fundamentals of Object Oriented Paradigm
01/27	UML *Class and Sequence Diagrams*	UML *Use Case and Activity and State Diagrams*
02/03	Problem Domain and Initial Design using UML	Introduction to Design Patterns
02/10	Structural Patterns *Adapter and Facade*	Structural Patterns *Bridge and Composite*
02/17	Out of Town / Possible Guest Lecture	**Midterm**
02/24	Structural Patterns *Flyweight and Decorator*	Creational Patterns *Abstract Factory, Factory and Builder*
03/03	Creational Patterns *Prototype and Singleton*	Behavioral Patterns *Observer, Iterator and Visitor*
03/10	Behavioral Patterns *Command, Strategy and Chain of Responsibility*	Behavioral Patterns *Momento and State*
03/17	**Midterm**	Patterns of Patterns
03/24	Spring Break	
03/31	Test-Driven Development	Test-Driven Development
04/07	Refactoring	Refactoring
04/14	Concurrency	Concurrency Patterns
04/21	Dependency Injection Spring Framework	Object Relational Mapping Hibernate, Ruby on Rails
04/28		
05/03	Finals Week - Project Presentation	

University Policy Statements

Disability Accomidations

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accomindations based on documented disabilities. Disability Services can be contacted at 303-492-8671, Willard 322 and `http://www.colorado.edu/disabilityservices`.

You may submit your letter in person after class, during office hours, or by meeting with me at your convenience.

Religious Observances

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 attendances. In this class, please contact me at least 2 weeks prior to any religious observances that conflict with your course responsibilities. See full details at `http://www.colorado.edu/policies/fac_relig.html`.

Classroom Behavior

Students and faculty each have resposibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional couresy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate

name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at `http://www.colorado.edu/policies/classbehavior.html` and at `http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code`.

Discrimination and Sexual Harassment

The University of Colorado at Boulder policy on Discrimination and Harassment, the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of sexual harassment or discrimination or harassment based upon race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH, the above referenced policies and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at `http://www.colorado.edu/odh`.

Honor Code

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (`honor@colorado.edu`; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).

Other information on the Honor Code can be found at `http://www.colorado.edu/policies/honor.html` and at `http://www.colorado.edu/academics/honorcode/`.