

# SOFTWARE ENGINEERING



## OBJECTIVES

With the rapid development of computerization and networks in our daily life, the software development is unavoidable. The needs of talented software engineers with a good expertise and capacity for technology monitoring are required to tackle new markets and to innovate in software.

The software engineer is an expert who can adapt himself/herself in any environment. He/She is involved in the design, implementation, development of software in several industrial domains. He/she has a global view and a large knowledge from hardware to algorithm layers.

## JOB PROSPECTS

IT consultant, IT project manager, expert of development in major industrial groups (Banks, Automotive, Aircraft...) or start-up, R&D in software industry (IBM, Google, Microsoft...).

# COURSE CONTENT

## SEMESTER 1

### COMPUTER MICROSYSTEMS

- C language programming: memory allocation, pointer and API
- Operating system description: process/thread/memory/supervision, shell & system programming

### PROJECT-BASED LEARNING IN WEB DEVELOPMENT

- Database management system: relational and object models, database schema, queries
- WEB architecture: client, server, communication protocols
- HMI: ergonomoy, dynamic contents generation, formatting
- Propagation & antenna, digital transmission, link budget

### NETWORK FUNDAMENTALS

- Network communication, communication channel
- Layer approach, OSI model, TCP/IP model
- Network devices, network addressing models

### JAVA/SOFTWARE ENGINEERING

- Java Programming
- Software engineering
- Agile software development methods

### DATA SCIENCE FUNDAMENTALS

- Probability theory
- Statistics (descriptive statistics, statistical theory of estimation, hypothesis testing)
- Data science (principal component analysis, linear regression)

### ENGLISH, FRENCH AND HUMANITIES COURSES

### ADVANCED ALGORITHMIC AND PROGRAMMING

- Graph theory, algorithm design
- Advanced Java: compound design patterns, network programming, functional programming

### DATA BASE AND BIG DATA

- Advanced querying techniques
- Non-relational databases

### INFORMATION SYSTEMS ARCHITECTURE

- Hardware and software architecture
- Service-oriented architecture and Rest APIs
- Virtualization and administration of an operating system
- Cloud Computing

### ENGLISH, FRENCH AND HUMANITIES COURSES

CHOOSE ONE COURSE BETWEEN:

### INTRODUCTION TO ARTIFICIAL INTELLIGENCE

- Applications of artificial intelligence to problem solving
- Methods of problem formalization and knowledge representation
- Resolution algorithms associated with these representations

### INTERNATIONAL BUSINESS INNOVATION PROJECT

- Build real business model in a multicultural team
- Create innovative idea with marketing & business strategies
- Present final business model to professionals

### FORMAL APPROACH, LANGUAGES AND COMPILATION

- Abstract Syntax Trees
- Compilation algorithms
- Proof of program properties, model-checking
- Typed programming languages, lambda calculus

### PROJECT

The project is composed of an advanced case study. The students will be called upon to use the knowledge, design techniques and tools that they learnt through their courses

### ENGLISH, FRENCH AND HUMANITIES COURSES

CHOOSE TWO COURSES AMONG:

### MOBILE APPLICATION DEVELOPMENT

- Introduction to the dedicated services for mobiles
- Handsets capabilities and market overview
- Android development basics & tutorials
- Project

### MACHINE LEARNING

- Linear predictors, convex learning
- Gradient descent, kernel methods
- Support vector machine, decision trees

### SOFTWARE SECURITY

- Fundamental notions about computer security & software security
- Malwares and software's low level vulnerabilities
- How to write a secure code (DevSecOps and security in SDLC)?
- Web application vulnerabilities

### 3D AND IMMERSIVE APPLICATIONS USING XR

- State of the art and use cases of XR technologies
- Design principles and associated specificities
- Development pipeline of 3D application with Unity3D.
- Develop an immersive 3D application or experience (in support of VR or AR hardware)

## SEMESTER 2

### WEB TECHNOLOGIES

- Client-side Web application: Java Servlet, Java Server Pages, Cookies, Sessions, JDBC, MVC
- Server-side Web application: WEB development methods and process, HTML, CSS, Javascript, HTML5, CSS3/4, Frameworks and Javascript tools, AJAX

## SEMESTER 3

### DISTRIBUTED PROGRAMMING AND ARCHITECTURE

- Typology of distributed systems
- Distributed applications properties: interoperability, scalability/elasticity, load balancing, consistency, fault tolerance
- Communication: protocols, topologies
- Concurrent programming
- Distributed algorithms & application patterns

## SEMESTER 4

### INTERNSHIP

The internship with an international company will enable students to display valuable professional skills and attitudes developed during the three academic semesters. ISEP will provide you with assistance in your search for an internship. Companies usually give a stipend to the trainees.