

1. Java programming

The training is grouped into modules in order to gain better knowledge of participants and connect the different areas used in Java programming.

Modules:

- Module 1 (48 classes): **Structural programming**
 - Introduction to programming languages and algorithms
 - Algorithms of linear, branched structures and cyclic structures
 - Advanced algorithms
 - Development environment preparation, data types, libraries, mathematical functions (Math)
 - Branched structures (if, switch)
 - Cyclic structures (for, while, do while)
 - Defining, calling and applying functions
 - One-dimensional arrays
 - Matrices (two-dimensional arrays)
 - Functions with arrays and matrices
 - Work with input-output files
 - Working with files
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- Module 2 (54 classes): **Object Oriented Programming**
 - Introduction to object oriented programming
 - Basic concepts of Java programming language
 - Classes, methods and attributes, toString method
 - Access modifiers
 - Constructors
 - Static attributes and methods
 - Date, time, calendar (Gregorian Calendar)
 - Collections
 - Arrays
 - Lists (ArrayList, LinkedList, HashSet, HashMap)
 - Inheriting classes and constructors
 - Polymorphism (Override and Overload methods)
 - Object instance compatibility
 - Abstract classes and methods
 - Final classes, methods and attributes
 - Interfaces and their implementation
 - Exceptions and their processing (try-catch-finally block and keyword throw)
 - Hierarchy of exceptions
- Module 3 (24 classes): **Advanced object oriented programming**
 - Competitive programming

- Creating threads via the Thread class or the Runnable interface
 - Merge, synchronize and thread priorities (highPriority, lowPriority)
 - Software patterns of micro-architecture (Singleton, Builder, Observer, Template Method) and macro-architecture (MVC)
 - Generic methods
 - Network programming, Sockets
- Module 4 (12 classes): **Databases**
 - Basic database concepts
 - Data and information
 - Data models
 - Database management systems
 - Conceptual and physical model
 - Entities, instances, attributes and identifiers
 - Object-link model
 - Normalization of the first, second and third normal forms
 - Translating a conceptual model into a physical model
 - Creating a database based on a physical model
 - SQL querying
 - DDL - CREATE, ALTER, DROP and TRUNCATE commands
 - DML - SELECT, UPDATE, INSERT and DELETE commands
- Module 5 (12 classes): **Graphical user interface**
 - User interface concept
 - Forms (JFrame)
 - Layout
 - Open embedded option panels (JOptionPane)
 - Events, ActionListener,(ActionEvent)
 - User Interface Editor (Eclipse WindowBuilder)
 - User interface components
 - Panel (JPanel)
 - Multi-panel operation
 - MVC pattern in a user interface application
 - Connecting the application to the database
 - Creating CRUD methods
 - Validation of input data on the user interface
- Module 6 (12 classes): **UML design**
 - Modeling using UML
 - Use case diagrams
 - Class diagram
 - Activity diagram

- UML sequence diagram
- UML communication diagram
- Module 7 (24 classes): **Web programming**
 - Design of static web pages, HTML, CSS
 - Servlet JSP technology
 - JAX-RS API for RESTful Web Service
 - Routing
 - REST route testing
 - Use JavaScript language using the jQuery library
- Module 8 (54 classes): **Advanced Web programming**
 - Spring framework – concepts
 - Spring dependency injection, DI
 - Spring aspect oriented programming, AOP
 - Spring application context
 - Spring Boot architecture
 - Spring model view controller, MVC
 - REST controllers
 - Route mapping
 - Java persistence api, JPA
 - Thymeleaf
- Module 9 (12 classes): **Software testing**
 - Introduction to software testing
 - Testing by black and white box methods
 - Testing with JUnit framework
 - Test automation with SeleniumHQ framework

1.3 References

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- [2] Синиша Влајић: Софтверски патерни, Златни пресек, Београд, 2014, ISBN 978-86-86887-30-6.
- [3] Синиша Влајић, Душан Савић, Војислав Станојевић, Илија Антовић, Милош Милић: Пројектовање софтвера - Напредне Јава технологије, Златни пресек, 2008, ISBN 978-86-86887-03-0.
- [4] Laslo Kraus: Programski jezik Java sa rešenim zadacima, Akademska misao, Beograd, 2013, ISBN 978-86-7466-455-1.
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[6] Dawn Griffiths, David Griffiths: Андроид програмирање без оклевања, O'Reilly Media, 2018, ISBN 978-86-7991-407-1.

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[8] Материјали на онлајн систему за образовање:
<https://eucenje.ftn.kg.ac.rs/course/view.php?id=152>

[9] <https://junit.org/>

[10] <https://www.seleniumhq.org/>