Object Oriented Programming in Java

University of California, San Diego

About this Course

Welcome to our course on Object Oriented Programming in Java using data visualization. People come to this course with many different goals -- and we are really excited to work with all of you! Some of you want to be professional software developers, others want to improve your programming skills to implement that cool personal project that you've been thinking about, while others of you might not yet know why you're here and are trying to figure out what this course is all about.

This is an intermediate Java course. We recommend this course to learners who have previous experience in software development or a background in computer science. Our goal is that by the end of this course each and every one of you feels empowered to create a Java program that's more advanced than any you have created in the past and that is personally interesting to you. In achieving this goal you will also learn the fundamentals of Object Oriented Programming, how to leverage the power of existing libraries, how to build graphical user interfaces, and how to use some core algorithms for searching and sorting data. And this course is project-based, so we'll dive right into the project immediately!

We are excited to be offering a unique course structure, designed to support learners of different backgrounds in succeeding at their own pace. The first module explains how this will work and if this course is right for you. We also recommend taking a few minutes to explore the course site. A good place to start is the navigation bar on the left. Click Course Content to see what material we'll cover each week, as well preview the assignments you'll need to complete to pass the course. Click Discussions to see forums where you can discuss the course material with fellow students taking the class. Be sure to introduce yourself to everyone in the Meet and Greet forum.

This course should take about 6 weeks to complete. You can check out the recommended course schedule below to see a quick overview of the lessons and assignments you'll complete each week.

We're excited you're here learning with us. Let's get started!

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Basic Info	Course 3 of 4 in the Object Oriented Programming in Java Specialization
Level	Intermediate
Commitment	6 weeks of study, 4-6 hours/week
Language	English, **Subtitles:** Korean, Chinese (Simplified) Volunteer to translate subtitles for this course
How To Pass	Pass all graded assignments to complete the course.
User Ratings	★★★★½ 4.7 stars

Syllabus

WEEK 1

Welcome and Project Overview: Visualizing Data

Welcome to the first week of our course. In this week, we'll get started by introducing ourselves and the Google engineers who will be making appearances throughout the course. We'll also give you of the unique video series we provide and help you understand how to navigate the course to get the most out of it given your background and learning speed. Finally, we'll jump right into objects and designing classes. This might be a bit of review for some of you who might have learned this in your first programming course. If that's the case, feel free to jump ahead to the Practice Quiz at the end of the week. Let's get started!

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13 videos, 8 readings, 3 practice quizzes

1. **Video:** Course Opening Title
2. **Reading:** A Customized Welcome to this Course
3. **Video:** Welcome (Object Oriented Java Programming: Data Structures and Beyond Specialization)
4. **Video:** Welcome (Object Oriented Programming in Java Specialization)
5. **Reading:** After completing this course, you will be able to...
6. **Reading:** Is this course right for me?
7. **Practice Quiz:** Pre-Course Quiz
8. **Reading:** Up Next: A short survey
9. **Practice Quiz:** Survey: Your goals for the course
10. **Reading:** Project overview
11. **Video:** Project prototype
12. **Video:** Your Path through the Course
13. **Video:** Concept Challenges: what and why?
14. **Video:** In the Real World: Welcome from Google Engineers
15. **Reading:** Additional Resources and Support
16. **Video:** Introduction: Classes and Objects
17. **Reading:** By the end of this week you will be able to...
18. **Reading:** A note about the main method
19. **Video:** Core: Defining Classes and Creating Objects
20. **Video:** When I Struggled: Objects
21. **Video:** Core: Overloading Methods
22. **Video:** Core: Public vs. Private

23. **Video:** In the Real World: Public vs. Private access
24. **Practice Quiz:** Basics of Objects
25. **Discussion Prompt:** What questions do you have about Objects?

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WEEK 2

Memory Models, Scope, and Starting the Project

We hope you're excited about the project that we're starting to build -- we sure are! In this second part of this week, we'll walk you through setting up your system and working through your first assignment so you'll be having fun with it in no time. Before that though, we'll finish going over some of the fundamentals fundamentals of object oriented programming. Specifically, being able to trace code is a key skill in becoming a stronger programmer. Like the end of last week, the first part of this week might be a bit of a review of material you already learned in your first Java programming course. If that's the case, you are always welcome to skip to the first graded assignment on Objects, Memory Models, and Scope.

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16 videos, 11 readings, 2 practice quizzes

1. **Video:** Introduction: Memory Models, Scope, and Project
2. **Reading:** Remember to Choose Your Own Path
3. **Reading:** By the end of this week, you will be able to...
4. **Reading:** Getting ready to write code
5. **Video:** Project: Module 1 Assignment Overview
6. **Reading:** Important note for learners working offline
7. **Reading:** Setting Up Java and Eclipse on Windows (and Linux)
8. **Reading:** Setting Up Java and Eclipse on Mac
9. **Reading:** Setting Up Unfolding Maps
10. **Video:** Project: Setting up the starter code in Eclipse
11. **Reading:** Support: Troubleshooting Common Issues
12. **Video:** Core: Drawing Memory Models with Primitive Data
13. **Practice Quiz:** Where to next?
14. **Video:** Support: Memory Models for Primitive Types

15. **Video:** Support: Setting Up and Running Examples in Eclipse
16. **Practice Quiz:** Working with Code
17. **Video:** When I Struggled: Compiling and Running Code
18. **Video:** Core: Drawing Memory Models with Objects
19. **Video:** Concept Challenge: Memory Models 1
20. **Video:** Concept Challenge: Memory Models 2
21. **Video:** Support: Memory Model Drawing Example
22. **Video:** Core: Introduction to Scope
23. **Video:** Concept Challenge: Scope
24. **Video:** Support: Putting it all Together Part 1
25. **Video:** Support: Putting it all Together Part 2
26. **Reading:** Congratulations and quiz answers
27. **Video:** Project: Module 1 Assignment Walkthrough
28. **Reading:** Programming Assignment Instructions
29. **Reading:** Congratulations and quiz answers

Show less

Graded: Objects, memory models, and scope

Graded: Programming Assignment Quiz (Do programming assignment FIRST)

WEEK 3

Graphical output: Creating GUIs and Displaying Data

Now that you have the tools to write and trace object oriented code, let's get back to developing the project! In this first (real) part of the project, you will create an interactive graphical map that will display geospatial data. This is a highly interactive week, so make sure you've got Eclipse loaded up! We encourage you to play around as you watch the videos. Some of the code that we use in the videos is in the demos package in the starter code you set up for this course. Open it up and experiment with it while you're watching the videos. We also encourage you to dive right into the programming project, even before watching the videos, if you want. The programming assignment instructions are in the last lesson of this week - you can watch a video walkthrough of the instructions and also read the step-by-step directions in the accompanying reading. There's lots of room for creativity, too, so have fun!

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23 videos, 4 readings

1. **Video:** Module Introduction: Graphical User Interfaces (GUIs)
2. **Reading:** By the end of this week you will be able to...
3. **Video:** Project: Module 3 Programming Assignment Overview
4. **Video:** Core: Graphical User Interfaces
5. **Video:** Core: Using PApplet
6. **Video:** When I struggled: GUIs
7. **Video:** Core: Resizing Images
8. **Video:** Core: Colors
9. **Video:** When I Struggled: Documentation
10. **Video:** Support: Setting up a Canvas
11. **Video:** Support: Drawing Happy Face
12. **Video:** Support: Loading and Displaying Images
13. **Video:** Core: Why Processing?
14. **Video:** Support: Using Documentation
15. **Video:** In the Real World: Documentation
16. **Video:** Core: Setting up map visualization
17. **Video:** Core: Adding markers
18. **Video:** Core: Using live data
19. **Reading:** Support: Understanding Features and Markers
20. **Video:** Bonus: Visualizing life expectancy
21. **Video:** Bonus: Setting up the map
22. **Video:** Bonus: Representing data
23. **Video:** Bonus: Coloring markers
24. **Video:** Support: ArrayLists and Generics
25. **Video:** Project: Module 3 Programming Assignment Walkthrough
26. **Reading:** Programming Assignment Instructions
27. **Reading:** Congratulations and quiz answers

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Graded: Programming Assignment Quiz (Do programming assignment FIRST)

WEEK 4

Inheritance

Now that you're in full swing with the project, let's take a closer look at some concepts that you have already been using in your code. Specifically, the keyword "extends". What exactly does it mean that your program "extends PApplet"? To answer this question we'll need to dive into the details of how Java allows for Class Hierarchies through Inheritance and Polymorphism. These fundamental and powerful concepts will serve you well in the future! We'll use these ideas to allow for displaying markers differently. If you feel you're already comfortable with Inheritance and Polymorphism, feel free to dive straight into the project (programming assignment) for this week. As you work with the project, feel free to have some fun and introduce new levels of class hierarchies for improved functionality.

Show less

25 videos, 3 readings

1. **Video:** Module Introduction: Inheritance and Polymorphism
2. **Reading:** By the end of this week, you will be able to...
3. **Video:** Project: Module 4 Programming Assignment Overview
4. **Video:** Core: Why use Inheritance?
5. **Video:** Core: Extends
6. **Video:** In the Real World: Inheritance 1
7. **Video:** Core: Reference vs. Object Type
8. **Video:** When I struggled: the "Is a" relationship
9. **Video:** Concept Challenge: References and Objects
10. **Video:** Core: Visibility Modifiers
11. **Video:** When I Struggled: Inheritance
12. **Video:** Core: Object Creation in Java
13. **Video:** Core: Compiler Rules for Class Construction
14. **Video:** Core: Variable Initialization in a Class Hierarchy
15. **Video:** Concept Challenge: Inheritance Constructors 1
16. **Video:** Concept Challenge: Inheritance Constructors 2
17. **Video:** Core: Method Overriding
18. **Video:** Core: Introduction to Polymorphism

19. **Video:** When I struggled: Polymorphism
20. **Video:** Core: Rules to Follow for Polymorphism
21. **Video:** Core: Casting Objects
22. **Video:** Concept Challenge: Polymorphism Part 1
23. **Video:** Concept Challenge: Polymorphism Part 2
24. **Video:** Core: Abstract Classes and Interfaces
25. **Video:** In the Real World: Inheritance 2
26. **Video:** Project: Module 4 Programming Assignment Walkthrough
27. **Reading:** Programming Assignment Instructions
28. **Reading:** Congratulations and Quiz Answers

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Graded: Programming Assignment Quiz (Do programming assignment FIRST)

WEEK 5

GUIs: Responding to User Events

You've reached an exciting point in the project - in this week you'll add interactivity to your map! You'll be learning how to design event-driven programs, using a new and powerful programming paradigm. Your map will now respond to mouse hovers and clicks. As always, make sure you're writing code along with us as you watch the videos and work through the week. Also, feel free to dive into the programming assignment (project) whenever you are ready

9 videos, 3 readings, 1 practice quiz

1. **Video:** Module Introduction: Responding to User Events
2. **Reading:** By the end of this week, you will be able to...
3. **Video:** Project: Module 5 Programming Assignment Overview
4. **Video:** Core: Introduction to Event-Driven Programming
5. **Video:** In the Real World: Events
6. **Video:** Core: Implementing Events in UnfoldingMaps
7. **Video:** Core: Implementing Buttons in UnfoldingMaps
8. **Video:** When I Struggled: Buttons and GUIs
9. **Video:** Core: Listener Hierarchy

10. **Practice Quiz:** Events
11. **Video:** Project: Module 5 Programming Assignment Walkthrough
12. **Reading:** Programming Assignment Instructions
13. **Reading:** Congratulations and Quiz Answers

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Graded: Programming Assignment Quiz (Do programming assignment FIRST)

WEEK 6

Searching and Sorting: From Code to Algorithms

You've come a long way in this course, and you've got a great project to show for it. In this last module we'll shift gears a bit to talk about some very exciting and fundamental algorithms for finding and sorting data in an array. Searching and sorting algorithms are not only fundamental to computer science, but also ideal for beginning to explore issues of algorithm efficiency. We will only begin to touch on issues of algorithm efficiency here. We will say much more about it in the next course in this specialization, so we hope you will continue with us. We'll also apply sorting to your project, and you'll wrap things up by finishing your project with an extension of your own choosing.

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19 videos, 3 readings, 1 practice quiz

1. **Video:** Module Introduction: Searching and Sorting
2. **Reading:** By the end of this week, you will be able to...
3. **Video:** Project Overview
4. **Video:** In the Real World: Searching and Sorting
5. **Video:** Core: Linear Search, Part 1
6. **Video:** Core: Linear Search, Part 2
7. **Video:** Core: Binary Search
8. **Video:** Core: Binary Search Example
9. **Video:** When I Struggled: Search
10. **Practice Quiz:** Searching Quiz
11. **Video:** Core: Introduction to Sorting
12. **Video:** Core: Selection Sort Algorithm

13. **Video:** Core: Selection Sort Implementation
14. **Video:** Core: Selection Sort Analysis
15. **Video:** Concept Challenge: Selection Sort
16. **Video:** Core: Mystery Sort
17. **Video:** Core: Java's Built-In Sort
18. **Video:** Core: Comparable Interface, Revisited
19. **Video:** Concept Challenge: Which Sort?
20. **Video:** Project: Module 6 Programming Assignment Walkthrough
21. **Reading:** Programming Assignment Instructions
22. **Reading:** Congratulations and quiz answers
23. **Peer Review:** Optional: Pre-grading Feedback on Programming Assignment Extension
24. **Video:** End of Course Message

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Graded: Programming Assignment Quiz (Do programming assignment FIRST)

Graded: Programming Assignment Extension Peer Review

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How It Works

GENERAL

How do I pass the course?

To earn your Course Certificate, you'll need to earn a passing grade on each of the required assignments—these can be quizzes, peer-graded assignments, or programming assignments. Videos, readings, and practice exercises are there to help you prepare for the graded assignments.

What do start dates and end dates mean?

Most courses have sessions that run multiple times a year — each with a specific start and end date. Once you enroll, you'll have access to all videos, readings, quizzes, and programming assignments (if applicable). Peer-graded assignments can only be submitted and reviewed once your session has begun. If you choose to explore the course without purchasing, you may not be able to access certain

assignments. If you don't finish all graded assignments before the end of the session, you can enroll in the next session. Your progress will be saved and you'll be able to pick up where you left off when the next session begins.

What are due dates? Is there a penalty for submitting my work after a due date?

Within each session there are suggested due dates to help you manage your schedule and keep coursework from piling up. Quizzes and programming assignments can be submitted late without consequence. However, it is possible that you won't receive a grade if you submit your peer-graded assignment too late because classmates usually review assignment within three days of the assignment deadline.

Can I re-attempt an assignment?

Yes. If you want to improve your grade, you can always try again. If you're re-attempting a peer-graded assignment, re-submit your work as soon as you can to make sure there's enough time for your classmates to review your work. In some cases you may need to wait before re-submitting a programming assignment or quiz. We encourage you to review course material during this delay.

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PEER-GRADED ASSIGNMENTS

Peer-graded assignments require you and your classmates to grade each other's work.

How do peer graded assignments work?

After you submit your work, you'll be asked to review your classmates' assignments. To pass, you'll need to earn a passing grade on your submission and complete the required number of reviews.

How are grades calculated?

You and your classmates will be asked to provide a score for each part of the assignment. Final grades are calculated by combining the median scores you received for each section.

What kind of feedback should I give?

Be respectful, encouraging, and honest. Acknowledge what your classmate did well and offer specific suggestions on how they can improve. Scores should reflect the learner's understanding of the assignment prompt and points should not be deducted for difficulties with language or differences in opinion.

Is there a penalty for submitting my work late?

No, but it's important to submit your work as close to the due date as you can. Classmates grade most of the assignments within three days of the due date. If you submit yours too late, there may not be anyone to review your work.

If I fail an assignment, can I try again?

Yes! You can always try again, but you'll need to resubmit your work as soon as possible to make sure your classmates have enough time to grade your work.

Can I edit my assignment?

Yes, but you'll need to re-submit your work and any grade you've already received will be deleted.

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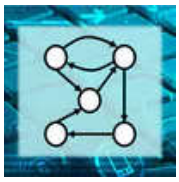

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