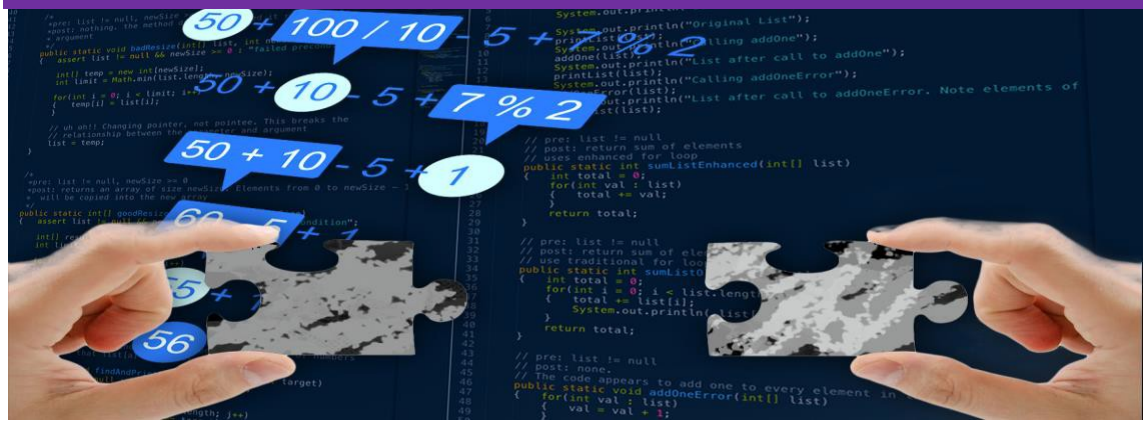
INTRODUCTION TO JAVA PROGRAMMING



Part I:
Starting to code in Java

LENGTH:	5 weeks
EFFORT:	6 - 8 hours per week
SUBJECT:	Computer Science
LEVEL:	Introductory
LANGUAGE:	English
VIDEO TRANSCRIPTS:	English, Español, Português, 中文

SYLLABUS

INTRODUCTION

Introduction to Java Programming is an introductory course to learn programming in an easy and interactive way. In this professional certificate program in three MOOCs, you will learn how to write code in Java, understand the basics of OOP and how to use software engineering techniques. The program will begin with introducing fundamental programming concepts and then will focus on how to write "good" programs, where "good" is to be understood from several perspectives: correctness, efficiency, software engineering techniques, and ethics. Lastly, you will learn about fundamental data structures, such as sequences and algorithms on them, such as searching and sorting.

Part 1: Starting to Code in Java introduces programming on the basis of familiar concepts, like calculators and games. Powerful concepts such as functional abstraction, the object oriented programming (OOP) paradigm and Application Programming Interfaces (APIs) are progressively introduced throughout the five weeks. Examples and case studies are provided so that learners can implement simple programs on their own or collaborating with peers.

Learner's experience is enhanced through a wide range of videos and audiovisual materials. Exercises accompanying videos give immediate feedback on common pitfalls and misconceptions when programming in Java. Code is presented using three visual and simple tools that make the development of small programs easier: Blockly, Codeboard and Greenfoot.

It is important that you know that some activities and exercises in this course may not be compatible with mobile devices (such as those running on iOS or Android). We recommend that you use a computer to ensure the best learning experience.

If this is your first course on edX, do not hesitate to enroll in the Demo course to get to know the courseware: https://www.edx.org/course/demox-edx-demox-1.

OBJECTIVES

After finishing this course, the learner should:

- Have acquired basic knowledge on algorithms and Java programming
- Be able to develop programs with conditionals and loops
- Be able to design and implement recursive algorithms
- Know the basic mechanisms of the OOP paradigm
- Be able to use and interpret the API of some of the most common Java classes
- Be able to develop simple programs in Java

COURSE STAFF

- CARLOS DELGADO KLOOS: Full Professor at Universidad Carlos III de Madrid, Director of the UNESCO Chair on "Scalable Digital Education for All", and Vice-Rector for Infrastructures and Environment. He introduced the teaching of Java at Universidad Carlos III de Madrid in 1997. Content creator and general supervisor of the professional program.

- CARMEN FERNÁNDEZ PANADERO: Assistant Professor at Universidad Carlos III de Madrid. Content creator and instructional designer.
- IRIA ESTÉVEZ-AYRES: Assistant Professor at Universidad Carlos III de Madrid. Content creator and assessment designer.
- JORGE BLASCO: Former Assistant Lecturer at Universidad Carlos III de Madrid and Research Fellow at City University London. Content creator and quality controller.
- CARLOS ALARIO-HOYOS: Teaching Assistant at Universidad Carlos III de Madrid. Content creator and instructional designer.
- SERGIO PASTRANA: Teaching Assistant at Universidad Carlos III de Madrid. Content creator and assessment designer.
- GUILLERMO SUAREZ-TANGIL: Teaching Assistant at Universidad Carlos III de Madrid. Content creator and responsible for communication with learners.
- JULIO VILLENA ROMÁN: Part-time lecturer at Universidad Carlos III de Madrid. Content creator and quality controller.

COURSE STRUCTURE

WEEK 1: *From the Calculator to the Computer*

The first week introduces basic programming concepts, such as values and expressions, as well as making decisions when implementing algorithms and developing programs.

WEEK 2: *State Transformation*

The second week introduces state transformation including representation of data and programs as well as conditional repetition.

WEEK 3: *Functional Abstraction*

The third week addresses the organization of code in a program through methods, which are invoked to carry out a task and return a result as answer. Recursion, as a powerful mechanism in the invocation of methods, is also covered this week.

WEEK 4: *Object Encapsulation*

The fourth week introduces the object oriented programming (OOP) paradigm, which enables the modeling of complex programs in Java through objects and classes. The concept of inheritance as the basis for reusing code and simplifying programs in Java is studied in this week.

WEEK 5: *Packaging*

The last week of the module aims to study the reuse of code through third-party classes that are already developed and that we can incorporate to our programs to perform specific actions, and reduce the number of lines that we need to code.

COURSE METHODOLOGY

Every week follows the same methodology and structure. First, theoretical concepts are presented in videos and other audiovisual formats in a simple and pleasant way through examples and metaphors. The learner assimilates these concepts by practicing with exercises, receiving immediate feedback.

Next, a case study is introduced to demonstrate the theoretical concepts. The learner can download, analyze and modify the code of the case study to improve the understanding on the concepts taught. At the end of the week learners can share their work with coursemates before taking the assessment activities. Supplementary materials to delve into the topics of the course may be provided.

The estimated time learners need to complete each week is from 8 to 12 hours.

COMMUNICATION AND SOCIAL COMPONENT

EMAILING and the **COURSE INFO PAGE** will be used by teachers to keep learners up-to-date with all the news related to the course.

In addition, **SOCIAL TOOLS** will be supported for learners to communicate with teachers and peers: the course forum on edX and Twitter (#javaedxuc3m). Programming can be very challenging, and difficulties will inevitably arise. Learners are encouraged to actively interact with other learners and teachers through these three social tools and share their concerns, problems, experiences and pieces of code.

EVALUATION

Evaluation will cover theoretical concepts and also small programs. These activities are mandatory only for those who wish to get a certificate at the end of the course.

The final grade for the course will be the result of the **FIVE EXAMS** (graded tests), each of them have a weight of 20%.

To **PASS THE COURSE** it will be necessary to obtain the 60% of the final grade.

CALENDAR

The course *Introduction to Java Programming – Part 1: Starting to Code in Java* is now running and will be available until 30 June 2020 (23:59 UTC) as a self-paced course.

Certificates will be available on demand for those learners who have asked for it, as soon as they complete enough of the course with a high enough grade to qualify for a certificate.