**ADVANCED WEB PROGRAMMING**

Master in Engenharia Informática

---

Code: 26205

Main Scientific Area: Computer Science

Lecturer: Paulo Rafael da Costa e Sousa

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 60h Total Workload: 108h

ECTS: 6,0

---

**Objectives**

The development of Web applications is an activity that combines, in equal proportions, design, usability and technology. To be proficient in the development of Web applications, it is essential to master a myriad of aspects such as communication protocols, software engineering, network management, design of user interfaces, databases, mark-up languages, scripting, systems security, legislation, among others.

This course aims to provide students the knowledge necessary to develop safe and effective Web applications.

At the end of the course, students will understand the main techniques to develop Web applications, using technologies such as async programming languages, NoSQL databases, application containers, and others.

The results will be achieved gradually over the semester, through the development of practical exercises and group work where students will be encouraged to investigate and develop strategies for implementing the technologies studied in class.

**Learning Outcomes**

At the end of the course students should be able to:

Understand the HTTP protocol
Understand the differences between the various types of HTTP methods and error codes
Understand the fundamental programming languages for the Web
Build a website from a design mockup
Understand and effectively use CSS and JavaScript frameworks
Develop server-side applications, namely using NestJS framework
Know publicly available Web services and integrate them into applications
Develop REST APIs
Develop client-side dynamic applications based Javascript frameworks
Recognise when and how to use NoSQL databases
Know techniques for continuous deployment
Know different cloud services for application deployment

**Course Contents**

01 – Introduction to the Web and to the HTTP protocol

W3C Standards

HTTP Protocol

Components of the Web

HTTP Requests

Status codes

MIME types

02 – Javascript and introduction to NodeJS

Data types

Operators: assignments, arithmetic, binary, logical, precedence, etc.

Expressions, decision structures, repetition structures

Data structures (Objects  Arrays)

Native functions

ECMA2015/ES6

Classes and functions

Browser objects

Introduction to NodeJS

NodeJS Ecosystem

Node Package Manager (npm)

Anatomy of a NodeJS application

03 – Advanced Javascript Topics

Modules

Callbacks vs Promises vs Async

04 - Server-side programming: NestJS

What is it?

Structure in layers: Controllers, Services, Models

Providers

Modules

Scaffolding of NestJS applications

Generating CRUD resources

Controllers

05 – Service-oriented architectures

Introduction to the Service Oriented Architectures (SOA)

SOAP vs REST

RESTful vs RESTless

CRUD operations

RESTful services best practices

Error handling

06 - Classroom work

Development, reflection and discussion on work assignmentDomain model

07 – Scalable indexing systems and NoSQL databases

Introduction to the NoSQL paradigm

Comparative analysis of NoSQL databases

Document-oriented databases (MongoDB)

CRUD operations on MongoDB

Main operators

Index types

Aggregations

Integration of NodeJS/Mongo (Mongoose)

08 – Client-side programming: XHTML, HTML5 e CSS 3

Anatomy of a HTML document

XHTML

Elements introduced by HTML 5

CSS Selectors

CSS Priority Rules

Box model

Text formatting

Positioning

Advanced selectors

Pseudo classes

CSS 3

Responsive design

CSS Frameworks

09 – Client-side programming: React

Introduction to React

Scaffolding

Anatomy of a React application

JSX

React components

Component state

Passing parameters

Parameter types

Events

Debugging React applications

10 – Client-side programming (continuation)

Component lifecycle

Forms

Router

Hooks

11 - Classroom work

Development, reflection and discussion on work assignmentPush notifications

12 – DevOps

Introduction to DevOps

DevOps tools

Building Docker containers

Composing Docker containers

Deploying Docker containers

13 - Classroom work

Development, reflection and discussion on work assignmentAxios interceptors

14 - Classroom work

Development, reflection and discussion on work assignment

15 – Evaluation

Final exam

**Recommended Bibliography**

ReactJS by Example – Building Modern Web Applications with React. Vipul A. M., Prathamesh Sonpatki. Packt Publishing, 2016.
Full Stack Javascript, Azat Mardan, APRESS
Enterprise Web Development - Building HTML5 Applications: From Desktop to Mobile
Gourley, D., Totty, B. (2002). HTTP: The definitive guide; [understanding web internals]. Beijing, u.a.: O'Reilly.
Crockford, D. (2008). JavaScript: The good parts. Beijing: O'Reilly.

**Learning and Teaching Methods**

The teaching and learning methods used in this class promote the acquisition of knowledge pertained in the syllabus as well as stimulate self-learning practices to create highly autonomous professionals.

**Assessment Methods**

Evaluation during normal period

The evaluation of this course is composed by 2 moments: 1 workgroup assignment, done in groups of 3 people and

out of class schedule, and a moment ofindividual evaluation in a form of an exam with a minimum grade of 8 marks (in 20):

TP – Workgroup assignment
E – Individual exam (minimum grade: 8 marks of 20)

The assignments will be evaluated according to various criteria to be defined in the description of the assignment itself. However, at least the following components will be part of every evaluation criteria:

completeness and quality of the presented solution,
quality of the written report, and
quality of the defence (individual evaluation).
The final grade of each student corresponds to the following formulation:

Final grade = TP * 0.4 + E * 0.6

The detection of fraud in any of the evaluations, implies failing the course.

Appealing period

The evaluation E may be repeated on the appealing period, in which the same formula is used to compute the final grade.
Note: theTPevaluation must be done,exclusively, during thenormal period.