Duke University

Java Programming and Software Engineering Fundamentals Specialization

Explore a Career as a Software Engineer. Learn the basics of programming and software development

Instructors: Andrew D. Hilton +3 more

333,246 already enrolled

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5 course series
Get in-depth knowledge of a subject

4.6 ★
(14,466 reviews)

Beginner level
No prior experience required

6 months to complete
at 10 hours a week

Flexible schedule
Learn at your own pace

What you'll learn

Take your first step towards a career in software development with this introduction to Java—one of the most in-demand programming languages and the foundation of the Android operating system. Designed for beginners, this Specialization will teach you core programming concepts and equip you to write programs to solve complex problems. In addition, you will gain the foundational skills a software engineer needs to solve real-world problems, from designing algorithms to testing and debugging your programs.

Applied Learning Project

Centered around projects, this Specialization will help you create a portfolio of work to demonstrate your new programming skills. In the capstone you will create a recommender engine similar to those used by Netflix or Amazon. Additional projects in your portfolio will include:an interactive webpage that applies filters to images, an analysis of CSV data files, an encryption program, and a predictive text generator.

Read less

Skills you'll gain

Integrated Development Environments | Web Applications | Javascript | Image Analysis | Computer Programming | Data Manipulation | Algorithms | Cascading Style Sheets (CSS) | Encryption | Software Engineering | Data Import/Export | Data Processing | Web Servers | Debugging | Data Analysis | Predictive Modeling | Java Programming | Event-Driven Programming | Statistical Analysis | Software Design

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Specialization - 5 course series

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Programming Foundations with JavaScript, HTML and CSS

Course 1 • 32 hours

Course details

What you'll learn

Learn foundational programming concepts (e.g., functions, for loops, conditional statements) and how to solve problems like a programmer. In addition, learn basic web development as you build web pages using HTML, CSS, JavaScript. By the end of the course, will create a web page where others can upload their images and apply image filters that you create.

After completing this course, you will be able to:
1. Think critically about how to solve a problem using programming;
2. Write JavaScript programs using functions, for loops, and conditional statements;
3. Use HTML to construct a web page with paragraphs, divs, images, links, and lists;
4. Add styles to a web page with CSS IDs and classes; and
5. Make a web page interactive with JavaScript commands like alert, onClick, onChange, adding input features like an image canvas, button, and slider.

Read more

Skills you'll gain

Javascript · Cascading Style Sheets (CSS) · Event-Driven Programming · HTML and CSS · Algorithms · Computational Thinking · Image Analysis · Web Applications · Computer Programming · Web Design · Web Development · Interactive Design · User Interface (UI)

Java Programming: Solving Problems with Software

Course 2 • 18 hours

Course details

What you'll learn

Learn to code in Java and improve your programming and problem-solving skills. You will learn to design algorithms as well as develop and debug programs. Using custom open-source classes, you will write programs that access and transform images, websites, and other types of data. At the end of the course you will build a program that determines the popularity of different baby names in the US over time by analyzing comma separated value (CSV) files.

After completing this course you will be able to:
1. Edit, compile, and run a Java program;
2. Use conditionals and loops in a Java program;
3. Use Java API documentation in writing programs.
4. Debug a Java program using the scientific method;
5. Write a Java method to solve a specific problem;
6. Develop a set of test cases as part of developing a program;
7. Create a class with multiple methods that work together to solve a problem; and
8. Use divide-and-conquer design techniques for a program that uses multiple methods.

Read less

Skills you'll gain

Java Programming | Java | Algorithms | Computer Programming | Data Manipulation | Data Analysis | Debugging | Software Testing | Data Import/Export | Integrated Development Environments | Object Oriented Programming (OOP) | Statistical Analysis | Software Design | Problem Solving

Java Programming: Arrays, Lists, and Structured Data

Course 3 • 14 hours

Course details

What you'll learn

Build on the software engineering skills you learned in “Java Programming: Solving Problems with Software” by learning new data structures. Use these data structures to build more complex programs that use Java’s object-oriented features. At the end of the course you will write an encryption program and a program to break your encryption algorithm.

Read more

After completing this course, you will be able to:

1. Read and write data from/to files;
2. Solve problems involving data files;
3. Perform quantitative analyses of data (e.g., finding maximums, minimums, averages);
4. Store and manipulate data in an array or ArrayList;
5. Combine multiple classes to solve larger problems;
6. Use iterables and collections (including maps) in Java.

Skills you'll gain

Java Programming | Data Structures | Java | Object Oriented Programming (OOP) | Algorithms | Data Analysis | Encryption | Debugging | File Management | Cryptography | Data Processing | Computer Programming | Software Engineering | Web Servers

Java Programming: Principles of Software Design

Course 4 • 12 hours

Course details

What you'll learn

Solve real world problems with Java using multiple classes. Learn how to create programming solutions that scale using Java interfaces. Recognize that software engineering is more than writing code - it also involves logical thinking and design. By the end of this course you will have written a program that analyzes and sorts earthquake data, and developed a predictive text generator.

Read more

After completing this course, you will be able to:

1. Use sorting appropriately in solving problems;
2. Develop classes that implement the Comparable interface;
3. Use timing data to analyze empirical performance;
4. Break problems into multiple classes, each with their own methods;
5. Determine if a class from the Java API can be used in solving a particular problem;
6. Implement programming solutions using multiple approaches and recognize tradeoffs;
7. Use object-oriented concepts including interfaces and abstract classes when developing programs;
8. Appropriately hide implementation decisions so they are not visible in public methods; and
9. Recognize the limitations of algorithms and Java programs in solving problems.

Skills you'll gain

Java Programming | Java | Software Design | Algorithms | Computer Programming | Debugging | Performance Tuning | Application Programming Interface (API) | Performance Testing | Data Structures | Predictive Modeling | Object Oriented Programming (OOP) | Development Testing | Programming Principles | Software Engineering

Java Programming: Build a Recommendation System

Course 5 • 5 hours

Course details

What you'll learn

Ever wonder how Netflix decides what movies to recommend for you? Or how Amazon recommends books? We can get a feel for how it works by building a simplified recommender of our own!

In this capstone, you will show off your problem solving and Java programming skills by creating recommender systems. You will work with data for movies, including ratings, but the principles involved can easily be adapted to books, restaurants, and more. You will write a program to answer questions about the data, including which items should be recommended to a user based on their ratings of several movies. Given input files on users ratings and movie titles, you will be able to:

1. Read in and parse data into lists and maps;
2. Calculate average ratings;
3. Calculate how similar a given rater is to another user based on ratings; and
4. Recommend movies to a given user based on ratings.
5. Display recommended movies for a given user on a webpage.

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Skills you'll gain

Java Programming | Algorithms | Data Analysis | Software Design | Data Processing | Java | Hypertext Markup Language (HTML) | Object Oriented Programming (OOP) | Data Structures

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Instructors

Andrew D. Hilton
Duke University
19 Courses • 1,126,254 learners

Robert Duvall
Duke University
8 Courses • 902,414 learners

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Frequently asked questions

How long does it take to complete the Java Programming and Software Engineering Fundamentals?

Time to completion can vary based on your schedule, but most learners are able to complete the Specialization in 6-7 months.

How often is each course in the Specialization offered?

Each course in the Specialization is offered on a regular schedule, with sessions starting about once per month. If you don't complete a course on the first try, you can easily transfer to the next session, and your completed work and grades will carry over.

What background knowledge is necessary?

None! This Specialization is appropriate for anyone interested in learning more about computer science and software development. You should come with an open mind and motivation to learn how to solve difficult problems with code.

Do I need to take the courses in a specific order?

Will I earn university credit for completing the Java Programming and Software Engineering Fundamentals?

What will I be able to do upon completing the Java Programming and Software Engineering Fundamentals?

What software or equipment will I need to complete the assignments?

Can I view the course materials for free?

How is Google involved in content creation and teaching for this Specialization?

Is this course really 100% online? Do I need to attend any classes in person?

Can I just enroll in a single course?

Is financial aid available?

Can I take the course for free?

Will I earn university credit for completing the Specialization?

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