ENGINEERING PROGRAMME

2023-2024

Year 2 / Year 3

Specialisation option

Computer Science for Information Systems

OD INFOSI

PROGRAMME SUPERVISOR

Jean-Yves MARTIN

Autumn Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 73 / 93	12	Core course	BDONN GELOG MADIS OBJET	DataBases Software Engineering Discrete Mathematics Object Oriented Programming
UE 74 / 94	13	Core course	ADATA MEDEV_INFOSI PAPPL SECUR SYRES	Data Analysis Industrial Software Development Project: Software Development Project Systems and Data security Systems and Networks

Spring Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 103 / 83	14	Core course	DEVMO PGROU PRWEB SYSIN TLANG	UI-UX Design and mobile Dev Group Project Web Programming Information Systems Language Theory

ENGINEERING - OD INFOSI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

DataBases [BDONN]

LEAD PROFESSOR(S): Jean-Yves MARTIN

Objectives

The objective of this course is to understand the functioning of databases, from both theoretical and practical perspectives. Starting from relational algebra, we study the conceptual modeling of a more or less well defined problem and its transformation into a relational model and its operations through administrative tools or software. The focus lies particularly on the treatment of ill-posed problems, or the exploitation of poorly designed databases in order to prepare engineers for real situations.

Course contents

This course includes lectures, exercices and practical work.

Lectures will follow the following programme:
- Introduction to Databases
- Relationnal Databases
 + Functional Modeling, Relational Modeling, Physical Modeling
 + Relational Algebra
 + Introduction to Normal Forms
 + Introduction to SQL
 + Programming databases with java, python and PL/SQL
- Notions of BI
- Introduction to noSQL and Big Data
  + Introduction to mongoDB
  + Introduction to Cassandra, CHEBOTKO Diagramme

Practical work consists in a projet that requires database modelling and creation, SQL requests, programming in java, triggers implementation, use of MongoDB database through python and java programs.

Course material

Assessment

Collective assessment: EVC 1 (coefficient 0.5)

Individual assessment: EVI 1 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	10 hrs	10 hrs	0 hrs	2 hrs

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

Software Engineering [GELOG]

LEAD PROFESSOR(S): Myriam SERVIÈRES

Objectives

To acquire the fundamentals in Software Engineering and Project Management.

Course contents

The course is structured around several major themes:
- Software development cycles (specifications, life cycle, planning, quality, specifications, production, acceptance),
- Analysis, specification and design models with a particular emphasis on UML,
- Fundamentals of IT project management,
- Introduction to Agile development (Scrum) and DevOps.

Upon completion of the course, students are expected to be able to design and model software and write specifications.

Course material

Modélisation objet avec UML, Pierre-Alain Muller, Best of Eyrolles, 2005.
UML2 et les design patterns, Craig Larman, Pearson Education, 2005.
Software Engineering 8, Ian Sommerville, Addison Wesley, 2007.
Le génie logiciel et ses applications, Ian Sommerville, InterEdition, 1988.
Processus d'ingénieries du logiciel, méthodes et qualité, Claude Pinet, Pearson Education, 2002.
UML2, Benoit Charroux, Aomar Osmani, Yann Thierry-Mieg, Pearson Education, 2005.

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	22 hrs	8 hrs	0 hrs	0 hrs	2 hrs

Discrete Mathematics [MADIS]

LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT

Objectives

The objective of this course is to provide a number of mathematical tools used in solving computer problems.
- To show the diversity of tools needed in information coding
- To introduce some elements of theoretical computer science underlying the other courses of the computer science specialisation.

Course contents

- Introduction to information coding
    - Theoretical foundations of coding theory and its history,
    - Application examples, associated algorithms.
    - Error correcting codes,
    - Cryptography.
- Graphs
    - Introduction to graph theory (shortest paths, minimum cover, flow, layout).

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	20 hrs	10 hrs	0 hrs	0 hrs	2 hrs

ENGINEERING - OD INFOSI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

Object Oriented Programming [OBJET]

LEAD PROFESSOR(S): Jean-Marie NORMAND

Objectives

The objective of this course is for students to be able to program in an object-oriented language. It will introduce the main concepts of object-oriented programming (encapsulation, inheritance, polymorphism) to model them using UML (Unified Modelling Language), and put them into practice with Java language.

Then, the course will focus on the major classes of data structures and algorithms based on the implementation in Java.

Finally, some specific mechanisms will be covered such as interfaces, abstraction, generics, exceptions and introspection.

The course consists of lectures as well as numerous practical sessions. During the lab work, students realize a project that evolves to integrate all the notions discussed in the classes, the project runs throughout the whole course.

Course contents

Introduction to Java
Object-oriented concepts
Data structures and how to use them in Java
Abstract classes and methods, Interfaces
Generics and Exceptions
Introspection

Addendum:
Packages
Threads in Java
Graphical User Interface in Swing

Course material

Assessment

Collective assessment: EVC 1 (coefficient 0.5)

Individual assessment: EVI 1 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	0 hrs	20 hrs	0 hrs	2 hrs

Data Analysis [ADATA]

LEAD PROFESSOR(S): Mathieu RIBATET

Objectives

Learn and implement classical data analysis methods

Course contents

1- Introduction to modeling and basic concepts, data visualization
2- Unsupervised classification
3 - Principal component analysis
4- Linear regression

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	14 hrs	18 hrs	0 hrs	0 hrs	0 hrs

Industrial Software Development [MEDEV_INFOSI]

LEAD PROFESSOR(S): Myriam SERVIÈRES

Objectives

This course aims to provide methods and tools for developing industrial-quality software. This includes unit and integration tests, version management, code metrics, continuous integration services, and design patterns. It will also be an opportunity to extend the students' technical knowledge.

Lab work will use java language. All notions covered in lectures will be applied practically in lab sessions.

Course contents

- Group work in computer science
- Version management
- Software tests
- Unit testing
- Advanced build tools and continuous integration
- Code metrics

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	6 hrs	10 hrs	16 hrs	0 hrs	0 hrs

ENGINEERING - OD INFOSI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

Project: Software Development Project [PAPPL]

LEAD PROFESSOR(S): Myriam SERVIÈRES

Objectives

The aim of this project is to build an application, using the concepts covered during the computer science lectures.

Course contents

The project undertaken in pairs. Emphasis is placed on project management, the quality of the deliverable, documentation of the source code and the results.

Projects change every year. They can include web development, specific software development, etc.

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	1	0 hrs	0 hrs	0 hrs	32 hrs	0 hrs

Systems and Data security [SECUR]

LEAD PROFESSOR(S): Jean-Yves MARTIN

Objectives

The objective of this course is to give students an understanding of computer security, cybersecurity, and copyright. For this, each of these aspects is covered by a professional in the field, who addresses the basic concepts, the tools used in practice, and illustrates his or her point with examples.

Course contents

- Introduction to internet security, main attacks, encryption, and main mechanisms. Introduction to LDAP authentication.
- Security from an administrative perspective. Security planning, RSSI, Using security audit.
- Security from a company audit perspective.
- Security from a technical point of view. Main attacks: how we can protect computers and software.
- Security from a legal point of view. CNIL, software licenses. RGPD.
- Personal data protection.

Course material

Assessment

Individual assessment: EVI 1   (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	25 hrs	5 hrs	0 hrs	0 hrs	2 hrs

Systems and Networks [SYRES]

LEAD PROFESSOR(S): Jean-Yves MARTIN

Objectives

This course aims to provide the fundamentals of systems and networks. The first part of the course defines what is an operating system, the services to be expected and principal components. The second part of the course presents the problems of data-processing networks (general concepts, overview, challenges, customer-server, groupware, security).

Course contents

The course is divided into two main chapters:
1 - Introduction to Operating Systems
- Main functions of an operating system,
- material architecture of information processing systems,

2 - Networks
- general concepts
- Data Transmission
- Network Technology Ethernet, Token Ring, FDDI, ATM
- ISO Architecture
- TCP/IP Architecture
- Internet and the World Wide Web
- Network administration
- Data security

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	22 hrs	8 hrs	0 hrs	0 hrs	2 hrs

UI-UX Design and mobile Dev [DEVMO]

LEAD PROFESSOR(S): Vincent TOURRE

Objectives

UI-UX : Learn the principles of creating a User Interface (UI) taking into account user experience (UX).
Mobile development: Learn the logic behind the creation of a mobile application for the Android platform.

Course contents

User Interfaces:
- History of interfaces
- Interaction styles
- User experience
- Visual perception
- Ergonomic criteria

Mobile development:
- Production process of an Android application
- Programming activities in JAVA

Interface/mobile development project to practise the concepts (two students).

Course material

Assessment

Collective assessment: EVC 1 (coefficient 0.4)

Individual assessment: EVI 1 (coefficient 0.6)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	10 hrs	8 hrs	0 hrs	2 hrs

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

Group Project [PGROU]

LEAD PROFESSOR(S): Jean-Yves MARTIN

Objectives

The aim of this project is to have students work in groups in order to address design issues, code sharing, project planning, development.

Course contents

This course is a project undertaken in groups of 5 to 7 students.

Emphasis is placed on project reporting, project management, code sharing, the quality of the deliverable, documentation of the source code and the results.

Projects change every year. They can include web development, specific software development, etc.

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	2	0 hrs	0 hrs	0 hrs	48 hrs	0 hrs

Web Programming [PRWEB]

LEAD PROFESSOR(S): Jean-Marie NORMAND

Objectives

The objective of this course is to provide students with the fundamentals of web programming.

It starts with HTML-CSS and JavaScript before witching to higher level frameworks.

Students will thus have to program a small but functional Web application using:
- Spring (Java)
- ReactJS/NodeJS

This course is made of many practicals.

Course contents

This course includes lectures and lab work.

Lectures:
- Introducing HTML, CSS and Javascript
- PHP
- J2EE
- Web servers
- Notions of Web Programming Frameworks

Lab work:
- HTML, Javascript, AJAX
- SPRING
- ReactJS/NodeJS

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	4 hrs	2 hrs	24 hrs	0 hrs	2 hrs

ENGINEERING - OD INFOSI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

Information Systems [SYSIN]

LEAD PROFESSOR(S): Jean-Yves MARTIN

Objectives

The aim of this course is to understand information systems, how they are built, how they can be analyzed.

Course contents

This course focus on following points :

- Structure and management of an Information System
- Cartography of an Information System, Urbanization of Information Systems
- Virtualisation and Cloud
- Managing Information Systems Projects
- Data management.

Course material

Assessment

Individual assessment: EVI 1   (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	24 hrs	6 hrs	0 hrs	0 hrs	2 hrs

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

Language Theory [TLANG]

LEAD PROFESSOR(S): Didier LIME

Objectives

The objective of this course is to introduce a number of fundamental theoretical models of Computer Science, through the notions of languages and compilation.

Course contents

The course follows the classical approach to compilation, extending to the Turing machine models.

1. Lexical analysis, regular expressions, and finite automata
2. Syntax analysis, formal grammars, and pushdown automata
3. The link between languages and algorithms, and Turing machines
4. Semantic analysis and attributed grammars
5. Code generation

These notions are illustrated and put into action through the use of Lex & Yacc derived compiler compilers.

Course material

Alfred V. Aho, Monica S. Lam, Ravi Sethi. Compilers: Principles, Techniques, and Tools (2nd edition). Addison Wesley. 2006

P. Dehornoy. Complexité et Décidabilité, Springer-Verlag, 1993.

M. Sipser. Introduction to the Theory of Computation, PWS Pub. Co., 1996.

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	20 hrs	10 hrs	0 hrs	0 hrs	2 hrs