

Computer Foundations

With java Programming language

ZielBit Academy

Course Syllabus: Computer Foundations in Java

Overview:

Welcome to ZielBit Academy's Computer Foundations in Java course. This course introduces students to the essential concepts of computer science, with a focus on programming through the Java language. We will delve into various computer science disciplines, including networks, AI, robotics, graphics, and computer architecture. Additionally, students will gain exposure to C and C++ programming to understand their roles and how they differ from Java.

Starting with the basics of computer organization, this course builds a solid foundation in programming, emphasizing Java. You'll learn fundamental programming concepts such as object-oriented programming, data structures, and algorithmic thinking. Instead of traditional exams, this course emphasizes real-world projects that will help you apply and reinforce the concepts you learn.

Upon completing this course, you will be able to:

1. Understand key disciplines within computer science, such as networking, AI, and computer architecture, to inform future learning paths.
2. Comprehend the main hardware components of modern computer systems and the interaction between software and hardware.
3. Develop and implement algorithms to solve problems using Java.
4. Write Java programs utilizing control structures like conditionals, loops, and functions.
5. Select appropriate data structures (e.g., arrays, lists) and understand Java's memory management system.
6. Apply object-oriented programming principles in Java.
7. Engage in practical programming tasks and complete a comprehensive project that synthesizes course concepts.

Prerequisites: None

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Learning Objectives:

- Understand fundamental programming principles in Java.
- Develop practical skills to solve computational problems.
- Learn the basics of computer organization and program execution.
- Explore algorithmic efficiency and the importance of data structures.
- Grasp the core concepts of object-oriented programming in Java.

Course Format:

- **Lecture Times:** Monday, Wednesday, and Friday, 3:00 pm - 6:30 pm
- **Location:** Room GB-105, ZielBit Academy
- **Instructor:**

It is based on the academic expertise of distinguished professionals, including Profs, Master & Bachelor degrees THU & USC Universities and materials adapted from the Technical University of Ulm for Applied Science and the University of Southern California.

Grading Structure:

- **Participation & Activities:** 30%
- **Programming Assignments:** 40%
- **Final Project:** 30%

Certification:

Upon successful completion of this course, you will earn a ZielBit Certificate, authorized by IHK Ulm, recognizing your proficiency in Java programming.

Textbook:

Java Programming: Program Design Including Data Structures by D.S. Malik, Course Technology, 2011 (ISBN 978-1133526322).

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Course Outline:

- **Week 1:** Overview of Computer Science and Computer Organization
 - Introduction to the field and curriculum.
 - Basics of computer systems and software.
- **Week 2:** Basic Program Design and Abstractions + Programming Environment
 - Understanding Java programming environments, editors, and debuggers.
 - *Reading:* Chapters 2 and 3
- **Week 3:** Algorithmic Thinking and Control Structures
 - Introduction to algorithms, Big-O notation, and control structures.
 - *Activity:* Develop a simple Java program using loops and conditionals.
- **Week 4:** Program Decomposition and Functions
 - Decompose problems into functions and understand their importance in Java.
 - *Reading:* Chapters 4 and 5
- **Week 5:** Arrays and Memory Management in Java
 - Work with 1-D arrays, understand memory allocation, and compare with C/C++.
 - *Activity:* Implement search algorithms in Java.
- **Week 6:** 2-D Arrays and File I/O
 - Manipulate 2D arrays and perform file operations in Java.
 - *Activity:* Develop a Java program to process and manipulate text files.
- **Week 7:** Introduction to Object-Oriented Programming
 - Explore classes, objects, and basic principles of OOP in Java.
 - *Reading:* Chapters 9 and 10
- **Week 8:** Data Structures in Java
 - Introduction to data structures such as lists, stacks, and queues.
 - *Activity:* Implement linked lists and basic data structures.
- **Week 9:** Advanced Object-Oriented Programming
 - Learn about inheritance, polymorphism, and abstract classes.
 - *Project:* Begin work on a comprehensive Java project integrating course concepts.

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- **Weeks 10-12:** Selected Algorithms and Advanced Topics in Java
 - Explore sorting algorithms, recursion, and more complex data structures.
 - *Activity:* Apply sorting and searching algorithms in Java.
- **Weeks 13-14:** Project Work and Review
 - Focus on completing the programming project.
 - Open lab sessions for project help and review of course material.
- **Week 15:** Final Review and Project Presentations
 - Finalize projects and present them for evaluation.

Course Policies:

- **Attendance:** Attendance is mandatory, and students are expected to participate actively in all sessions.
- **Academic Integrity:** All work must be original and completed individually, reflecting your own understanding and effort.

Note: This course is based on materials and methodologies adapted from the Technical University of Ulm for Applied Science - Germany & University of Southern California - USA.

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