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## Hardware Architecture

### Digital Circuits

#### AIMS

The goal of this course is to gain theoretical and practical understanding of the principles and mechanisms that govern digital circuits, from basic logic gates up to a simple microprocessor.

#### Expected skills:

- coding and decoding information in binary
- building combinatorial circuits from boolean functions
- modeling sequential behavior as finite-state automata
- building a sequential circuit from a finite-state automaton
- evaluating the cost and performance of digital circuits

#### IDENTIFICATION

CODE : IF-3-AC  
ECTS : 2.0

#### HOURS

Lectures : 9.0 h  
Seminars : 4.0 h  
Laboratory : 12.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h

#### ASSESSMENT METHOD

Written exam (1h30). Progress evaluation by Moodle QCMs.

#### TEACHING AIDS

Lecture notes for the course, work sheets for classwork and labs [in French]

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

- coding: from information to bits
- computing: from boolean functions to combinatorial circuits
- storing: from latches to addressable memory
- controlling: from behavioral specification to sequential circuits [finite state automata]
- building complex circuits: separation of control and data
- Von Neuman model
- initiation to CAD and simulation tools for circuits

#### BIBLIOGRAPHY

- D. Patterson, J. Hennessy. Computer Organization and Design, The Hardware/Software Interface. Morgan Kaufmann.
- P. Amblard, J.C. Fernandez, F. Lagnier, F. Maraninchi, P. Sicard, P. Waille. Architectures Logicielles et Matérielles. Dunod. [in french]

#### PRE-REQUISITE

### INSA LYON

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## Hardware Architecture Computer Architecture

### IDENTIFICATION

CODE : IF-3-AO  
ECTS : 2.0

### HOURS

Lectures : 9.0 h  
Seminars : 4.0 h  
Laboratory : 12.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h

### ASSESSMENT METHOD

Written exam (1h30). Progress  
evaluation by Moodle QCM.

### TEACHING AIDS

Lecture notes for the course, work  
sheets for classwork and labs (in  
French)

### TEACHING LANGUAGE

French

### CONTACT

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### AIMS

The objective of this course is to understand

- the design and working principles of a modern computer (processor, memory hierarchy, peripherals)
- the lower levels of the software stack (assembly language, application binary interface, interruptions, input/output drivers, compiler).

### Expected skills

- understanding the execution of a program or operating system on a machine
- low-level programming of embedded systems
- optimizing the execution of software for a given architecture (exploiting caches, instruction-level parallelism, etc)
- exploiting technical documentation in these fields

### CONTENT

#### Lectures:

- design of a simple processor, from instruction set to architecture
- commented overview of current mainstream processors (x86, ARM, MSP430)
- exploiting instruction-level parallelism (pipeline, superscalar, SIMD)
- memory hierarchy and virtual memory

#### Classworks and labs

- building and simulating a processor
- MSP430 programming
- system aspects (I/O, interruptions)
- optimizing for performance (exploiting pipelines and caches)

### BIBLIOGRAPHY

Tanenbaum. Computer architecture.

Hennessy & Patterson. Computer architecture, a quantitative approach.

### PRE-REQUISITE

A basic course on digital circuits, for instance IF-3-AC

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**Conferences and Seminars**

## One Semester Exchange [S1]

## AIMS

**IDENTIFICATION**CODE : IF-5-ECH-S1  
ECTS : 30.0**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.0 h
Personal work :	400.0 h
Total :	400.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Conferences and Seminars**

## One Semester Exchange [S2]

## AIMS

**IDENTIFICATION**CODE : IF-5-ECH-S2  
ECTS : 30.0**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.0 h
Personal work :	400.0 h
Total :	400.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Conferences and Seminars**

## Research Master

## AIMS

**IDENTIFICATION**CODE : IF-5-MR  
ECTS : 16.0**HOURS**

Lectures :	1.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	1.0 h
Personal work :	1.0 h
Total :	2.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Conferences and Seminars**

## PhD Track

## AIMS

Lectures and elective seminars given at the University of Passau (French-German IFIK-MDPS PhD-Track)

**IDENTIFICATION**CODE : IF-5-PASSAU-S1  
ECTS : 9.0**HOURS**

Lectures :	1.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	1.0 h
Personal work :	1.0 h
Total :	2.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Conferences and Seminars**

## PhD Track

## AIMS

Master thesis (Masterarbeit) at the University of Passau (French-German PhD-Track IFIK-MDPS)

**IDENTIFICATION**CODE : IF-5-PASSAU-S2  
ECTS : 30.0**HOURS**

Lectures :	1.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	1.0 h
Personal work :	1.0 h
Total :	2.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

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**Conferences and Seminars****Industrial and International Seminar****AIMS**

Students have to choose 3 seminars animated by company representatives, and 1 international seminar.

**IDENTIFICATION**

CODE : IF-5-SEM-EI  
ECTS : 1.0

**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

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**CONTENT****BIBLIOGRAPHY****PRE-REQUISITE****INSA LYON****Campus LyonTech La Doua**

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## Conferences and Seminars

### Programming infrastructure and paradigms for Big Data

#### AIMS

Organising Big Data project involves taking into account operational constraints to set the adapted data collection / computing / storage infrastructure, paying a particular attention on the way the deployment project is organised and on security concerns.

#### IDENTIFICATION

CODE : IF-5-SEMA11  
ECTS : 2.0

#### HOURS

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
<b>Total :</b>	<b>50.0 h</b>

#### ASSESSMENT METHOD

Oral&written examination

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

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M. SCUTURICI Vasile-  
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#### CONTENT

- 1) Organisation of Big Data infrastructure
  - Requirements analysis and infrastructure sizing. Identification on the Big Data impact on the infrastructure management / operation organisation
  - Cloud Computing middleware and associated meta-models
  - Cost models related to Big Data infrastructure
- 2) Data collection management
  - Organising a data collection project and management of a large scale project (how to industrialize a deployment process, interoperability management...)
  - Data value model
  - Economic and ethic models related to the Data market, introduction to Open Data, management of legal constraints and charters
  - Security Policy organisation: what are the main changes involved by Big Data, how to manage protection requirements
- 3) Frameworks for management and analysis of big data : Spark, Hadoop
  - programming paradigms
  - processing models : batch, interactive, stream, iterative
  - main components of Spark
  - getting started with Spark - practical examples

#### BIBLIOGRAPHY

- [1] Data Just Right: Introduction to Large-Scale Data & Analytics, Michael Manoochehri
- [2] Getting Started with NoSQL Your guide to the world and technology of NoSQL, Gaurav Vaish
- [3] Professional NoSQL, Shashank Tiwari
- [4] MapReduce Design Patterns, Donald Miner and Adam Shook
- [5] Learning Hadoop 2: Design and implement data processing, lifecycle management, and analytic workflows with the cutting-edge toolbox of Hadoop 2, Garry Turkington Gabriele Modena

#### PRE-REQUISITE

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## Conferences and Seminars

### Big data management and analytics

#### AIMS

This class aims at giving the theoretical and practical basics for managing and mining large volumes of data. It includes: big data management, artificial intelligence (machine learning and data mining) as well as optimization.

The main skills you will acquire are :

- Understanding the problems issued by the heterogenous data integration and data quality
- Use NoSQL data management techniques for concrete problems
- Learn the theory behind predictive modeling, clustering, pattern mining and optimisation
- Learn several algorithms for each task and understand their specificity, limits and parameters

These skills will be reinforced in satellite projects of this class.

#### IDENTIFICATION

CODE : IF-5-SEMA12  
ECTS : 2.0

#### HOURS

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
<b>Total :</b>	<b>50.0 h</b>

#### ASSESSMENT METHOD

1.5 hour exam to test the assimilation of the content. Documents will be authorized.

#### TEACHING AIDS

All documents will be available on moodle (<http://moodle.insa-lyon.fr>)

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

Big Data Data management Systems

- NoSQL/NewSQL databases
- data models (key-value, column oriented),
- storage models (memory, disk),
- physical models (distribution)
- getting started with Cassandra - concrete examples

« Predictive analytics » - deepening of learning methods ("machine learning") including two key techniques: support vector machines [SVM] and artificial neural networks ["deep learning"];

« Descriptive analytics » - discovery of heterogeneous, structured and dynamic patterns in big data

« Prescriptive analytics » - exploiting knowledge extracted during descriptive and predictive analytics to propose action plans for policy makers

#### BIBLIOGRAPHY

- S. Harizopoulos, D. Abadi, P. Boncz. Column-Oriented Database Systems, VLDB 2009 Tutorial
- N. Marz. Big Data, Principles and best practices of scalable real-time systems. Manning Publications, 2012
- A. Gates. Programming Pig, O'Reilly 2012
- E. Hewitt. Cassandra: The Definitive Guide. O'Reilly 2011
- J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufmann, 2000.
- P. N. Tan, M. Steinbach, and V. Kumar. Introduction to Data Mining. Addison-Wesley, 2006.
- M. J. Zaki, W. Meira Jr. Fundamentals of Data Mining Algorithms. Cambridge Univeristy Press, 2013.
- C. C. Aggarwal. Data Mining: The Textbook, Springer, May 2015

#### PRE-REQUISITE

Basic of database management, data-mining and statistics.

If you were at the department in 4th year, the following classe must be mastered:

- IF-4-FD
- IF-4-BDD
- IF-4-ST
- IF-3-BDR
- IF-3-MD

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**Conferences and Seminars****Transformation and Collaboration****IDENTIFICATION**CODE : IF-5-SEMA21  
ECTS : 2.0**HOURS**

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
Total :	50.0 h

**ASSESSMENT METHOD**

Case studies defence and presentation slides.  
Evaluation of the quality of the collaboration in the project team

**TEACHING AIDS**

Hard-copy of slides and some electronic documents

**TEACHING LANGUAGE**

French

**CONTACT**

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**AIMS**

This course aims at introducing one of the major challenges of companies: Digital Transformation. One can observe that people are using individual technologies which are far behind technologies used by companies (Smartphones, 4G networks, Cloud Computing, Big Data Analytics, Internet of Things,...). It seems obvious that companies need to invest heavily on technology in order to build digital enabled Information Systems. The course will be centered on building transformation projects based on actual cultural behavior (Collaboration, share, permanent connection to cloud systems through touch-screens).

**CONTENT**

Digital transformation: based on case studies, you will learn to use your technological know-how (analytics, mobile computing, social networks) to design the digital transformation, in order to implement better customer experience, to redesign key processes or to create new business models.  
Collaborative management: after a rapid introduction to the classical organization theories the class will be separated into four teams, and each team will animate a seminar on one of the following subjects: collective intelligence, collaborative project management, digital strategy, disruptive innovation.  
Information system governance: the best practices enabling a company to identify the best investment policy.  
A case study will permit a concrete implementation of the guidelines of commonly admitted referentials.

**BIBLIOGRAPHY****PRE-REQUISITE**

Competencies and knowledge on Information System and distributed architecture design and implementation, enterprise organisation and management.

IF-4-PLD-SIE  
IF-4-WASO  
IF-4-PLD-MARS  
IF-4-GP

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## Conferences and Seminars

### Driving and technologies of the digital transformation

#### IDENTIFICATION

CODE : IF-5-SEMA22  
ECTS : 2.0

#### HOURS

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
<b>Total :</b>	<b>50.0 h</b>

#### ASSESSMENT METHOD

Defense / report on a technology synthesis or a small project  
Quizz and multiple choice exam depending on the topic.

#### TEACHING AIDS

Hard copy of slides and some electronic documents / supports.

#### TEACHING LANGUAGE

French

#### CONTACT

M. BADR Youakim  
[youakim.badr@insa-lyon.fr](mailto:youakim.badr@insa-lyon.fr)

#### AIMS

This course aims at introducing some technologies and methods involved in Corporate Digital transformation. Key issues related to information system protection, Cloud migration, IoT or Big data adoption will be discussed.

The main learning outcomes can be summarized as:

- IoT: understanding fundamental elements to design and deploy a technical end to end architecture of connected objects, being able to analyze IoT technologies and opportunities for a given economic field
- Big Data: understanding technologies and key challenges to manage and analyse large volume of data, being able to identify challenges and opportunities and being able to design and manage a big data project within companies
- Information systems protection: understanding and managing a risk analysis approach, being able to implement an identity management system and being able to identify legal constraints related to personal data protection.
- Cloud computing: understanding Cloud technologies organisation, being able to design and evaluate a Cloud offering, to understand Cloud economic models and to organise a Cloud deployment project.

#### CONTENT

- Internet of things: after the introduction of key concepts, technologies and integration of the connected objects infrastructure, the impact of connected objects offers, services and products in the tertiary and industrial sectors is presented.
- Big Data: introduction of the problems, issues and solutions related to the storage, management and analysis of environments associated to large volume of data. Hadoop based architectures ad ecosystem (storage layer HDFS, Pig, querying with Hive) are detailed. Finally a case study allows to show all of the life cycle of a Big Data Project
- Information security and protection: main requirements, standards and methods related to the Security [EBIOS, OCTAVE, mass....], design of an identity management architecture, organizational and legal constraints, management of personal data. Different case studies picked from concrete examples address the key concepts/ requirements and present how to implement these knowledge and know-how
- Cloud Computing and IT services industrialization: context analysis, Cloud models and technologies, how to build a Cloud offer, Cloud economic model, Service agreement management and how to manage a Cloud deployment project

#### BIBLIOGRAPHY

- [1] Data Just Right: Introduction to Large-Scale Data & Analytics, Michael Manoochehri
- [2] Doing Data Science, Cathy O'Neil, Rachel Schutt
- [3] Designing the Internet of Things, Adrian McEwen , Hakim Cassimally

#### PRE-REQUISITE

Competencies and knowledge on Information System and distributed architecture design and implementation, entreprise organisation and management.

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## Conferences and Seminars

### Parallel and GPU computing

#### IDENTIFICATION

CODE : IF-5-SEMA31  
ECTS : 2.0

#### HOURS

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
Total :	50.0 h

#### ASSESSMENT METHOD

Active participation

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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M. WOLF Christian  
[christian.wolf@insa-lyon.fr](mailto:christian.wolf@insa-lyon.fr)

#### AIMS

The objective of this course is twofold. On the one hand, it presents the general principles and architectures of parallel systems, as well as their communication models, and programming models. On the other hand, this course presents the GPU parallel architecture, memory architecture and management, parallel computing and synchronization, and the underlying programming models. The course presents theoretical and practical aspects of parallel and GPU computing.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies
- Using news technologies in the design and implementation of parallel systems and applications

#### CONTENT

The course consists in two parts.

Part one:

- Collective communication et message passing
- Parallel linear algebra
- Parallel algorithms
- Programming: MPI, OpenMP
- Performance evaluation of parallel programs

Part two:

- Introduction to massively parallel programming, kernel programming
- Architecture of modern GPU

#### BIBLIOGRAPHY

Book "Programming Massively Parallel Processeurs" par by D.B.Kirk et W.W Hwu.  
CUDA Programming guide : <https://docs.nvidia.com/cuda/cuda-c-programming-guide/>

#### PRE-REQUISITE

### INSA LYON

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## Conferences and Seminars

### Distributed Systems and Algorithms

#### IDENTIFICATION

CODE : IF-5-SEMA32  
ECTS : 2.0

#### HOURS

Lectures :	0.0 h
Seminars :	32.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
Total :	50.0 h

#### ASSESSMENT METHOD

- Active participation

#### TEACHING AIDS

- Lecture slides

#### TEACHING LANGUAGE

French

#### CONTACT

MME BEN MOKHTAR Sonia  
[sonia.benmokhtar@insa-lyon.fr](mailto:sonia.benmokhtar@insa-lyon.fr)  
MME BOUCHENAK  
KHELLADI Sahra  
[sahra.bouchenak@insa-lyon.fr](mailto:sahra.bouchenak@insa-lyon.fr)

#### AIMS

The objective of this course is to present the algorithms and mechanisms underlying distributed computing systems.

First, the course presents the architectures of distributed systems, the main technologies for building distributed systems, with both theoretical and practical aspects.

Furthermore, the course presents distributed algorithms, from basic abstractions to different families of distributed algorithms.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies: clouds, P2P, Big Data, etc.
- Using news technologies in the design and implementation of distributed systems and applications

#### CONTENT

The first part of the course, related to distributed systems, consists of:

- Introduction to distributed systems and their architectures
- Big Data systems: SQL vs. NoSQL systems
- Case study: Hadoop/MapReduce distributed systems
- Cluster-based computing systems, Cloud computing systems (IaaS, SaaS, PaaS) - Possibly (depending on time), caching systems, replication solutions

The second part of the course, related to distributed algorithms, consists of:

- Basic abstractions of distributed algorithms
- Reliable broadcast: How to ensure that a message sent to a group of processes is received by all or none (in presence of failures)?
- Shared memory (registers): How to ensure that some information is stored reliably among a set of processes (in presence of failures)?

#### BIBLIOGRAPHY

- George Coulouris, Jean Dollimore, Tim Kindberg. Distributed Systems: Concepts and Design (4th Edition). Addison Wesley, 2005.
- Consensus: How to enable a set of processes to agree on a given value (in presence of failures)?
- Andrew S. Tanenbaum, Maarten van Steen. Distributed Systems: Principles and Paradigms (2nd Edition). Prentice Hall, 2006.
- Nancy A. Lynch. Distributed Algorithms. Morgan Kaufmann Publishers, 2001.

#### PRE-REQUISITE

Programming skills

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**Conferences and Seminars**

## Foreign Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEME-EI10  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	12.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	12.0 h
Personal work :	0.0 h
Total :	12.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

English

**CONTACT**M. PORTIER Pierre-Edouard  
[pierre-edouard.portier@insa-lyon.fr](mailto:pierre-edouard.portier@insa-lyon.fr)**CONTENT**

Titre

A Guided tour to the Random Walk for Computer Scientists  
Résumé

The study of Random Walks finds application in many fields of Science: Computer Science and Information Technologies make no exception.

Random Walks models offer the conceptual ground to the study of several real-world graphs, such as those of peer-to-peer networks, social networks or the graph of web pages: for instance, the definition of the well-known (Google search) Page-Rank algorithm is structured around the ideal behavior of web random surfers. Many communication protocols for peer-to-peer networks and sensor networks are based on Radom Walks.

Furthermore, diffusion phenomena, consisting in the Random displacements of a population of hypothetic walkers inspire several image-processing algorithms for image filtering, segmentation and enhancement; they represent as well the key element of general purpose tools such as the Markov Chain Monte Carlo (Metropolis-Hastings) algorithms and of the Simulated Annealing optimization techniques.

Indeed, the full list of application in Computer Science would be very long.

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## Conferences and Seminars

### Foreign Seminar

#### AIMS

#### IDENTIFICATION

CODE : IF-5-SEME-EI11  
ECTS : 0.5

#### HOURS

Lectures :	0.0 h
Seminars :	12.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	12.0 h
Personal work :	0.0 h
Total :	12.0 h

#### ASSESSMENT METHOD

#### TEACHING AIDS

#### TEACHING LANGUAGE

English

#### CONTACT

M. PORTIER Pierre-Edouard  
[pierre-edouard.portier@insa-lyon.fr](mailto:pierre-edouard.portier@insa-lyon.fr)

#### CONTENT

Titre

A quick course on model-based engineering of real-time and embedded software systems  
Résumé

Principal objectives of this course:

To introduce the model-based engineering (MBE) approach to software design and development

To teach certain aspects of the craft of software design

Design philosophy

Design techniques/patterns & emphasis on architecture

To explain the essentials of modern modeling languages (using UML as an example)

Design philosophy

Major elements and capabilities

#### BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI01  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

## BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI02  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

## BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI03  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. PORTIER Pierre-Edouard  
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## CONTENT

## BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI04  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

## BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI05  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. PORTIER Pierre-Edouard  
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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI06  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. PORTIER Pierre-Edouard  
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## CONTENT

## BIBLIOGRAPHY

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI07  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

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**Conferences and Seminars**

## Industrial Seminar

## AIMS

**IDENTIFICATION**CODE : IF-5-SEMI-EI09  
ECTS : 0.5**HOURS**

Lectures :	0.0 h
Seminars :	18.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	18.0 h
Personal work :	0.0 h
Total :	18.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## CONTENT

## BIBLIOGRAPHY

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## Conferences and Seminars

### Introduction to Computer Science R&D

#### IDENTIFICATION

CODE : IF-5-TCS0  
ECTS : 2.0

#### HOURS

Lectures :	32.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	18.0 h
<b>Total :</b>	<b>50.0 h</b>

#### ASSESSMENT METHOD

Teams of 4 students will have to give a 30' talk on a selected topic.

#### TEACHING AIDS

Slides

#### TEACHING LANGUAGE

French

#### CONTACT

M. BOULICAUT Jean-  
Francois  
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#### AIMS

Nous introduisons des méthodes et tâches spécifiques à la recherche en informatique [production d'un résultat scientifique, évaluation d'un résultat, usages multiples, construction et suivi de projets de recherche collaboratifs, assistance au transfert, à l'innovation, et à la valorisation]. La recherche suppose l'existence de problèmes « ouverts » c'est-à-dire de problèmes pour lesquelles on n'identifie pas de solutions qui puissent être construites à partir des briques ou technologies disponibles « sur l'étagère ». Avec les différents thèmes abordés, les étudiants doivent être capables de mieux comprendre les enjeux de la R&D et de l'innovation, mettre en oeuvre des méthodes de travail caractéristiques de la recherche et notamment comprendre les principales méthodes de dissémination de résultats avec les aspects scientifiques mais aussi économiques qui y sont associées.

La notion de publication scientifique est centrale en R&D et elle est souvent mal comprise. Non seulement nous discuterons des étapes typiques qui conduisent à une publication mais les étudiants pourront eux-mêmes s'exercer à l'étude critique de documents dans le cadre du module « Synthèse Scientifique et Technique ». Les questions des mises en oeuvre ou exploitations des résultats de recherche seront posées : usages, dissémination, maturation, transfert, ou valorisation. Enfin, nous allons considérer l'écosystème de la R&D en Informatique. Le comprendre, c'est bien sûr connaître les acteurs et donc des organisations publiques et privées à des échelles variées (régionale, nationale ou internationale) qui existent pour aider la recherche (CNRS, ANR), l'innovation, le transfert, et la création d'activités (e.g., INSAVALOR, la filiale de valorisation de l'INSA Lyon ou encore PULSALYS la Société d'Accélération du Transfert de Technologie ; SATT- de Lyon/Saint-Etienne).

#### CONTENT

Terminologie et introduction à la recherche, la R&D et à l'innovation

Exemples de projets de recherche pour illustrer les différentes facettes des métiers de la recherche en informatique

Qu'est-ce qu'un résultat de recherche ?

Le cas particulier de la publication scientifique

Protection d'un résultat

Modèles économiques pour l'exploitation de résultats scientifiques

Maturation, transfert, et valorisation.

La responsabilité du chercheur dans la société numérique

Ecosystème de la R&D en Informatique

#### BIBLIOGRAPHY

#### PRE-REQUISITE

N/A

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## Conferences and Seminars

### Experimentation and Experimental Validation

#### AIMS

The goal is to tackle computer science as a science, with its theoretical foundations, and its practical experimental evaluations. We present methods and tools to design, validate, evaluate and improve algorithms. We illustrate through concrete examples the importance of having a scientific approach to design and evaluate an algorithm in an R&D context and, more generally, to master tools for adopting a critical thought.

#### IDENTIFICATION

CODE : IF-5-TCS1  
ECTS : 2.0

#### HOURS

Lectures :	24.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	18.0 h
Total :	42.0 h

#### ASSESSMENT METHOD

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

MME SOLNON Christine  
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#### CONTENT

- 1 - Correctness and completeness of an algorithm: What is a correct/complete algorithm? How to prove correctness and completeness?
- 2 - Complexity classes and computational complexity: How to evaluate scale-up properties of an algorithm from a theoretical point of view? Complexity classes, Parametrized complexity. What can we do in practice when theory tells us our goal is impossible to achieve?
- 3 - Experimental evaluation: What can we experimentally evaluate? What are the main steps of an experimental process? How to design a reproducible experimentation? How to choose a benchmark? What performance indicators? How to analyze experimental results?
- 4 - Algorithm engineering: Algorithm tuning vs code tuning; Automatic algorithm configuration and parameter tuning; Learning for per-instance automatic selection of algorithms

#### BIBLIOGRAPHY

Cormen, Leiserson, Rivest : Introduction to algorithms. MIT Press and McGraw-Hill, 2009  
Papadimitriou : Computational complexity. Editions Addison-Wesley, 1994  
McGeoch : A guide to experimental algorithmics. Cambridge University Press, 2012  
Baillargeon : Petit cours d'autodéfense intellectuelle. Lux Editeur, 2005

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## Conferences and Seminars

### Modelisation and systems simulation

#### IDENTIFICATION

CODE : IF-5-TCS2  
ECTS : 2.0

#### HOURS

Lectures :	24.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	18.0 h
Total :	42.0 h

#### ASSESSMENT METHOD

#### TEACHING AIDS

slides, scientific articles.

#### TEACHING LANGUAGE

French

#### CONTACT

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M. ROUZAUD-CORNABAS  
Jonathan  
[jonathan.rouzaud-cornabas@insa-lyon.fr](mailto:jonathan.rouzaud-cornabas@insa-lyon.fr)

#### AIMS

The "computational science" module aims at giving an overview of the relationship between computation and sciences. Contrary to the classical "computer science" field which is the science OF information, we will here do science WITH information. In other words, we will here use the methods and technics of computer science to produce knowledge in other scientific fields. Computational Science is a rapidly growing field triggered by the increasing power of computational tools (HPC, cloud computing) but also by the increasing need to tackle societal questions that cannot be directly addressed experimentally (e.g. global warming, genome analysis, smart cities, crisis management, high energy physics...).

#### Competencies:

- identify the main issues of computational sciences for the scientific and for the engineer
- build relevant models to answer scientific questions
- master interdisciplinary collaborations
- use HPC in science
- analyse data produced by the models
- produce reliable knowledge from computational models

#### CONTENT

The lecture will introduce the main principles, tools and methods needed to study real objects through the prism of models and simulations. It will be based on four series of conferences:

- [1] basis of computational sciences (what is a model? why/when modelling? what is the difference between model and a simulation? how to validate a model?)
- [2] main classes of formalisms (differential equations, discrete models, individual-based models) and their advantages and disadvantages
- [3] computation infrastructures for computational science (HPC, parallel computation, cloud computation)
- [4] examples from e.g. computational physics, computational biology or computational sociology

#### BIBLIOGRAPHY

- William H. Press, Saul A. Teukolsky, William T. Vetterling, Brian P. Flannery. [2007] Numerical Recipes: The Art of Scientific Computing 3rd Edition. Cambridge University Press, 1256 p.
- Angela B. Shiflet, George W. Shiflet. [2006] Introduction to Computational Science: Modeling and Simulation for the Sciences. Princeton University Press, 584 p.
- Hans Petter Langtangen. [2009] Python Scripting for Computational Science. Springer, 756 p.
- Steven F. Railsback, Volker Grimm. [2011] Agent-Based and Individual-Based Modeling: A Practical Introduction. Princeton University Press, 352 p.
- Uri Wilensky, William Rand. [2015] An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with NetLogo. MIT Press, 504 p.
- Anthony M. Starfield, Karl A. Smith, Andrew L. Bleloch. [1994] How to Model It: Problem Solving for the Computer Age. Burgess Intl Group, 206 p.

#### PRE-REQUISITE

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**Software Development****Algorithms and Data Structures****IDENTIFICATION**CODE : IF-3-ALGO  
ECTS : 2.0**HOURS**Lectures : 10.5 h  
Seminars : 12.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 22.5 h  
Personal work : 25.0 h  
Total : 47.5 h**ASSESSMENT METHOD**

Supervised test on the platform.

**TEACHING AIDS**Lectures notes  
Programming platform (based on  
domjudge)**TEACHING LANGUAGE**

French

**CONTACT**M. GUERIN Eric  
[eric.guerin@insa-lyon.fr](mailto:eric.guerin@insa-lyon.fr)  
M. SCUTURICI Vasile-  
Marian  
[marian.scuturici@insa-lyon.fr](mailto:marian.scuturici@insa-lyon.fr)**AIMS**

The objective of this module is to give algorithmic basics that are needed for any computer science engineer. Students are initiated to the basic techniques for the design of a correct and good performing algorithm. Classical algorithms are presented.

This module develops the skill "Implémenter de bons logiciels" together with the capacity "Choisir les algorithmes et structures de données adaptés à la situation, et évaluer leur complexité".

**CONTENT**

- A. Design and analysis of an algorithm
  - introduction + motivation
  - pseudocode: variable, expressions, assignment ; looping instructions and branching ; parameters, procedures/functions ;
  - complexity ;
  - correctness ;
  - preconditions/postrelations/invariants ;
- B. Algorithmic resolution paradigms : complete search, divide&conquer, greedy, dynamic programming
- C. Sorting algorithms
- D. Data structures
  - Dynamic allocation ;
  - Structures ;
  - Abstract data types ;
  - Stacks and queues ;
  - Vectors ;
  - Linked lists ;
  - Trees

**BIBLIOGRAPHY**

Steven S. Skien, The Algorithm Design Manual, Springer, Second Edition, 2010

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein. Introduction to Algorithms, MIT Press, Third edition, 2009

Donald E. Knuth. Fundamental Algorithms, volume 1 of The Art of Computer Programming. Addison-Wesley, 1968. Third edition, 1997

UVa Online Judge, <http://uva.onlinejudge.org/>DOMjudge - Programming Contest Jury System, <http://www.domjudge.org/>**PRE-REQUISITE****INSA LYON****Campus LyonTech La Doua**20, avenue Albert Einstein - 69621 Villeurbanne cedex - France  
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**Software Development****Object Oriented Programming - C++ - Basis****IDENTIFICATION**CODE : IF-3-POO1  
ECTS : 3.0**HOURS**Lectures : 10.5 h  
Seminars : 10.0 h  
Laboratory : 16.0 h  
Project : 0.0 h  
Teacher-student  
contact : 36.5 h  
Personal work : 30.0 h  
Total : 66.5 h**ASSESSMENT METHOD**Lab work evaluation:  
- Written report (most of the  
time).  
Final exam:  
- Written final exam with  
documents allowed (duration: one  
hour and a half).**TEACHING AIDS**

Copy of the lecture slides.

**TEACHING LANGUAGE**

French

**CONTACT**M. MARANZANA Mathieu  
[mathieu.maranzana@insa-lyon.fr](mailto:mathieu.maranzana@insa-lyon.fr)**AIMS**

The aim of this course is the mastery of the methodological tools and concepts essential to the design, the implementation, the test, and the maintenance of high quality software. The object oriented approach with the C++ programming language is used to reach our goal.  
This course can be considered as an initiation to the C++ programming language. It requires little programming background though prior programming experience will make it easier.

**Skills**

Target skills are as follow:

- Applying methodologies for the development of software;
- Designing an object oriented software architecture;
- Designing, implementing and maintaining high quality software.

**CONTENT**

This course focuses on the core concepts of the object oriented approach: class, instance, method, attribute, single inheritance, polymorphism, early and late binding...

At the end of this teaching unit, you should be able:

- To manipulate the basic types of the C++ programming language (character, integer, float, array, structure, pointer, reference);
- To understand and to manipulate all the algorithmics forms of the C++ programming language;
- To master the class notion in a very simple contexts (visibility and data encapsulation, constructors, destructor, method call...);
- To master the inheritance concept (specialization, reuse, polymorphism...), key concept of the object oriented programming, in very simple situation (no template);
- To use properly the dynamic memory allocation in C++ using the new and delete operators;
- To build and to debug high quality object oriented programs using modularity (header file and implementation file);
- To understand the work of the C++ preprocessor.

**BIBLIOGRAPHY**

- [1] Bjarne Stroustrup, The C++ Programming Language (Fourth Edition), Addison-Wesley, 2013, ISBN-13: 978-0321563842
- [2] Bjarne Stroustrup, Programming: Principles and Practice Using C++ (Second Edition), Addison-Wesley, 2014, ISBN-13: 978-0321992789
- [3] Stanley B. Lippman, Josée Lajoie, Barbara E. Moo, C++ Primer (Fifth Edition), Addison-Wesley, 2012, ISBN-13: 978-0321714114
- [4] Stephen Prata, C++ Primer Plus (Sixth Edition), Addison-Wesley, 2011, ISBN-13: 858-0001090474

**PRE-REQUISITE**

Basic knowledge in algorithmics and in C programming language (IF-3-ALGO).

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## Software Development

### Object Oriented Programming - C++ - Advance

#### IDENTIFICATION

CODE : IF-3-POO2  
ECTS : 2.0

#### HOURS

Lectures :	9.0 h
Seminars :	6.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	27.0 h
Personal work :	25.0 h
<b>Total :</b>	<b>52.0 h</b>

#### ASSESSMENT METHOD

Lab work evaluation:  
- Written report (most of the time).  
Final exam:  
- Written final exam with documents allowed (duration: one hour and a half).

#### TEACHING AIDS

Copy of the lecture slides.

#### TEACHING LANGUAGE

French

#### CONTACT

M. MARANZANA Mathieu  
[mathieu.maranzana@insa-lyon.fr](mailto:mathieu.maranzana@insa-lyon.fr)

#### AIMS

The aim of this course is the mastery of the methodological tools and concepts essential to the design, the implementation, the test, and the maintenance of high quality software. The object oriented approach with the C++ programming language is used to reach our goal.  
This course reinforces the basic knowledge acquired during the teaching module IF-3-POO1 which is a prerequisite for this course.

#### Skills

Target skills are as follow:

- Applying methodologies for the development of software;
- Designing an object oriented software architecture;
- Designing, implementing and maintaining high quality software.

#### CONTENT

This course completes the description of the fundamental concepts of the object oriented approach already tackled in the IF-3-POO1 module. It adds: inline, overloading of functions, operators and methods, friendship, namespaces, templates (functions and classes), STL (Standard Template Library), exception handling, standard input/output stream...

At the end of this teaching unit, you should be able:

- To build generic C++ programs (with functions and/or classes);
- To master the inheritance concept (specialization, reuse, polymorphism...) with use of templates;
- To master the use of the STL (Standard Template Library) in particular STL containers, STL algorithms and STL iterators;
- To manipulate the input/output streams with the standard C++ stream library (class hierarchy ios);
- To build and to debug high quality complex object oriented programs using almost all the structure of the C++ programming language.

#### BIBLIOGRAPHY

- [1] Bjarne Stroustrup, The C++ Programming Language (Fourth Edition), Addison-Wesley, 2013, ISBN-13: 978-0321563842
- [2] Bjarne Stroustrup, Programming: Principles and Practice Using C++ (Second Edition), Addison-Wesley, 2014, ISBN-13: 978-0321992789
- [3] Scott Meyers, Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 (1st Edition), O'Reilly, 2015, ISBN-13: 978-1491903995
- [4] Scott Meyers, Effective C++: 55 Specific Ways to Improve Your Programs and Designs (3rd Edition), Addison-Wesley Professional Computing Series, 2005, ISBN-13: 078-5342334876
- [5] Scott Meyers, Effective STL: 50 Specific Ways to Improve Your Use of the Standard Template Library (1st Edition), Addison-Wesley Professional Computing Series, 2008, ISBN-13: 978-0201749625

#### PRE-REQUISITE

Basic knowledge in algorithmics and in C programming language (IF-3-ALGO).  
Object Oriented Programming - C++ - Basis (IF-3-POO1).

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## Software Development

### Grammar and Languages

#### IDENTIFICATION

CODE : IF-4-LG  
ECTS : 1.0

#### HOURS

Lectures : 6.0 h  
Seminars : 4.0 h  
Laboratory : 4.0 h  
Project : 0.0 h  
Teacher-student  
contact : 14.0 h  
Personal work : 10.0 h  
Total : 24.0 h

#### ASSESSMENT METHOD

Validation of the practical work during the session.  
Final exam with individual evaluation.

#### TEACHING AIDS

Lecture notes.

#### TEACHING LANGUAGE

French

#### CONTACT

M. GUERIN Eric  
[eric.guerin@insa-lyon.fr](mailto:eric.guerin@insa-lyon.fr)

#### AIMS

Introduction to methods and tools for [formal] language processing (language design, parsing and translation, and thus the multiples uses of grammars in computer science).

This module develops the skill "Analyse and transform a language" by enforcing the following capacities :

- Design, transform and interpret a formal grammar
- Implement a lexical analysis
- Implement a syntactic analysis (top-down and bottom-up)

It also participates to the skill "Designe the architecture of an object oriented software" thanks to the following capacities :

- Structure a software into packages and weakly coupled classes
- Use the Design Patterns

#### CONTENT

Course

1. Lexical parsing, finite automata
2. Top-down parsing
3. Bottom-up parsing
4. Attributed grammars

This course is completed with a 4h practical on parsing (LL(1), LR(0), SLR(1) et LALR(1)) and a practical of 4h during which a complete parser is implemented in C++.

#### BIBLIOGRAPHY

[1] AHO, SETHI, ULLMAN. Compilers : Principles, Techniques and Tools. Addison Wesley Pub.

#### PRE-REQUISITE

Software Development and algorithms, Graph Theory, Logic Programming, XML, C++

## Software Development

### AGILE object oriented software design and development

#### IDENTIFICATION

CODE : IF-4-PLD-AGILE  
ECTS : 4.0

#### HOURS

Lectures :	12.0 h
Seminars :	0.0 h
Laboratory :	32.0 h
Project :	0.0 h
Teacher-student contact :	44.0 h
Personal work :	50.0 h
Total :	94.0 h

#### ASSESSMENT METHOD

Evaluation of the project: Written report (by groups of 6 students), and oral presentations (at mid-time and at the end of the projects)

#### TEACHING AIDS

Slides  
Java source code of an application (PlaCo) used to illustrate design patterns

#### TEACHING LANGUAGE

French

#### CONTACT

MME SOLNON Christine  
[christine.solnon@insa-lyon.fr](mailto:christine.solnon@insa-lyon.fr)

#### AIMS

- A first goal is to introduce how to design object oriented softwares (structuration by means of packages and classes that are weakly coupled and strongly cohesive; utilisation of design patterns).
- A second goal is to study iterative Agile methodologies for designing, implementing and maintaining object oriented software.
- A third goal is to study how to adopt a quality process within an Agile context.

#### Main targeted skills:

- Apply Agile iterative methodologies to design, implement and maintain softwares
- Use UML diagrams to model
- Design the object oriented architecture of a software
- Apply object oriented principles to develop softwares
- Choose suited algorithms and data structures
- Apply generic tools for software quality

#### CONTENT

- 1 - Principles of Object Oriented Design and Design Patterns
- 2 - Agile and Iterative Software Development
- 3 - Tools for Software Quality

Practice of an Agile methodology to analyze, design, develop and test a software. This project is also an opportunity to use design patterns, tools for software quality control, test-driven development, versioning, continuous integration, model-checking, etc.

#### BIBLIOGRAPHY

- UML 2 et les design patterns. Craig Larman
- Tête la première : Design Patterns. Eric Freeman & Elizabeth Freeman
- Meyer, Bertrand. "Touch of class." Learning to program well with Object Technology and Design by Contract
- CRISPIN, GREGORY, Agile Testing, 2009
- WHITTAKER, ARBON, CAROLLO, how google tests software, 2012
- MYERS, the art of software testing, 2012
- RILEY, beautiful testing, 2010

#### PRE-REQUISITE

- IF-3-GL
- IF-3-ALGO
- IF-3-POO
- IF-3-POOA
- IF-3-AAIA

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**Compagny****Business Economics****IDENTIFICATION**CODE : IF-3-ESF  
ECTS : 1.0**HOURS**Lectures : 13.5 h  
Seminars : 4.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 17.5 h  
Personal work : 10.0 h  
Total : 27.5 h**ASSESSMENT METHOD**

- TD project to be realized by groups of students [40%]
- 1.5 hour Individual Final Exam [60%]

**TEACHING AIDS**

- Lecture slides
- Cases studies
- Articles

**TEACHING LANGUAGE**

French

**CONTACT**M. BRETTE Olivier  
[olivier.brette@insa-lyon.fr](mailto:olivier.brette@insa-lyon.fr)**AIMS****COMPETENCES**

The course contributes to the development of the students abilities to:

- 1) Identify and analyze the principles of business organizations or of other socioeconomic units, notably in the digital economy
- 2) Analyze the economic, industrial, strategic and human context of the organization, in order to make relevant professional decisions
- 3) Innovate within business or non-profit organizations
- 4) Act responsibly in complex environment

**KNOWLEDGE**

Business Economics, Industrial Economics, Innovation Economics

**CONTENT**

Introduction. Some definitions

1. The economic environment of business
2. The strategic management of business
3. Governance and the Responsibility of business in society
4. Knowledge-based economy and Innovation management
5. Digital economy
6. Intellectual Property and its stakes

**BIBLIOGRAPHY**

- Johnson, G., Scholes, K., Whittington, R., Angwin, D., Regnér, P., 2014, Stratégique, 10e ed., Pearson
- Capron, M., Quairel-Lanoizelée, F., 2015, L'entreprise dans la société, Paris : La Découverte
- Foray, D., 2009, L'économie de la connaissance, Paris : La Découverte, Coll. Repères
- Curien, N., 2005, Économie des réseaux, Paris : La Découverte, Coll. Repères

<http://scd.docinsa.insa-lyon.fr/> : Factiva, Cairn**PRE-REQUISITE**

None

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**Compagny**

## Legal Aspects of Companies

**IDENTIFICATION**CODE : IF-3-JE  
ECTS : 1.0**HOURS**Lectures : 7.0 h  
Seminars : 4.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 11.0 h  
Personal work : 10.0 h  
Total : 21.0 h**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME CUBIZOLLES Karine  
[karine.cubizolles@insa-lyon.fr](mailto:karine.cubizolles@insa-lyon.fr)**AIMS**

The goals of this course include providing legal training to students which will allow them to better understand the daily functioning of companies and the contractual relationship that exists at the level of both corporate and labor law.  
Due to its preliminary approach, this course will serve as a foundation for more advanced classes during the fifth year (À« 5IF »).

**CONTENT**

## PART 1

General introduction - the judicial institutions of France - the company in its social form - legal forms of companies and corporate law in France (SA, SARL, Associations, Individual Companies, Civil Companies).

## PART 2

Legal relations in companies - contractual relations: the drawing-up, life cycle and end of contracts - Civil, contractual and Criminal Responsibility .

## PART 3

Employment contracts - different types of employment contracts - the drawing up, life cycle and resign of contracts.

The rights and obligations of employees - the rights and obligations of employers - professional confidentiality - Internship agreements.

**BIBLIOGRAPHY****PRE-REQUISITE**

None

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**Compagny****Financial Analysis and Management Control**

## AIMS

**IDENTIFICATION**CODE : IF-4-AF  
ECTS : 1.0**HOURS**

Lectures :	11.5 h
Seminars :	4.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	15.5 h
Personal work :	10.0 h
Total :	25.5 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME CHOQUET Regine  
@

## CONTENT

This course has three areas of focus:

In the first part, the following topics are presented: accounting principles and the organization of accounting in the corporate world, the placing to account of the life of companies (financing, production and distribution), and the ending of accounts and their analysis (inventory, evaluation and result).

In the second part, the following subjects are presented: major methods to calculate cost price using analytic accounting; among the proposed examples, students will discover the analysis of cost price of labor in software engineering companies.

The final part of the course develops budgetary techniques and tools to measure performances for the mastery of costs and piloting.

Application of examples and a seminar (Â« TD ») of four hours will present concrete cases for the practice of these techniques.

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Compagny****Project Management****IDENTIFICATION**CODE : IF-4-GP  
ECTS : 1.0**HOURS**Lectures : 6.0 h  
Seminars : 4.0 h  
Laboratory : 4.0 h  
Project : 0.0 h  
Teacher-student  
contact : 14.0 h  
Personal work : 10.0 h  
Total : 24.0 h**ASSESSMENT METHOD**Written examination + continuous  
assessment**TEACHING AIDS**Support of course  
Digital resources available on  
platform MOODLE of INSA de Lyon**TEACHING LANGUAGE**

French

**CONTACT**M. OU HALIMA Mohamed  
[mohamed.ou-halima@insa-lyon.fr](mailto:mohamed.ou-halima@insa-lyon.fr)  
Phone : 0472438702**AIMS**

The aim of this course is :

- 1) to acquire basic principles, methods and standard tools for project management.
- 2) to know usual methodologies for the phases of project of information system designing :
  - + Project life cycles
  - + Splitting to steps and tasks, planning
  - + Content of deliverables
  - + Cost and load estimating
  - + Analysis of the risks
  - + Management of teams
  - + Instrument panels, indicators
  - + Follow-up
- 3) To familiarize itself with the tools, the standards of project management

**CONTENT**

1. Introduction
  - 1.1. Information systems [IS]
  - 1.2. problems of the management of project, definition
2. Life cycle and phasage [cutting] of IS project
3. Principles of the organization and the management of the computing projects
  - 3.1. Organization/preparation: file of initialization
  - 3.2. Approach produced [PBS]
  - 3.3. Approach activity [WBS]
  - 3.4. Approach organization [OBS]
4. Evaluation loads
5. Costing
6. Contractual aspects
7. Follow-up of a project
  - 7.1. Control of quality
  - 7.2. Risk management
  - 7.3. Piloting of the project: instrument panels, indicators
8. Appendices  
Accompaniment of the change  
Supports for the management of projects: tools, standards, software

**BIBLIOGRAPHY**

- Gestion d'un projet web Planification [pilotage et bonnes pratiques], Vincent Hiard, Eni, 2016
- Manuel de gestion de projet, Jean-Yves Moine, Afnor, 2013
- Gestion de projet informatique, Pascal Mangold, Eyrolles, 2006
- A Guide to the Project Management Body of Knowledge [PMBOK® Guide], Fifth Edition - <http://www.pmi.org/>
- <http://www.redmine.org/> [Logiciel de gestion de projets]

**PRE-REQUISITE**

None

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**Compagny****Organization and Management of Services and Goods****IDENTIFICATION**CODE : IF-4-OGP  
ECTS : 2.0**HOURS**

Lectures :	9.0 h
Seminars :	0.0 h
Laboratory :	16.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	25.0 h
Total :	50.0 h

**ASSESSMENT METHOD**

- Projet en groupe de 6 : rapport et présentation orale
- Examen individuel : QCM de 2 heures

**TEACHING AIDS**

- mise à disposition des diapositives de support de cours
- Documents diffusés en TD et projet

**TEACHING LANGUAGE**

French

**CONTACT**MME LEGAIT Anne  
[anne.legait@insa-lyon.fr](mailto:anne.legait@insa-lyon.fr)  
Phone : 0472437927**AIMS**

- + Skills listed :
  - To carry out the needs analysis according to the industrial activities
  - To be able to specify the logistic and human organizations of an industrial company
- + Acquire the following knowledge :
  - Terminology about Organization and Production Management
  - Method of MRP 2 production planning and hybrid organization (pushed flows / pulled flows)
  - Structure of information system concerning the logistic process of an industrial company
  - Process of company concerned by the logistics: purchases, sales, Distribution, Production, Planning, Inventory control
- + Put into practice during the project : Propose in a management team a new logistic organization further to the introduction of a new range of products with variants in a context of delayed differentiation

**CONTENT**

- 1- The enterprise and its supply chain process
- 2- Logistic processes infrastructure
- 3- Purchase, sales and distribution process
- 4- Production process
- 5- Planning methods
- 6- Strategies of piloting
- 7- Production management systems

**BIBLIOGRAPHY**

- [1] BREUZARD Jean-Pierre, FROMENTIN Daniel. Gestion pratique de la chaîne logistique, une vision globale, des outils de management et de progrès. Paris : Les Editions Demos
- [2] JAVEL Georges. Organisation et gestion de la production : Cours et exercices corrigés. Paris : Editions Dunod
- [3] ARNOULD Philippe, RENAUD Jean. Les niveaux de planification : Gestion industrielle. Paris : AFNOR
- [4] AIT HSSAIN Addi. Optimisation des flux de production, méthodes et simulation. Paris : Editions Dunod
- [5] Brissard JL, Polizzi M. Livre : "Des outils pour la GPI". Paris : AFNOR Gestion. Disponible sur <http://perso.wanadoo.fr/lyc-jaures-argenteuil/outilgpi/outilgpi.htm#outils> (consulté le 21/07/2010)

**PRE-REQUISITE**

IF-3-MP

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**Compagny**

## Professional Project

## AIMS

**IDENTIFICATION**CODE : IF-4-PP  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	4.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	4.0 h
Personal work :	0.0 h
Total :	4.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. CHAMBE Hugues  
@

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Compagny**

## Industrial Conference

## AIMS

**IDENTIFICATION**CODE : IF-5-CI  
ECTS : 0.0**HOURS**

Lectures :	6.0 h
Seminars :	6.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	12.0 h
Personal work :	0.0 h
Total :	12.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. FLOREZ VALENCIA  
Leonardo  
@

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Compagny**

## Management

## AIMS

**IDENTIFICATION**CODE : IF-5-MAN  
ECTS : 3.0**HOURS**

Lectures :	10.0 h
Seminars :	60.0 h
Laboratory :	0.0 h
Project :	10.0 h
Teacher-student contact :	80.0 h
Personal work :	10.0 h
Total :	90.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME CUBIZOLLES Karine  
[karine.cubizolles@insa-lyon.fr](mailto:karine.cubizolles@insa-lyon.fr)

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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## Software Engineering

### Software Engineering and UML Modelling

#### IDENTIFICATION

CODE : IF-3-GL  
ECTS : 3.0

#### HOURS

Lectures : 13.5 h  
Seminars : 10.0 h  
Laboratory : 16.0 h  
Project : 0.0 h  
Teacher-student  
contact : 39.5 h  
Personal work : 35.0 h  
Total : 74.5 h

#### ASSESSMENT METHOD

- Practicals: written report by groups of 2 students.
- Written exam [1.5 hours]

#### TEACHING AIDS

- Lecture notes
- Exercises

#### TEACHING LANGUAGE

French

#### CONTACT

M. DUFFNER Stefan  
[stefan.duffner@insa-lyon.fr](mailto:stefan.duffner@insa-lyon.fr)

#### AIMS

This course gives an overview of the principal concepts and techniques of Software Engineering and addresses more deeply the design of object-oriented software with UML. These concepts are put into practice in a mini-project where an application is developed in a collaborative way.

The expected competences are:

- Defining requirement specifications for a software to be developed.
- Establishing an iterative software development process.
- Modeling a software with UML incorporating the fundamental principles of object-oriented design.
- Developing a [C++] application from a conceptual UML model.
- Using collaborative development utilities (version control, IDE).
- Creating and setting up automated software tests.

#### CONTENT

The principal points addressed are:

- The formal definition of a future software (requirements specification).
- The set of processes involved in the life cycle of a software.
- The principles and methodologies of object-oriented software modelling and design. We will concentrate on the Unified Modelling Language [UML], and address the main types of diagrams that are able to model the structure and behaviour of an application.
- "Security by design" : aim of security, possible attacks, requirement analysis, different security strategies for software design and development.
- Versioning techniques and utilities, and software integration.
- Software test and validation strategies.

#### BIBLIOGRAPHY

(i) On Software Engineering:

- "Génie logiciel : principes, méthodes et techniques", A. Strohmeier, D. Buchs
- "Software Engineering", Ian Sommerville
- "Software Engineering - A Practitioner's Approach", Roger Pressman

(ii) On the UML Meta-Model:

<http://www.omg.org/uml>

(iii) On Object Oriented Modeling with UML:

- "UML en action", Pascal Roques and Franck Lavallée, Ed. Eyrolles
- "Modélisation Objet avec UML", Pierre-Alain Muller and Nathalie Gaertner

#### PRE-REQUISITE

- Algorithmics and programming [C++/Java].
- Object-oriented programming principles [encapsulation, inheritance, abstraction, genericity].

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**Software Engineering****Software Quality****IDENTIFICATION**CODE : IF-4-AFQL  
ECTS : 1.0**HOURS**Lectures : 9.0 h  
Seminars : 8.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 17.0 h  
Personal work : 10.0 h  
Total : 27.0 h**ASSESSMENT METHOD**

DS

**TEACHING AIDS**<http://liris.cnrs.fr/pierre-edouard.portier/>**TEACHING LANGUAGE**

French

**CONTACT**M. PORTIER Pierre-Edouard  
[pierre-edouard.portier@insa-lyon.fr](mailto:pierre-edouard.portier@insa-lyon.fr)**AIMS**

Targeted competence:

- enforce quality assurance and quality control through the derivation of programs correct by construction.

To do this, sub-competences are necessary:

- transform a natural language specification into a formal specification with the predicate calculus
- derive a correct program from its specification

This approach leads to a smart management of the complexity: checking the correction of a program is hard while deriving a program correct by construction splits the complexity in a sequence of simpler decisions. After this module, one will be able to derive both sequential and concurrent programs correct by construction.

**CONTENT**

- \* Sequential Programs Correct by Construction
- \*\* Part 1, Theory
- \*\*\* Predicate Calculus Reminder
- \*\*\* Hoare Triples
- \*\*\* Weakest Precondition
- \*\*\* Guarded Command Language
- \*\* Part 2, Examples
- \*\*\* Array subsequences [e.g., maximal AB subsequence, longest null subsequence, etc.]
- \*\*\* Correct and efficient programs [e.g., integer division, fibonacci, etc.]
- \*\*\* Sorting algorithms [Dutch National Flag, Quicksort, etc.]
- \* Concurrent Programs Correct by Construction
- \*\* Part 1, Theory
- \*\*\* locally correct / globally correct
- \*\*\* System invariant
- \*\*\* Weakest liberal precondition
- \*\*\* Atomicity
- \*\*\* Progress
- \*\* Partie 2, Examples
- \*\*\* Mutual Exclusion of Critical Sections
- \*\*\* Safe Slave

**BIBLIOGRAPHY**

- \* BACKHOUSE, 2002, Program Construction the Correct Way
- \* COHEN, 1990, Programming in the 1990s an Introduction to the Calculation of Programs
- \* DIJKSTRA, 1976, A Discipline of Programming
- \* GRIES, 1981, the Science of Programming
- \* KALDEWALJ, 1990, Programming the Derivation of Algorithms
- \* KOURIE, WATSON, 2012, the Correctness by Construction Approach to Programming

**PRE-REQUISITE**

IF3-ALGO

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## Software Engineering

### Human Computer Interaction

#### IDENTIFICATION

CODE : IF-4-IHM  
ECTS : 2.0

#### HOURS

Lectures :	7.5 h
Seminars :	0.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	19.5 h
Personal work :	30.0 h
Total :	49.5 h

#### ASSESSMENT METHOD

Individual evaluation :  
\* Written exam (1h30, course materials allowed)  
Team evaluation :  
\* QCM  
\* Report (one per team of 6 students)  
\* Project defense (per team of 6 students)

#### TEACHING AIDS

Slides on moodle

#### TEACHING LANGUAGE

French

#### CONTACT

MME LAPORTE Lea  
[lea.laporte@insa-lyon.fr](mailto:lea.laporte@insa-lyon.fr)

#### AIMS

The main goal of this course is for the student to acquire fundamental knowledge on Human-Computer Interaction and to develop competences for the design of interactive systems. We will focus on human-centered methods for user interfaces, on the evaluation of user interfaces and interactive systems and on ergonomics.

This course targets the following skills:

- \* To enforce a methodology to design, implement and maintain quality software
- \* To enforce generic tools for software quality.
- \* To design the architecture of an object-oriented software

More precisely, at the end of this course, the student should be able to :

- \* Enforce a user-centered design process
- \* Evaluate an interactive system based on ergonomic criteria
- \* Develop an interface with respect to the principle of separation between the UI source code and the core application source code

#### CONTENT

- \* Fundamentals models and concepts in Human Computer Interaction
- \* Human centered design for interactive systems
  - Methods to collect users'needs
  - User, context and task modeling
  - Prototyping
  - Evaluation
- \* Ergonomics for conception and evaluation of interactive systems
- \* Mobility and innovation in HCI

#### BIBLIOGRAPHY

Jean-François NOGIER, Thierry BOUILLON, Jules LECLERC. Ergonomie des interfaces : Guide pratique pour la conception des applications web logicielles, mobiles et tactiles, Dunod, 5ème édition corrigée, ISBN978-2-10-059487-0, 298 pages, 2013.

#### PRE-REQUISITE

IF-3-00, IF-3-DASI

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**Informatique**

## One Semester Exchange [S1]

## AIMS

**IDENTIFICATION**CODE : IF-4-ECH-1  
ECTS : 30.0**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.0 h
Personal work :	400.0 h
Total :	400.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Informatique**

One Semester Exchange [S2]

## AIMS

**IDENTIFICATION**CODE : IF-4-ECH-2  
ECTS : 30.0**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.0 h
Personal work :	400.0 h
Total :	400.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Knowledge Engineerin****Algorithms for Artificial Intelligence and Graphs****IDENTIFICATION**CODE : IF-3-AAIA  
ECTS : 3.0**HOURS**Lectures : 13.5 h  
Seminars : 16.0 h  
Laboratory : 8.0 h  
Project : 0.0 h  
Teacher-student  
contact : 37.5 h  
Personal work : 35.0 h  
Total : 72.5 h**ASSESSMENT METHOD**

DS and TP

**TEACHING AIDS**[http://liris.cnrs.fr/peportie/  
#enseignements](http://liris.cnrs.fr/peportie/#enseignements)  
[http://liris.cnrs.fr/csolnon/  
supportAlgoGraphes.pdf](http://liris.cnrs.fr/csolnon/supportAlgoGraphes.pdf)  
Platform for running algorithms  
(based on DomJudge)**TEACHING LANGUAGE**

French

**CONTACT**M. PORTIER Pierre-Edouard  
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MME SOLNON Christine  
christine.solnon@insa-lyon.fr**AIMS**

A first goal is to deepen some principles and practice introduced during the first semester, in the course IF-3-ALGO : Specification of an algorithm by means of pre- and post-conditions, Algorithm complexity, Proof of correction of an algorithm, etc.

A second goal is to study some classical algorithm coming from two (non-disjoint) domains: Graph theory and Artificial Intelligence

**Targeted skills:**

- Choose relevant algorithms and data structures, and evaluate their complexity
- Master recursion and iteration
- Recognize the complexity class of a problem, and choose an appropriate solution process with respect to this class
- Analyze a decision making problem

**CONTENT**

- Graph Algorithms: Definitions, Data structures for modelling graphs, Graph traversals, Shortest path problems
- Planning Algorithms: Modelling a problem as the search of a plan in a state-transition graph, Looking for optimal paths in a state-transition graph
- Introduction to computational complexity: Complexity classes, Problem reduction
- Algorithms for solving NP-hard problems: Notion of search space, Exhaustive exploration of a search space (Branch and Bound, Minimax/alpha-beta, A\*), heuristic and meta-heuristic approaches (greedy construction, local search and simulated annealing, neural networks)

Practice through exercises, with an emphasis on the traveling salesman problem

**BIBLIOGRAPHY**

- Introduction à l'algorithmique - Cormen, Leiserson, Rivest  
Edelkamp, Stefan, and Stefan Schroedl. Heuristic search: theory and applications. Elsevier, 2011.  
RUSSELL, NORVIG, artificial intelligence a modern approach, 3rd edition, 2010  
Haykin, Simon S., et al. Neural networks and learning machines. Vol. 3. Upper Saddle River: Pearson Education, 2009.  
Michalewicz, Zbigniew, and David B. Fogel. How to solve it: modern heuristics. Springer Science & Business Media, 2004.  
Negnevitsky, Michael. Artificial intelligence: a guide to intelligent systems. Pearson Education, 2005.  
BACKHOUSE, program construction the correct way, 2002  
Langville, Amy N., and Carl D. Meyer. Google's PageRank and beyond: The science of search engine rankings. Princeton University Press, 2011.

**PRE-REQUISITE**

IF-3-ALGO

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**Knowledge Engineerin****A Logical Approach to Artificial Intelligence****IDENTIFICATION**CODE : IF-4-ALIA  
ECTS : 2.0**HOURS**Lectures : 9.0 h  
Seminars : 4.0 h  
Laboratory : 12.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h**ASSESSMENT METHOD**A 1.5h exam will test your  
knowledge [documents allowed].The project on logic programming  
with PROLOG will be evaluated by  
groups of six students: you will  
provide the PROLOG code you  
wrote and will defend your project  
to an audience [teachers and  
other students]: you will present,  
compare and discuss the different  
AI that you wrote [experimental  
validation].**TEACHING AIDS**All documents are available on  
MOODLE (<http://moodle.insa-lyon.fr>).**TEACHING LANGUAGE**

French

**CONTACT**MME CALABRETTO Sylvie  
[sylvie.calabretto@insa-lyon.fr](mailto:sylvie.calabretto@insa-lyon.fr)  
M. KAYTOUE Mehdi  
[mehdi.kaytoue@insa-lyon.fr](mailto:mehdi.kaytoue@insa-lyon.fr)**AIMS**

This class aims at:

- Learn theoretical foundations of logic for Artificial Intelligence: Logic of propositions, logic of predicates (first order and superior orders), revisable logics, multi-valued logics, modal logic.
  - Learn resolution and inference techniques
  - Be able to model/translate problems written in natural language into logical formulas
  - Be able to solve these problems with classical or non standards reasoning using inference rules
  - Be able to use a logical programming language like PROLOG for modeling and solving Artificial Intelligence problems
- The programming project consists in developing several Artificial Intelligence for 2-player games (reversi, chess, ...)

**CONTENT**

- State of the logic.
- Logic of propositions.
- Logic of predicates (first order).
- Logic of predicates (superior orders).
- Revisable logics / non-monotonous.
- Multi-valued Logics.
- Modal Logics, Alethic logic, temporal logic, epistemic logic.
- Introduction to Logic Programming.
- Introduction to PROLOG language.

**BIBLIOGRAPHY**

## LOGIC

- [1] Nilsson N. Principes d'Intelligence Artificielle. Cepadues, Toulouse
- [2] Laurière J.C. Intelligence Artificielle, II, Représentation des Connaissances. Eyrolles
- [3] Dubois & Prade. Théorie des Possibilités. Masson, 1985
- [4] Pabion. Logique. Paris : Hermann; 1976
- [5] Thayse et coll. Approche logique de l'Intelligence Artificielle. Dunod Informatique, 1990
- [6] Tong-Tong J.R. La logique floue. Hermès, 1995

## PROLOG

- [7] Blackburn P., Bos J., Striegnitz K. Learn PROLOG now! Volume 1, 2007
- [8] Nilsson U. and Maluszynski J. Logic, programming and PROLOG, 1995
- [9] <http://www.learnprolognow.org>

**PRE-REQUISITE**

IF-3-AAIA, IF-3-MI

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## Knowledge Engineering Data Mining

### AIMS

Data mining was identified as one of the top ten emerging technologies for the 21st century (MIT Technology Review, 2001). The goal of this discipline is to support the discovery of knowledge from a large volume of data, typically data warehouses. Its development was built at the intersection of several existing disciplines in data processing, for example, machine learning, database management, visual display and statistics. The main data mining techniques are introduced (statistical techniques like PCA, supervised classification or unsupervised classification, pattern discovery methods).

We expect that after this module, students are able to explore real data sets, perform cleaning tasks, looking for patterns with an emphasis on cluster discovery within real data. We expect that they understand how to choose a given algorithm and how to determine relevant parameters for them. This involves also the practice of discovery processes by means of the open source platform KNIME. Students are expected to understand, use and adapt typical data analysis workflows prepared for KNIME.

As such, you will acquire the following skills:

- Learn the basic of Knowledge discovery in all its aspects, from data cleaning to model interpretation
- Learn several techniques for supervised classification, clustering and pattern discovery
- Be able to discuss the choice of a data analysis algorithm and its parameters
- Be able to use a data analysis platform (KNIME) for a real-world knowledge discovery problem

### CONTENT

The main data mining tasks are introduced. The concepts are illustrated during two exercise sessions (1 on data exploration and 1 on data mining, both based on the use of the open source platform KNIME) and a 2-weeks project.

- Class 1. Motivations and terminology
- Class 2. Data exploration
- Class 3. Clustering
- Class 4. Prediction and supervised classification
- Class 5. Computing pattern and descriptive rules
- Class 6. Knowledge Discovery Processes

Some popular data mining algorithms are detailed like K-Means, DBSCAN, C4.5, NB, APRIORI (non exhaustive list). Important issues related to predictive tasks and machine learning are just sketched with decision trees (advanced concepts and methods for Big Data Analytics are studied during the 5IF first semester).

The project concerns geo-localized data analysis where localized objects are photos associated to tags. By computing clusters of photos, we expect to be able to discover automatically points of interest within a city. Pattern mining techniques will be used to help interpreting the found clusters.

### BIBLIOGRAPHY

- U. M. Fayyad, G. Piatetsky-Shapiro, P. Smyth, and R. Uthurusamy. Advances in Knowledge Discovery and Data Mining. AAAI/MIT Press, 1996.
- J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufmann, 2000.
- D. Hand, H. Mannila, P. Smyth. Principles of Data Mining. MIT Press, 2001.
- P. N. Tan, M. Steinbach, and A. Karim. Introduction to Data Mining. Addison-Wesley, 2006.
- M. R. Berthold, C. Borgelt, F. Hoppner, F. Klawonn. Guide to Intelligent Data Analysis, Springer, 2010.
- M. J. Zaki, W. Meira Jr. Fundamentals of Data Mining Algorithms. Cambridge University Press, 2013.
- A. Cornuéjols et L. Miclet. Apprentissage Artificiel. Concepts et Algorithmes. Seconde version, Eyrolles, 2010.

### PRE-REQUISITE

Basic statistics and mathematics, relational databases, SQL, programming

### IDENTIFICATION

CODE : IF-4-FD  
ECTS : 2.0

### HOURS

Lectures :	9.0 h
Seminars :	8.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	25.0 h
<b>Total :</b>	<b>50.0 h</b>

### ASSESSMENT METHOD

Final exam (1h30) where every document on paper can be used.

Programming project where a real dataset has to be mined. A report is expected. Implemented KNIME workflows can be asked as well.

### TEACHING AIDS

Slides of lessons are disseminated.

Two seminars are dedicated to KNIME practice on toy data sets.

Two weeks are targeted to a programming project on a real data set. Tutoring and a forum can help on Moodle.

### TEACHING LANGUAGE

French

### CONTACT

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M. KAYTOUE Mehdi  
mehdi.kaytoue@insa-lyon.fr

## Knowledge Engineering Semantic Web

### IDENTIFICATION

CODE : IF-4-WS  
ECTS : 2.0

### HOURS

Lectures :	9.0 h
Seminars :	4.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	10.0 h
<b>Total :</b>	<b>35.0 h</b>

### ASSESSMENT METHOD

A 1.5h exam will test your knowledge [documents allowed]. Your mini-project will be evaluated by groups of six students: you will provide an experiment report and will defend your project to an audience [teachers and other students]. The final mark is computed as follow: 60% for the exam ; 40% for the project.

### TEACHING AIDS

All documents are available on MOODLE (<http://moodle.insa-lyon.fr>).

### TEACHING LANGUAGE

French

### CONTACT

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[mehdi.kaytoue@insa-lyon.fr](mailto:mehdi.kaytoue@insa-lyon.fr)

### AIMS

How to formalize and exchange information and knowledge on the Web? To answer this question, this class introduces Semantic Web which can be understood as an extension of the classic Web by allowing to exchange et reuse data far beyond the boundaries of a Web site or an application thanks to a "universal language". For that, the World Wide Web Consortium (W3C) introduced a series of standards for representing, interrogating, exchanging and reasoning on knowledge [data format, languages, protocoles and description logics]. Although the original and complete vision of Tim Berners-Lee [founder of the W3C] may remain utopian for some practitioners today, a big step has already been achieved through the Web of Data, structuring and linking existing information on the Web [Linked data]. Applications are numerous and close to open data initiatives that flourish in many companies and territorial collectivities.

In this context, this class aims at:

- Learn the main W3C standards on semantic Web technologies
- Be able to represent knowledge with these standards
- Be able to interrogate Web data
- Be able to use reasoning mechanisms on Web data
- Be able to develop a system using these notions along with Web services (API) to give semantics to existing Web pages and propose a use case

### CONTENT

In this class, you will study the theoretical foundations of Semantic Web to represent basic information (RDF) and query knowledge bases (SPARQL). You will also see how to represent information with richer languages (RDF-S et OWL) and a few reasoning mechanisms (RIF). This will be done through 5 sessions of 1.5 hours each. During the unique exercise session [4 hours] you will study in detail how to represent both formally and concretely (XML, JSON) information and statements of the real world with RDF graphs. You will also learn how to query such representations with the graph matching technique and will test in practice with a DBpedia access point [where formally lie Wikipedia information]. During 3 practical sessions, you will prepare a mini-project with the following aim: adding semantics to the results of a search engine [Google, Bing, ...]. For that, you will learn how to interrogate the search engine and inspect the HTML content: each WEB page of the results will be turned into a RDF graph. You will then be able to compare the Web pages and, for example, group pages with a similar content with respect to their semantics and not their syntax as it is usually done in the classical Web.

### BIBLIOGRAPHY

- GANDON Fabien et al. Le web sémantique : comment lier les données et les schémas sur le Web. Paris, Dunod, 2012.
- ALLEMANG Dean et HENDLER James. Semantic Web for the Working Ontologist. Effective Modeling in RDFS and OWL. Morgan Kaufmann, 2011.
- MOOC Web sémantique et Web de données de Gandon, Corby, Faron Zucker <https://www.france-universite-numerique-mooc.fr/>

### PRE-REQUISITE

This class does not require strong prior knowledge. A plus is to have studied XML (IF-3-BDS). It is strongly advise however to follow the class on artificial intelligence and logics (IF-4-ALIA) during the semester.

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## System Software

### Concurrent Programming

#### AIMS

This course has to provide the students with a good understanding of the features, the mechanisms and the algorithms occurring in concurrent programming. It also has to favor their effective use.

#### IDENTIFICATION

CODE : IF-3-PC  
ECTS : 3.0

#### HOURS

Lectures : 12.0 h  
Seminars : 6.0 h  
Laboratory : 16.0 h  
Project : 0.0 h  
Teacher-student  
contact : 34.0 h  
Personal work : 20.0 h  
Total : 54.0 h

#### ASSESSMENT METHOD

Written examination  
Practical class assessment.

#### TEACHING AIDS

Lecture notes

#### TEACHING LANGUAGE

French

#### CONTACT

M. MARANZANA Mathieu  
[mathieu.maranzana@insa-lyon.fr](mailto:mathieu.maranzana@insa-lyon.fr)

#### CONTENT

This course is divided into 5 main chapters:

1. The study of the main concepts used in concurrent programming:
  - The task / job management;
  - The synchronization principles: semaphore, mutex, critical section, p and V operations;
  - The deadlock problem: starvation, dining philosophers' problem...
  - The communication between tasks: message queues, tube, shared memory;
  - The hardware (details in 3IF-AM) and software interrupt.
2. A graphical approach to ease the design of multitasking applications
3. The implementation of the various concepts using the Linux operating system
  - The process: creation/destruction, synchronization during process termination, exec functions;
  - The Linux signal: handler, send/wait a signal, special case of the alarm signal;
  - The inter-process communication using named or unnamed pipes;
  - The IPC System V inter-process mechanisms: key, semaphore, message queue and shared memory.
4. The concurrent programming using the pthreads API:
  - General overview of the thread (safeness, performance) and the pthreads API (organization);
  - Thread management: creation/destruction and join;
  - The mutex object: creation/destruction and management;
  - The condition variable: creation/destruction/wait and signal
5. The POSIX semaphore (named and unnamed).

#### BIBLIOGRAPHY

- [1] Tanenbaum Andrew. Modern operating systems. Upper Saddle River : Pearson International
- [2] Tanenbaum Andrew. Système d'exploitation. Paris : Pearson Education
- [3] Bach Maurice. The design of the UNIX operating system. New.York : Prentice Hall
- [4] Silbershatz Abraham. Operating system concepts. USA : John Wiley & Sons inc
- [5] Silbershatz Abraham. Principes des systèmes d'exploitation. Paris : Vuilbert
- [6] Card Rémy. Programmation Linux 2.0 : API système et fonctionnement du noyau. Paris : Eyrolles

#### PRE-REQUISITE

None

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**Mathematics**

## Linear algebra and image synthesis

## AIMS

**IDENTIFICATION**CODE : IF-3-CMSI  
ECTS : 3.0**HOURS**

Lectures :	7.5 h
Seminars :	4.0 h
Laboratory :	20.0 h
Project :	0.0 h
Teacher-student contact :	31.5 h
Personal work :	40.0 h
Total :	71.5 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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M. GUERIN Eric  
[eric.guerin@insa-lyon.fr](mailto:eric.guerin@insa-lyon.fr)**CONTENT**

- A. TODO : partie calcul matriciel
- B. Image synthesis
  1. Image synthesis pipeline
  2. 3D transformations
  3. Geometric modeling (explicit, implicit and iterative)
  4. Display
  5. Illumination models
  6. Procedural generation

**BIBLIOGRAPHY****PRE-REQUISITE****INSA LYON****Campus LyonTech La Doua**20, avenue Albert Einstein - 69621 Villeurbanne cedex - France  
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## Mathematics

### Probability

#### AIMS

To acquire basis on probabilistic tools, in order to applicate them for stochastic modeling and statistics.

#### Targeted skills:

- Description of phenomenons using a probabilistic model: random variables and stochastic distributions.
- Extraction of some relevant features from a model.
- Understanding of law of large numbers and central limit theorem and their repercussions
- Representations of a dynamical system using graphs, matrices and probabilistic model: Markov chains.

#### IDENTIFICATION

CODE : IF-3-PROB  
ECTS : 2.0

#### HOURS

Lectures :	7.5 h
Seminars :	16.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	31.5 h
Personal work :	20.0 h
Total :	51.5 h

#### ASSESSMENT METHOD

Exam (1h30, all documents authorized).  
Evaluation of a report on practical work, at the end of the sessions.

#### TEACHING AIDS

Lecture notes [1].  
Description of the practical work.

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

##### Outline:

- 1- Recalling - Complements
- 2- Bases of probability theory
- 3- Random variables
- 4- Random vectors
- 5- Limit theorems
- 6- Introduction to Markov chains

##### Practical sessions:

- random variables simulations
- test of the quality of simulation
- queing simulation

#### BIBLIOGRAPHY

- [1] Mazet O. Cours de probabilités 3IF 2005-2006. Disponible sur [http://www-gmm.insa-toulouse.fr/~omazet/Enseignement/Cours/Cours\\_Proba.pdf](http://www-gmm.insa-toulouse.fr/~omazet/Enseignement/Cours/Cours_Proba.pdf)  
[2] Saporta G. [1990] Probabilités, analyse de données et statistique. Paris : Ed. Technip

#### PRE-REQUISITE

Undergraduate level is needed for : theory of integration, numerical sequences and series, and matrices

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## Mathematics

### Decision-Making Support

#### AIMS

The lecture objective is to develop skills aiming to:

- Analyse decision making problems, introducing basing concepts such as decision making factors, preferences, criteria, constraints.
- Select the most suitable mathematical representation according to an optimization objective and implement the solving, methods introducing basing concepts such as mathematical programming, optimization.
- Present and justify a mathematical approach to non-specialists with argumentation, synthesis

#### IDENTIFICATION

CODE : IF-4-AD  
ECTS : 1.0

#### HOURS

Lectures :	9.0 h
Seminars :	0.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	17.0 h
Personal work :	8.0 h
Total :	25.0 h

#### ASSESSMENT METHOD

written evaluation of the project  
Final examen (1h30), documents  
on paper can be used

#### TEACHING AIDS

Lecture slides  
case studies and exercises  
scientific papers

#### TEACHING LANGUAGE

French

#### CONTACT

MME MIQUEL Maryvonne  
[maryvonne.miquel@insa-lyon.fr](mailto:maryvonne.miquel@insa-lyon.fr)

#### CONTENT

The course syllabus will address the 3 following main topics:

- Introduction and positioning of a decision making process
- Mathematical programming: problem main categories, non-constrained/constrained multidimensional optimization (linear/nonlinear), Simplex algorithm
- Multi-criteria decision making: multi-criteria nonlinear programming, discrete multi-criteria analysis, the ELECTRE method

#### BIBLIOGRAPHY

- [1] Minoux Michel. Programmation mathématique - Théorie et algorithmes Tomes 1 et 2, Dunod
- [2] Roy Bernard. Méthodologie multicritère d'aide à la décision, Gestion Economica
- [3] Scharlig Alain. Décider sur plusieurs critères, Collection Diriger l'entreprise, Presse Polytechniques et Universitaires Romandes

#### PRE-REQUISITE

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## Mathematics

### Statistics

#### IDENTIFICATION

CODE : IF-4-ST  
ECTS : 2.0

#### HOURS

Lectures :	12.0 h
Seminars :	12.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	25.0 h
Total :	49.0 h

#### ASSESSMENT METHOD

Exam (1h30, all documents authorized, calculator needed).

#### TEACHING AIDS

Lecture notes are available.

#### TEACHING LANGUAGE

French

#### CONTACT

MME CLAUSEL Marianne  
@  
MME GANNAZ Irene  
[irene.gannaz@insa-lyon.fr](mailto:irene.gannaz@insa-lyon.fr)

#### AIMS

The aim is to give the bases of statistics for an engineer, in particular on statistical estimation and hypothesis testing.

At the end of the lecture you should be able :

- to determine whether a hypothesis is plausible and evaluate the associated risk (p-value),
- to take a decision relative to what has been observed,
- to test the goodness of fit of a model,
- to establish an eventual link between two characteristics.

#### CONTENT

1. Descriptive statistics
2. Theory of estimation : punctual estimation and confidence intervals
3. Hypothesis testing
4. Chi-square tests
5. Introduction to regression

#### BIBLIOGRAPHY

Saporta G. (1990) "Probabilités, analyse des données et statistique" Paris : Ed; Technip

#### PRE-REQUISITE

IF-3-PR

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**Projects**

## Project

## AIMS

**IDENTIFICATION**

CODE : IF-3-FR  
ECTS : 0.0

**HOURS**

Lectures :	11.0 h
Seminars :	1.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	12.0 h
Personal work :	20.0 h
Total :	32.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

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M. SCUTURICI Vasile-  
Marian  
[marian.scuturici@insa-lyon.fr](mailto:marian.scuturici@insa-lyon.fr)

## CONTENT

## BIBLIOGRAPHY

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**Projects**

## Guidance

## AIMS

**IDENTIFICATION**

CODE : IF-3-TU  
ECTS : 0.0

**HOURS**

Lectures :	0.0 h
Seminars :	1.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	1.0 h
Personal work :	0.0 h
Total :	1.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

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[youssef.amghar@insa-lyon.fr](mailto:youssef.amghar@insa-lyon.fr)

## CONTENT

## BIBLIOGRAPHY

## PRE-REQUISITE

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**Projects**

## Specific Project

## AIMS

**IDENTIFICATION**CODE : IF-4-PS  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	6.5 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	6.5 h
Personal work :	40.0 h
Total :	46.5 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## CONTENT

## BIBLIOGRAPHY

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**Projects**

## Guidance

## AIMS

**IDENTIFICATION**

CODE : IF-4-TU  
ECTS : 0.0

**HOURS**

Lectures :	0.0 h
Seminars :	1.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	1.0 h
Personal work :	0.0 h
Total :	1.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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## BIBLIOGRAPHY

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## Projects

### Algorithms and Data Structures for Indexing Big Volume of Textual Data

#### IDENTIFICATION

CODE : IF-5-PRJ11  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	16.0 h
Project :	0.0 h
Teacher-student contact :	16.0 h
Personal work :	30.0 h
Total :	46.0 h

#### ASSESSMENT METHOD

source code and written report

#### TEACHING AIDS

[http://liris.cnrs.fr/peportie/  
#enseignements](http://liris.cnrs.fr/peportie/#enseignements)

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

We will explore algorithmic strategies for making an index to efficiently access large amount of unstructured textual data. At the core of an information retrieval system we often find a data structure called the "inverted index" used to retrieve documents given a word they may contain. For all information retrieval models -- from the simpler ones [e.g., vector space model,...] to the more advanced [e.g., language models,...] -- their performance depends mainly on the decisions made while making the index. Thus, we will first study the elements necessary for the construction of the index (i.e., specific algorithms and data structures), and then implement and test an index on a realistic dataset.

#### CONTENT

We will study and experiment on the following topics:

- + management of the vocabulary: hashing VS self balancing trees (B-Tree, etc.)
- + construction of the index [in memory, on disk, one pass, two pass, sort-based, etc.]
- + compressing the index (VByte, gamma-code, etc.)
- + maintaining the index
- + using the index for a vector space model and/or a probabilistic model [e.g., BM25,...]
- + experiments on a TREC dataset

#### BIBLIOGRAPHY

Büttcher, Stefan, Charles LA Clarke, and Gordon V. Cormack. Information retrieval: Implementing and evaluating search engines. Mit Press, 2010.

Manning, Christopher D., Prabhakar Raghavan, and Hinrich Schütze. Introduction to information retrieval. Vol. 1. Cambridge: Cambridge university press, 2008.

Sedgewick R., Algorithms in C, Parts 1-5: Fundamentals and Graphs, 2001.

#### PRE-REQUISITE

Algorithmic  
C Programming

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**Projects**

## Design Project

## AIMS

**IDENTIFICATION**CODE : IF-5-PRJ12  
ECTS : 3.0**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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M. GARCIA Christophe  
[christophe.garcia@insa-lyon.fr](mailto:christophe.garcia@insa-lyon.fr)

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## BIBLIOGRAPHY

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## Projects

### Design Project

#### AIMS

This project aims to introduce you to job of engineer - specialist of data, the "data scientist" that arouses just today a growing number of companies. While it is often associated with an experimental and technical work based on mathematical concepts, statistics and computer science, it is also seen otherwise in the industrial world: besides solving well-defined problems in the presence of data, the "data analyst" should know finding the right problem from available data (or appropriate), a problem whose solution has a high added value for the company. This is indeed an engineering approach: although the data owner thinks that his data is "rich", the possible use of this wealth in terms, for example, growth of turnover remains unclear.

#### IDENTIFICATION

CODE : IF-5-PRJ13  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	16.0 h
Project :	0.0 h
Teacher-student contact :	16.0 h
Personal work :	30.0 h
Total :	46.0 h

#### ASSESSMENT METHOD

Presentation and report.

#### TEACHING AIDS

See on moodle.

#### TEACHING LANGUAGE

French

#### CONTACT

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Marian  
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#### CONTENT

From supplied or public datasets on the city [for example, « open data » of a city like Grand Lyon], this project is about to define a new service and design an architecture and / or prototype, that will convince a structure likely to finance the development and deployment of the new service. For example, students may have data concerning about three million of events per day since January 2014 [traffic, weather, social networking / tweets, air quality, etc.]. It will also focus on legal and ethical aspects of the data used (and enriched) and the proposed solution. For that, contacts with specialists (companies, researchers &) through the Labex "Intelligences of Urban Worlds" will be encouraged. Students will build "on top" of what they have done during the PLD "Smart Cities" in 4IF but this is not an obligation. An implementation is possible but first we are looking for a rich conception report, detailed and motivated [market study, feasibility, architecture, etc.]. It may possibly be given with a prototype implementation.

#### BIBLIOGRAPHY

#### PRE-REQUISITE

PLD SMART 4IF  
IF-5-SEMA11  
IF-5-SEMA12

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## Projects

### Design Project

#### AIMS

One of the striking phenomena of recent years goes to the possible collection of very large volumes of behavioral data: mobility data, browsing history on merchant sites or media content sponsored by advertising. This is especially what motivates the explosion of developments around the "profiling" of users for targeted ad placement or personalized recommendation systems. To deepen your knowledge of data science, we propose in this project to develop a prototype application that makes good use and benefit from behavioral traces through data mining, machine learning or even visualization techniques.

As such, this project will enable you to:

- Be able to instantiate a data analysis chain given your own hypothesis
- Be able to build, evaluate and interpret a model (prediction or clustering)
- Learn a programming language for data science in an integrated environment

#### IDENTIFICATION

CODE : IF-5-PRJ14  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
<b>Total :</b>	<b>40.0 h</b>

#### ASSESSMENT METHOD

Project presentation and prototype evaluation

#### TEACHING AIDS

All available on moodle (<http://moodle.insa-lyon.fr>)

#### TEACHING LANGUAGE

French

#### CONTACT

M. KAYTOUE Mehdi  
[mehdi.kaytoue@insa-lyon.fr](mailto:mehdi.kaytoue@insa-lyon.fr)

#### CONTENT

Either the students bring their own behavioral data collections on an area of interest (with permissions to store and work validated by the owner of data and the teaching team) or they can work with the data provided. We will propose data for "Video game analytics" on one hand, and on historical records on a well known shopping website.

The video game is an industry that today surpasses the cinema and music in income generated. The games always generate a considerable amount of action and behavioral data for millions of players around the world. Such data allow to analyse hundreds of problems without any problem of privacy which is difficult in most of the domains.

E-commerce companies like Amazon seek to "profile" users to offer them products they are likely to enjoy. The trend is even today the supply warehouses before the purchase decision of (future!) customers. Then we can imagine various scenarios for the prediction of purchases and / or personal recommendation to an individual or group. For this, we can have access to 35 million of comments from Amazon (6 million customers of 2 million products).

Finally, it is also possible to participate to a data science platform challenge, e.g., on Kaggle.com

We will pay a particular attention in developing in the python environment scikit-learn with Jupiter (but student with knowledge of R can use it)

#### BIBLIOGRAPHY

- J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufmann, 2000.
- P. N. Tan, M. Steinbach, and V. Kumar. Introduction to Data Mining. Addison-Wesley, 2006.
- M. J. Zaki, W. Meira Jr. Fundamentals of Data Mining Algorithms. Cambridge Univeristy Press, 2013.
- C. C. Aggarwal. Data Mining: The Textbook, Springer, May 2015
- <http://scikit-learn.org/stable/>

#### PRE-REQUISITE

Basics of statistics and data mining are welcomed.

If you were in 4th year in the department, the following classes are important :

- 4IF Fouille de données
- 4IF Statistiques
- 4IF Base de données décisionnelles

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## Projects

### Digitalisation of payment process

#### AIMS

This education work allows students to build a market and technical report. The case study concerns electronic payment. Enterprises as SODEXO and ENDERED are considered as examples from which students have to propose new solutions. The work is directed towards client and development team.

For the client, the goal is :

- a) to specify the functional dimension of information system a the new enterprise
- b) to elaborate the business plan

For the development team, the goal is :

- a) to specify and to model the requirements
- a) to specify technical architectures

Skills:

- write a market-technical offer
- analyse an economic context
- lead a study of processes digitalisation

#### IDENTIFICATION

CODE : IF-5-PRJ21  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
<b>Total :</b>	<b>40.0 h</b>

#### ASSESSMENT METHOD

Speech  
reports

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

Sequence 1 :  
General presentation of the case study

Sequence 2 :  
Validation of starting report, working on user requirements and business plan.

Sequence 3 :  
Termination of following reports : starting report, user requirements. Elaborating applicative and date architecture, organisation of bibliography study bringing on technologies to use. Working on business plan.

Sequence 4 :  
Validation of data and applicative architecture. Presentation of bibliography study on technologies. Working on EDI.

Sequences 5, 6 and 7 :  
Validation of bibliography study. termination of business plan, preparation of final speech

#### BIBLIOGRAPHY

#### PRE-REQUISITE

Knowledge in Information System and architectures of date and applications

## Projects

### Retail information system transformation

#### AIMS

This project concerns the design of the transformation of a the information system of a big food retail company

#### IDENTIFICATION

CODE : IF-5-PRJ22  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

#### ASSESSMENT METHOD

Intermediate and final project presentations by the team

#### TEACHING AIDS

Project documents  
Case study

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

#### BIBLIOGRAPHY

#### PRE-REQUISITE

IF-4-PLD-SIE  
IF-4-WASO  
IF-4-PLD-MARS  
IF-4-GP  
IF-5-MAN

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**Projects**

## Information system transformation

**AIMS**

This project aims to build multiple transformation scenarios for an industrial compagny

**IDENTIFICATION**

CODE : IF-5-PRJ23  
ECTS : 3.0

**HOURS**

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

**ASSESSMENT METHOD**

Project team presentation

**TEACHING AIDS**

Documents on the company

**TEACHING LANGUAGE**

French

**CONTACT**

M. OU HALIMA Mohamed  
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## Projects

### Decision Support System and process design

#### AIMS

This project aims to modelling the supply chain processes of a retail company using the SCOR process referential and to design the decision support system for managers

#### IDENTIFICATION

CODE : IF-5-PRJ24  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

#### ASSESSMENT METHOD

Intermediate and final presentations by the project team

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

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#### CONTENT

#### BIBLIOGRAPHY

#### PRE-REQUISITE

### INSA LYON

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## Projects

### Parallel processing for data processing and image analysis

#### AIMS

- Three projects related to Big Data distributed and parallel systems are proposed:
- Large-scale Big Data systems, the user's perspective
  - Compute-oriented vs. data intensive parallel systems, the designer's perspective
  - Performance evaluation of Big Data distributed and parallel systems.

This is the second chapter of the set of proposed projects.

The objective of the project is to illustrate the concepts of parallel systems and GPU computing, through the building and deployment of an application for parallel image processing.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies
- Using news technologies in the design and implementation of parallel systems and applications

#### IDENTIFICATION

CODE : IF-5-PRJ31  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

#### ASSESSMENT METHOD

- Evaluation of project development and management

#### TEACHING AIDS

All necessary information (slides and code) are available on the moodle page of the module:  
<http://moodle2.insa-lyon.fr/course/view.php?id=3099>

#### TEACHING LANGUAGE

French

#### CONTACT

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M. WOLF Christian  
[christian.wolf@insa-lyon.fr](mailto:christian.wolf@insa-lyon.fr)

#### CONTENT

- Building a High Performance Computing (HPC) application
- Adapting algorithms to specific architectures
- Developing a kernel for CPU/GPU computing

#### BIBLIOGRAPHY

Book "Programming Massively Parallel Processeurs" par by D.B.Kirk et W.W Hwu.  
CUDA Programming guide : <https://docs.nvidia.com/cuda/cuda-c-programming-guide/>

#### PRE-REQUISITE

- Course "Parallel and GPU computing"

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## Projects

### Lareg scale distributed systems for big data management

#### IDENTIFICATION

CODE : IF-5-PRJ32  
ECTS : 3.0

#### HOURS

Lectures : 0.0 h  
Seminars : 0.0 h  
Laboratory : 10.0 h  
Project : 0.0 h  
Teacher-student  
contact : 10.0 h  
Personal work : 30.0 h  
Total : 40.0 h

#### ASSESSMENT METHOD

- Evaluation of project  
development

#### TEACHING AIDS

- Lecture slides

#### TEACHING LANGUAGE

French

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KHELLADI Sahra  
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#### AIMS

- Three projects related to Big Data distributed and parallel systems are proposed:
- Large-scale Big Data systems, the user's perspective
  - Compute-oriented vs. data intensive parallel systems, the designer's perspective
  - Performance evaluation of Big Data distributed and parallel systems.

The objective of the course is to design, develop and deploy distributed applications, handling large amount of data, in an adaptive way, a.k.a. Autonomic computing.

It illustrates Big Data systems, algorithms for fault tolerance management, performance management, etc.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies: clouds, P2P, Big Data, etc.
- Using news technologies in the design and implementation of distributed systems and applications

#### CONTENT

- Building and deploying Big Data systems
- Building fault-tolerant distributed applications, performance- oriented distributed applications
- Cluster- and Cloud-based distributed applications

#### BIBLIOGRAPHY

- Asif Qumer Gill. Adaptive Cloud Enterprise Architecture. World Scientific Publishing, Jul. 2015;
- Kephart, J.O., Chess, D.M.. The vision of Autonomic Computing. IEEE Computer, 36(1), Jan. 2003.

#### PRE-REQUISITE

- Course "Distributed systems and algorithms"
- Programming skills

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## Projects

### Performance evaluation

#### AIMS

- Three projects related to Big Data distributed and parallel systems are proposed:
- Large-scale Big Data systems, the user's perspective
  - Compute-oriented vs. data intensive parallel systems, the designer's perspective
  - Performance evaluation of Big Data distributed and parallel systems.

This is the third chapter of the set of proposed projects.

The objective of the project is to present the principles and methods for performance evaluation of Big Data distributed and parallel systems.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies
- Using news technologies in the design and implementation of parallel systems and applications

#### IDENTIFICATION

CODE : IF-5-PRJ33  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
<b>Total :</b>	<b>40.0 h</b>

#### ASSESSMENT METHOD

- Evaluation of project development and management

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

M. MARQUET Kevin  
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M. MOREL Lionel  
[lionel.morel@insa-lyon.fr](mailto:lionel.morel@insa-lyon.fr)  
M. ROUZAUD-CORNABAS Jonathan  
[jonathan.rouzaud-cornabas@insa-lyon.fr](mailto:jonathan.rouzaud-cornabas@insa-lyon.fr)

#### CONTENT

- Benchmarking, program evaluation
- Performance monitoring, profiling, code instrumentation
- Bottleneck analysis
- Program optimization, impact on performance
- Methodology to conduct experiments
- Methodology for statistical analysis of execution traces
- Performance prediction model

#### BIBLIOGRAPHY

#### PRE-REQUISITE

- Course "Distributed systems and algorithms"
- Course "Paralle and GPU computing"

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## Projects

### Mobile and distributed social networks

#### AIMS

The objective of the project is to set up a mobile distributed application, implementing a social network, and illustrating aspects related to crowd sensing, geolocation, and privacy management.

Target skills are as follows:

- Analyzing and understanding news technologies
- Integrating emerging technologies
- Using news technologies in the design and implementation of distributed and mobile systems and applications

#### IDENTIFICATION

CODE : IF-5-PRJ34  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	10.0 h
Personal work :	30.0 h
Total :	40.0 h

#### ASSESSMENT METHOD

- Evaluation of project development and management

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

M. BRUNIE Lionel  
[lionel.brunie@insa-lyon.fr](mailto:lionel.brunie@insa-lyon.fr)

#### CONTENT

- Set up social networks
- Implement mobile applications in Android
- Integrating geolocation
- Crowd sensing
- Using cloud services for data storage
- Data replication
- Privacy management

#### BIBLIOGRAPHY

#### PRE-REQUISITE

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## Projects

### Specific Project

#### AIMS

Specific projects are projects carried out by a small group of students. As other last year curriculum projects, they are associated to three main objectives:

- Maximize the training openness by proposing projects on various topics.
- Allow all students to experience project management (initialization, monitoring and assessment)
- Mobilize acquired skills in a transverse way

These projects are associated to various fields and are also designed to learn to understand situations where an immediate solution is not necessarily known: various techniques of problem solving (integrating technical, methodological, organisational and human elements) must be used to achieve the result. In other words, these projects are also a pretext to learn how to solve problems paying attention to quality, cost, availability, safety requirements

#### IDENTIFICATION

CODE : IF-5-PRJS  
ECTS : 3.0

#### HOURS

Lectures :	0.0 h
Seminars :	6.5 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	6.5 h
Personal work :	30.0 h
Total :	36.5 h

#### ASSESSMENT METHOD

Different deliverables are defined by the project supervisor. In addition an oral defense is organised at the end of the semester

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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[frederique.biennier@insa-lyon.fr](mailto:frederique.biennier@insa-lyon.fr)

#### CONTENT

The work program is prepared by students with their supervisor. These projects take place off-schedule. The associated ECTS are used to replace another last year curriculum project.

#### BIBLIOGRAPHY

#### PRE-REQUISITE

Dépends on the project topic.

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## Projects

### Scientifical and Technical Synthesis

#### IDENTIFICATION

CODE : IF-5-SST  
ECTS : 3.0

#### HOURS

Lectures :	3.0 h
Seminars :	3.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	6.0 h
Personal work :	50.0 h
Total :	56.0 h

#### ASSESSMENT METHOD

1. Mid-term Review
2. Project Monitoring Report
3. Summary Report
4. sheet approach to access to information for SCD

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

MME BENHARKAT Aicha  
Nabila  
[nabila.benharkat@insa-lyon.fr](mailto:nabila.benharkat@insa-lyon.fr)  
Phone : 0472438879

#### AIMS

##### SKILLS

1) Search for information (vocabulary, sources, queries), 2) Evaluate information found (selection, evaluation, justification), 3) Exploit the selected documents, 4) Write a bibliography according to the standards and make calls correct citations.

##### OBJECTIVES

The proposed scientific and technical synthesis is a major working engineer training by and for research. The purpose is to make a critical analysis of the existing (concepts, tools, methods, systems, ...) and seek any information relating to the problem. By properly leveraging informational skills, one can establish a solid foundation of a state of the art. On a more technical level, this should allow a critical study of the existing to make choices of concepts, more appropriate tools and techniques. It will discover, select and use relevant information sources to meet a given need. It will synthesize and criticize the selected information, then write a literature synthesis. The work is done by a group of students and includes coordination aspects for rendering collective.

#### CONTENT

- Introduction to Information Science, Technical and Economic (IST [E])
- Information Research Methodology
- Libraries Portal Presentation and discovery of useful information resources for the field
- Analysis of the reliability and relevance of information
- Writing a bibliography using bibliographic references guide

#### BIBLIOGRAPHY

- 1] NADJI F., BOUDIA D. Guide de rédaction des références bibliographiques [ en ligne ]. Villeurbanne : Doc'INSA, 2012. Disponible sur : <http://referencsbibliographiques.insa-lyon.fr/> [consulté le 15/02/2012]  
[2] SCD - Doc'INSA. Portail des bibliothèques de l'INSA [ en ligne ]. Villeurbanne : Doc'INSA, 2012. Disponible sur : <http://scd.docinsa.insa-lyon.fr/> [consulté le 15/02/2012]

#### PRE-REQUISITE

Internet navigation tools and classic office tools

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**Diploma thesis****End of study internship****IDENTIFICATION**CODE : IF-5-PFE  
ECTS : 30.0**HOURS**

Lectures :	0.0 h
Seminars :	1.0 h
Laboratory :	15.0 h
Project :	0.0 h
Teacher-student contact :	16.0 h
Personal work :	595.0 h
Total :	611.0 h

**ASSESSMENT METHOD**

The evaluation of the project is linked to the different academic stages [initialization, defense at mid-term, final Defense, synthesis report] and to the work done during the training period [method and project management, quality and quantity of work, quality of the documentation...]. It is therefore important to note that continuous exchanges with the INSA supervisor are necessary.

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

MME BIENNIER Frederique  
[frederique.biennier@insa-lyon.fr](mailto:frederique.biennier@insa-lyon.fr)  
MME CALABRETTO Sylvie  
[sylvie.calabretto@insa-lyon.fr](mailto:sylvie.calabretto@insa-lyon.fr)  
MME LEGAIT Anne  
[anne.legait@insa-lyon.fr](mailto:anne.legait@insa-lyon.fr)  
Phone : 0472437927

**AIMS**

An important part of our curriculum aims at providing knowledge and competencies on tools, technologies and methods. The last semester is devoted to an End Study Project achieved in enterprises or any public bodies. During this semester, students are in charge of the management and development of their own project, from design steps [architecture of an information system, a complex software system?] and may lead to an implementation. The main outcomes and skills are to be able to understand, organise and manage a real project, being able to use and implement methods and techniques to solve a complex problem. End Study projects are proposed by companies or public bodies. Each proposal (described in 1-2 pages and indicating precisely who will manage and guide the trainee) is validated by a teacher of the department according to the required specialisation field. The proposal is then precised to identify the nature and volume of work. The teacher is in charge to decide whether the proposal can be the subject of a project of end of studies.

Contractual and administrative aspects are specified by an agreement signed by the Department, the student and the hosting company.

**CONTENT**

Each student has to search and apply for an end study project during the first 3 months of the 5th year curriculum, either by applying for an internship proposal received and validated by the department or by sending direct applications to companies. As far as a direct application is concerned, the student is also in charge of initializing the validation process [sending the proposal to the End Study Project coordinator]. The End Study Project should represent at least 85 working days. It starts with an initialization step devoted to the subject understanding and required skills acquisition phases before producing an initialisation document describing precisely the project perimeter and how the work will be organised and scheduled. A mid-term oral examination allows to validate the progress of the project and to make any adjustments for the rest of the project. Finally, the submission of a synthesis report and a public defense are used to present the work carried out. During their internship students benefit from the constant supervision of a teacher of the Department

**BIBLIOGRAPHY****PRE-REQUISITE**

All 3IF and 4IF courses

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**Diploma thesis****End of study internship****IDENTIFICATION**

CODE : IF-5-PFE-6IF1  
ECTS : 24.0

**HOURS**

Lectures :	0.0 h
Seminars :	1.0 h
Laboratory :	15.0 h
Project :	0.0 h
Teacher-student contact :	16.0 h
Personal work :	595.0 h
Total :	611.0 h

**ASSESSMENT METHOD**

The evaluation of the project is linked to the different academic stages [initialization, defense at mid-term, final Defense, synthesis report] and to the work done during the training period [method and project management, quality and quantity of work, quality of the documentation...]. It is therefore important to note that continuous exchanges with the INSA supervisor are necessary.

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

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**AIMS**

This learning unit is devoted to student that have to achieve the End Study Project during the first semester according to a specific curriculum. An important part of our curriculum aims at providing knowledge and competencies on tools, technologies and methods. The last semester is devoted to an End Study Project achieved in enterprises or any public bodies. During this semester, students are in charge of the management and development of their own project, from design steps [architecture of an information system, a complex software system] and may lead to an implementation. The main outcomes and skills are to be able to understand, organise and manage a real project, being able to use and implement methods and techniques to solve a complex problem.

End Study projects are proposed by companies or public bodies. Each proposal (described in 1-2 pages and indicating precisely who will manage and guide the trainee) is validated by a teacher of the department according to the required specialisation field. The proposal is then precised to identify the nature and volume of work. The teacher is in charge to decide whether the proposal can be the subject of a project of end of studies.

Contractual and administrative aspects are specified by an agreement signed by the Department, the student and the hosting company.

**CONTENT**

Each student has to search and apply for an end study project either by applying for an internship proposal received and validated by the department or by sending direct applications to companies. As far as a direct application is concerned, the student is also in charge of initializing the validation process [sending the proposal to the End Study Project coordinator]. The End Study Project should represent at least 85 working days. It starts with an initialization step devoted to the subject understanding and required skills acquisition phases before producing an initialisation document describing precisely the project perimeter and how the work will be organised and scheduled. A mid-term oral examination allows to validate the progress of the project and to make any adjustments for the rest of the project. Finally, the submission of a synthesis report and a public defense are used to present the work carried out. During their internship students benefit from the constant supervision of a teacher of the Department

**BIBLIOGRAPHY****PRE-REQUISITE**

All courses involved in the 2 first years of the specialization curriculum (3IF and 4IF)

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**Diploma thesis****End of study internship****IDENTIFICATION**CODE : IF-5-PFE-6IF2  
ECTS : 24.0**HOURS**Lectures : 0.0 h  
Seminars : 1.0 h  
Laboratory : 15.0 h  
Project : 0.0 h  
Teacher-student  
contact : 16.0 h  
Personal work : 595.0 h  
Total : 611.0 h**ASSESSMENT METHOD**

The evaluation of the project is linked to the different academic stages [initialization, defense at mid-term, final Defense, synthesis report] and to the work done during the training period [method and project management, quality and quantity of work, quality of the documentation...]. It is therefore important to note that continuous exchanges with the INSA supervisor are necessary.

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME BIENNIER Frederique  
[frederique.biennier@insa-lyon.fr](mailto:frederique.biennier@insa-lyon.fr)**AIMS**

This learning unit is devoted to student that have to achieve the End Study Project during the first semester according to a specific curriculum. An important part of our curriculum aims at providing knowledge and competencies on tools, technologies and methods. The last semester is devoted to an End Study Project achieved in enterprises or any public bodies. During this semester, students are in charge of the management and development of their own project, from design steps [architecture of an information system, a complex software system] and may lead to an implementation. The main outcomes and skills are to be able to understand, organise and manage a real project, being able to use and implement methods and techniques to solve a complex problem.

End Study projects are proposed by companies or public bodies. Each proposal (described in 1-2 pages and indicating precisely who will manage and guide the trainee) is validated by a teacher of the department according to the required specialisation field. The proposal is then precised to identify the nature and volume of work. The teacher is in charge to decide whether the proposal can be the subject of a project of end of studies.

Contractual and administrative aspects are specified by an agreement signed by the Department, the student and the hosting company.

**CONTENT**

Each student has to search and apply for an end study project either by applying for an internship proposal received and validated by the department or by sending direct applications to companies. As far as a direct application is concerned, the student is also in charge of initializing the validation process [sending the proposal to the End Study Project coordinator]. The End Study Project should represent at least 85 working days. It starts with an initialization step devoted to the subject understanding and required skills acquisition phases before producing an initialisation document describing precisely the project perimeter and how the work will be organised and scheduled. A mid-term oral examination allows to validate the progress of the project and to make any adjustments for the rest of the project. Finally, the submission of a synthesis report and a public defense are used to present the work carried out. During their internship students benefit from the constant supervision of a teacher of the Department

**BIBLIOGRAPHY****PRE-REQUISITE**

All courses involved in the first 2 years of specialization (3IF and 4IF)

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.01.01  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.01.02  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.01.03  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.01.04  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.01  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

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## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.02  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.03  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.04  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.05  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.02.06  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.01  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.02  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

**INSA LYON****Campus LyonTech La Doua**20, avenue Albert Einstein - 69621 Villeurbanne cedex - France  
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**REF-HRS**

REH-IF-AP.03.03

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.03  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	240.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	240.0 h
Personal work :	0.0 h
Total :	240.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME CUBIZOLLES Karine  
[karine.cubizolles@insa-lyon.fr](mailto:karine.cubizolles@insa-lyon.fr)

## CONTENT

## BIBLIOGRAPHY

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**REF-HRS**

REH-IF-AP.03.04

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.04  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	110.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	110.0 h
Personal work :	0.0 h
Total :	110.0 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME BENHARKAT Aicha  
Nabila  
[nabila.benharkat@insa-lyon.fr](mailto:nabila.benharkat@insa-lyon.fr)  
Phone : 0472438879

## CONTENT

## BIBLIOGRAPHY

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.05  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. BRES Stephane  
[stephane.bres@insa-lyon.fr](mailto:stephane.bres@insa-lyon.fr)

## BIBLIOGRAPHY

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.07  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.08  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. EGYED-ZSIGMOND Elod  
[elod.egyed-zsigmond@insa-lyon.fr](mailto:elod.egyed-zsigmond@insa-lyon.fr)

## BIBLIOGRAPHY

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.10  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.11  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**M. ERGIN Bulent  
[bulent.ergin@insa-lyon.fr](mailto:bulent.ergin@insa-lyon.fr)

## BIBLIOGRAPHY

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.12  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

## BIBLIOGRAPHY

## PRE-REQUISITE

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**REF-HRS**

## AIMS

**IDENTIFICATION**CODE : REH-IF-AP.03.13  
ECTS : 0.0**HOURS**

Lectures :	0.0 h
Seminars :	100.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	100.0 h
Personal work :	0.0 h
Total :	100.0 h

**ASSESSMENT METHOD**

## CONTENT

**TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**

Unknown

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## Network

### Network programming

#### AIMS

The objective of this course is to introduce the paradigms and techniques that underly communication networks. The main objectives are as follows:

- Introduce the OSI model of networks
- Describe the high-level layers of the OSI model
- Present the mechanisms for network programming, for the application programmer point of view (which API, how to use them)

Target skills are as follows:

- Designing protocols at application level
- Implémenting a distributed application using sockets

#### IDENTIFICATION

CODE : IF-3-RE1  
ECTS : 2.0

#### HOURS

Lectures : 9.0 h  
Seminars : 0.0 h  
Laboratory : 16.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h

#### ASSESSMENT METHOD

Exam:

- 1h30 of written exam
- Allowed document: one sided A4 of lecture notes

Lab evaluation:

- Type of evaluation: demonstration
- Requested data: report + source of code of the implemented software

#### TEACHING AIDS

- Lecture slides
- Code for lab work

#### TEACHING LANGUAGE

French

#### CONTACT

MME BOUCHENAK  
KHELLADI Sahra  
[sahra.bouchenak@insa-lyon.fr](mailto:sahra.bouchenak@insa-lyon.fr)

#### CONTENT

Lectures (Cours Magistraux - CM) :

- CM1 : Introduction
- CM2 : Socket-based network programming
- CM3 : RPC/RMI-based network programming
- CM4 : Application protocols (HTTP, FTP, SMTP)
- CM5 : Architecture design
- CM6 : Architecture design (cont.)

Lab (Travaux Pratiques - TP) :

- TP1 : Socket-based network programming
- TP2 : RPC/RMI-based network programming
- TP3 : Programming an HTTP server
- TP4 : Programming an HTTP server (cont.)

#### BIBLIOGRAPHY

- A. S. Tanenbaum, D. J. Wetherall. Computer Networks. Pearson, 2010.
- G. Pujolles. Les Réseaux

#### PRE-REQUISITE

Programming skills (Java, or C)

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**Human and Social Sciences****Professionnal Project****IDENTIFICATION**CODE : IF-3-PP  
ECTS : 0.0**HOURS**

Lectures :	1.5 h
Seminars :	8.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	9.5 h
Personal work :	3.0 h
Total :	12.5 h

**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME LEGAIT Anne  
[anne.legait@insa-lyon.fr](mailto:anne.legait@insa-lyon.fr)  
Phone : 0472437927**AIMS**

- To increase student's awareness of the importance of a good professional project for their career path (training, professional and community experiences)
- To give them (from the start of the IF training course) the essential keys to choose a professional project, sector and type of engineer job & in relation to their personal profile and evolution of the labour market
- To get them training in application for internship (documents, contact opportunities)

**CONTENT**

- The important role of the professional project in careers guidance
- Content, conception and methodology of a personal professional project
- Professional profiles and jobs in IF technology
- Personality test about strengths and professional motivations
- Overview of IF main engineer jobs
- Results of the last survey about « first job of the IF students »
- How to make a CV
- How to get in contact with firms
- How to use networks (INSA, professional networks)
- How to get ready for an industrial or contact Forum
- How to apply to an internship
- Checking of the CV
- The interview process

**BIBLIOGRAPHY**(among available books in the MARIE CURIE library & 2<sup>o</sup> floor):

- Le guide du super candidat EYROLLES [D 35 371 425 2 OLI]
- Réussir sa lettre de motivation DANIEL POROT ([D 35 371 425 2 POR])
- Guide du CV en langues étrangères STUDYRAMA [D 35 371 425 2 LAC]
- Réussir sa candidature en anglais STUDYRAMA [D 35 371 425 2 DEL]
- Tests d'entreprises mode d'emploi MARABOUT [D 35 371 425 2 AZZ]

**PRE-REQUISITE****INSA LYON****Campus LyonTech La Doua**20, avenue Albert Einstein - 69621 Villeurbanne cedex - France  
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**Human and Social Sciences****Human Sciences and Communication (S1)****IDENTIFICATION**CODE : IF-3-SHC-1  
ECTS : 1.0**HOURS**Lectures : 0.0 h  
Seminars : 24.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 24.0 h  
Personal work : 0.0 h  
Total : 24.0 h**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME LECLERE Julie  
[julie.leclere@insa-lyon.fr](mailto:julie.leclere@insa-lyon.fr)**AIMS**

Bring students to discover the stakes of human communication.  
Initiate students to the codes and languages of human sciences.  
Allow students to experiment and enrich their methods of self expression by putting them in situations in which they must act in the form of a collective, public presentation, a complex act of communication which puts into practice the following capacities:

- Collaborative work.
- Research in documentaries.
- How to structure, synthesize and reformulate information.
- How to combine words, gestures, audio-visual tools and creativity to one's speech.

**CONTENT**

First part:  
General introduction and theoretical approaches: communication, initiation to human sciences (various research and contemporary theories).  
Second part:  
Methodological approaches: documentary research, how to structure one's verbal expression and approach public speaking; use of audio-visual materials.

**BIBLIOGRAPHY**

- [1] Bernard Lahire, Ceci n'est qu'un tableau, Essai sur l'art, la domination, la magie et le sacré, Editions La Découverte, 2015  
[2] Yves Citton, L'avenir des Humanités, Economie de la connaissance ou cultures de l'interprétation, La Découverte, 2010  
[3] Breton Phillipe. Argumenter en situation difficile, Editions La Découverte, 2004

**PRE-REQUISITE**

necessary linguistic skills for written and oral expression in french

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**Human and Social Sciences****Human Sciences and Communication (S2)****IDENTIFICATION**CODE : IF-3-SHC-2  
ECTS : 1.0**HOURS**Lectures : 0.0 h  
Seminars : 22.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 22.0 h  
Personal work : 0.0 h  
Total : 22.0 h**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

**CONTACT**MME LECLERE Julie  
[julie.leclere@insa-lyon.fr](mailto:julie.leclere@insa-lyon.fr)**AIMS**Bring students to discover the stakes of human communication.  
Initiate students to the codes and languages of human sciences.

Allow students to experiment and enrich their methods of self expression by putting them in situations in which they must act in the form of a collective, public presentation, a complex act of communication which puts into practice the following capacities:

- Collaborative work.
- Research in documentaries.
- How to structure, synthesize and reformulate information.
- How to combine words, gestures, audio-visual tools and creativity to one's speech.

**CONTENT**

First part:

General introduction and theoretical approaches: communication, initiation to human sciences (various research and contemporary theories).

Second part:

Methodological approaches: documentary research, how to structure one's verbal expression and approach public speaking; use of audio-visual materials.

**BIBLIOGRAPHY**

- [1] Rosanvallon Pierre. La contre-démocratie - La politique à l'âge de la défiance. Paris : Points, 2008  
 [2] Breton Philippe. Convaincre sans manipuler. Paris : La découverte, 2008  
 [3] Breton Philippe. Argumenter en situation difficile. Paris : La découverte, 2004

**PRE-REQUISITE**

necessary linguistic skills for written and oral expression in french

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## Signal and Image Processing

### Signal Processing

#### AIMS

This course aims to present the general aspects of signal processing.

#### IDENTIFICATION

CODE : IF-3-TSI  
ECTS : 2.0

#### HOURS

Lectures :	15.0 h
Seminars :	4.0 h
Laboratory :	20.0 h
Project :	0.0 h
Teacher-student contact :	39.0 h
Personal work :	10.0 h
Total :	49.0 h

#### ASSESSMENT METHOD

Practical work (8 hours on 2 weeks) and exam (1 hour)

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

M. BRES Stephane  
[stephane.bres@insa-lyon.fr](mailto:stephane.bres@insa-lyon.fr)

#### CONTENT

It starts by a mathematical survey of Fourier's series, as well as a cursory presentation of the notion of distribution in order to introduce the Dirac. Students will then study the transform of Fourier, the convolution operator, notions of transfer functions, impulse responses and complex spectrums. The second part of the class focus on digital signals and sampling and its consequences, of Fourier's transform and filtering. A lab. work (« TP ») is associated with this course and will allow students to use the Fourier transform to visualize digital signal spectrums and construct different filtering.

#### BIBLIOGRAPHY

- [1] COTTET F., Traitement des signaux et acquisition de données, DUNOD.
- [2] GASQUET C., WITOMSKI P., Analyse de Fourier et applications, MASSON.
- [3] KUNT M., Traitement numérique des signaux, DUNOD.
- [4] JAIN A.K., Fundamentals of digital image processing, PRENTICE-HALL INT. ED.

#### PRE-REQUISITE

Complex numbers, integral calculus

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## Internship

### Internship

#### AIMS

The first year of specialization (3IF) allows students to become familiar with programming techniques and design methods and gain a level of programmer analyst.

This first internship gives them the opportunity to practice in a real context, theoretical and technical knowledge and to understand the structure and running of the host company.

#### IDENTIFICATION

CODE : IF-3-STA  
ECTS : 6.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.5 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.5 h
Personal work :	308.0 h
Total :	308.5 h

#### ASSESSMENT METHOD

By the company and the teacher tutor at the end of the internship.

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

M. GUERIN Eric  
[eric.guerin@insa-lyon.fr](mailto:eric.guerin@insa-lyon.fr)  
MME LEGAIT Anne  
[anne.legait@insa-lyon.fr](mailto:anne.legait@insa-lyon.fr)  
Phone : 0472437927

#### CONTENT

The 3IF internship takes place during the summer (June to mid-September) and covers at least two months.

#### BIBLIOGRAPHY

#### PRE-REQUISITE

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## Internship

### Internship

#### AIMS

The 4IF course, with a minimum duration of 4 months, between May and late September, aims to make students tackle real projects of reasonable size.

Indeed, the second year of computer training allows them to confront with more complex problems in various fields of IT, as well as raise awareness of the teamwork and project management.

This internship is oriented analysis / design activities ranging mostly to realization.

#### IDENTIFICATION

CODE : IF-4-STA  
ECTS : 10.0

#### HOURS

Lectures :	0.0 h
Seminars :	0.5 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	0.5 h
Personal work :	616.0 h
Total :	616.5 h

#### ASSESSMENT METHOD

By the company and the teacher  
tutor at the end of the internship

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

MME LEGAIT Anne  
[anne.legait@insa-lyon.fr](mailto:anne.legait@insa-lyon.fr)  
Phone : 0472437927

#### CONTENT

#### BIBLIOGRAPHY

#### PRE-REQUISITE

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[www.insa-lyon.fr](http://www.insa-lyon.fr)

**Information Systems****Data Base Management System****IDENTIFICATION**CODE : IF-3-BDR  
ECTS : 3.0**HOURS**Lectures : 12.0 h  
Seminars : 10.0 h  
Laboratory : 10.0 h  
Project : 0.0 h  
Teacher-student  
contact : 32.0 h  
Personal work : 35.0 h  
Total : 67.0 h**ASSESSMENT METHOD**Labor course evaluation (multiple-choice questionnaire, report),  
Final exam (1:30)**TEACHING AIDS**

Lecture slides

**TEACHING LANGUAGE**

French

**CONTACT**M. LAMARRE Philippe  
[philippe.lamarre@insa-lyon.fr](mailto:philippe.lamarre@insa-lyon.fr)**AIMS**

With an approach focused on the development of applications using databases, the module addresses the data management issues and the principles of Relational Database Management Systems, their motives and what they can bring in the global landscape of information systems.

It contributes to the acquisition and development of specific skills defined in the repository of IF Department.

- \_ To create and to query a relational database.
- \_ To manage a Database Management System.
- \_ To model distributed databases.

**CONTENT**

Part I: Relational Databases

- 1 - Introduction.
- 2 - Data Manipulation: using a declarative language (SQL)
- 3 - Programming: PL-SQL language
- 4 - Optimization (indexes, execution plan, cost model)
- 5 - Transactions (atomicity, consistency, isolation, durability).
- 6 - Database administration
- 7 - distributed databases: motivations
- 8 - distributed databases: conception
- 9 - data fragmentation
- 10 - data replication
- 11 - query processing in distributed databases
- 12 - transaction in distributed databases
- 13 - Conclusion, broader context

**BIBLIOGRAPHY**

Suzanne Dietrich, « An advanced course in database systems : beyond relational databases », Pearson/Prentice Hall, 2005.

Raghu Ramakrishnan, « Database management systems », McGraw-Hill, 2003.

S. Abitboul, R. Hull, V. Vianu « Foundations of Databases », Addison-Wesley 1995

Serge Abiteboul, Ioana Manolescu, Philippe Rigaux, Marie-Christine Rousset, Pierre Senellart « Web Data Manbagement » Cambridge University Press 2012

Karl Aberer: Peer-to-Peer Data Management Morgan & Claypool Publishers 2011

Tamer Ozsu, Patrick Valduriez, «Principles of. Distributed Database Systems» 3rd edition, Springer, 2011

**PRE-REQUISITE**

Module «Fondamentaux de la modélisation de données».

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## Information Systems

### Application Development for Information Systems

#### AIMS

The objective of this course is to study methods and tools for the development of service oriented applications for information systems (IS). We will study transactional multi-tier architectures and Web technologies for user interfaces.

The target skills in this course are:

- 1) Apply methods for analysis and design of IS:
  - Identify business objects, business services, and associated GUI
  - Design and implement data models
- 2) Design and implement applications for IS:
  - Write IS specifications documents
  - Implement an application from IS specification documents

#### IDENTIFICATION

CODE : IF-3-DASI  
ECTS : 2.0

#### HOURS

Lectures : 10.5 h  
Seminars : 4.0 h  
Laboratory : 32.0 h  
Project : 0.0 h  
Teacher-student  
contact : 46.5 h  
Personal work : 10.0 h  
Total : 56.5 h

#### ASSESSMENT METHOD

Exam and projects

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

- Bases of analysis and design of applications for IS
- Specifications of the 3 layers: interface-business-data
- Persistence and object-relational mapping technologies (ORM)
- GUI Design Principles
- Architectures MVC (Model-View-Controller)
- Web Technologies for GUI

Technologies: Java, JPA (persistence), Servlets, JavaScript, AJAX

#### BIBLIOGRAPHY

#### PRE-REQUISITE

UML Modeling  
Databases  
Algorithmic and Object-oriented Programming  
Java development

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## Information Systems

### Data Management for the Web

#### IDENTIFICATION

CODE : IF-3-DW  
ECTS : 2.0

#### HOURS

Lectures : 9.0 h  
Seminars : 2.0 h  
Laboratory : 8.0 h  
Project : 0.0 h  
Teacher-student  
contact : 19.0 h  
Personal work : 30.0 h  
Total : 49.0 h

#### ASSESSMENT METHOD

Lab evaluation  
Individual written exam

#### TEACHING AIDS

Lecture notes, Lab and exercise

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

This course aims to address the problems related to hyper documents, XML (DTD, Schema, XPath, XSL, XQuery, DOM, Javascript) and the NoSQL dbms

#### Skills :

- design and model XML documents
- create a DTD and an XML Schema
- write XPath expressions
- write complex XSL stylesheets
- write javascript functions to manipulate html DOM
- call REST webservices and manipulate XML and json results in javascript
- install and use XML DBMS [BaseX]
- write XQuery queries
- install MongoDB
- write MongoDB queries

#### CONTENT

1. Context and issues: survey of major concepts and domains of application.
2. Documents and multimedia hyper documents: Modeling of specific documents, class of documents, hyper documents, and multimedia contents.
3. Introduction to XML: major concepts (element, attribute, entity), document type definition (DTD) and instance.
4. Advanced XML Concepts: name-space domains, schema, XLINK links, style sheet processing (XSL).
5. The XML galaxy: RDF, DOM, SVG.
6. Semi-structured databases: Representation of semi-structured data, XML and semi-structured data, XML databases.
7. XML manipulation: DOM, SAX, Javascript
8. Conclusion, assessment and perspectives.
9. NoSQL DBMS

#### BIBLIOGRAPHY

#### PRE-REQUISITE

IF-3-BDR, IF-3-MD  
Basic Relational Database Management notions

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## Information Systems

### Data Modeling

#### AIMS

The goal of this course is to gain theoretical understanding of the principles of data management. It consists of two main parts: relational query languages (algebraic, logic and SQL) for understanding the basics optimization process of SQL queries. The second focuses on constraints, mainly functional dependencies and reasoning related to database design.

#### Expected skills:

- Writing equivalent queries in several languages
- Reasoning on equivalent query languages
- Understanding the different types of data model (conceptual, logical)
- Transforming schema between different data models
- Mastering database design with quality guarantees

#### IDENTIFICATION

CODE : IF-3-MD  
ECTS : 2.0

#### HOURS

Lectures :	12.0 h
Seminars :	12.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	30.0 h
<b>Total :</b>	<b>54.0 h</b>

#### ASSESSMENT METHOD

Written exam [1h30]

#### TEACHING AIDS

Lecture notes for the course, work sheets for classwork [in French]

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

- Introduction to data models.
- Applications to databases, information systems, software engineering and artificial intelligence
- Relational data model
- \* Structure.
- \* Languages: relational algebra, domain relational calculus and Datalog
- \* Constraints: functional dependencies, inclusion dependencies, keys, foreign keys
- Extended Entity-Relationship [ER] models
- Database design:
- \* Conceptual ER
- \* Universal relation
- \* Armstrong databases

#### BIBLIOGRAPHY

- [1] Abiteboul, Rick Hull, Victor Vianu, Foundations of databases, 685 pages, 1995, Addison-Wesley  
 [2] Carlo Batini, Stefano Ceri, Shamkant B. Navathe, Conceptual Database Design: An Entity-Relationship Approach, 455 Pages, Benjamin/Cummings  
 [3] Mark Levene, Georges Loizou, Guided tour of relational databases and beyond, 625 pages, 1999, Springer  
 [4] Heikki Mannila, Kari-Jouko Raiha, The Design of Relational Databases, 2nd edition, 1994, Addison-Wesley

#### PRE-REQUISITE

Set theory, Algorithmics basic notions

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**Information Systems****Process Modeling****AIMS**

The course Process Modelling aims at presenting the context, methods and tools of Model Driven Information System, specially Business Process Modelling [BPM] and the modelling techniques and standards that are linked to it [Aris, SADT, CIMOSA, ISO19439, SCOR].

**IDENTIFICATION**

CODE : IF-3-MP  
ECTS : 1.0

**HOURS**

Lectures :	4.5 h
Seminars :	2.0 h
Laboratory :	4.0 h
Project :	0.0 h
Teacher-student contact :	10.5 h
Personal work :	0.0 h
Total :	10.5 h

**ASSESSMENT METHOD**

- Written Exam (1h30)
- Standard ARIS report

**TEACHING AIDS**

- Slide course
- Textual Business case for extraction of modelling construct
- Modelling Platform ARIS <http://vmaris-2016.insa-lyon.fr>

**TEACHING LANGUAGE**

French

**CONTACT**

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**CONTENT**

- I- Modelling, Information system, and business process
- II - Comparison of modelling languages for business process
- III - ARIS Modelling language

**BIBLIOGRAPHY**

- [1] La théorie du système général: théorie de la modélisation. Jean-Louis Lemoigne. <http://www.mcxapc.org/inserts/ouvrages/0609tsgtm.pdf>
- [2] Idrissi N, P. Knockaert et M. Cattan, Maîtriser les processus de l'entreprise. Organisation, 2001
- [3] ARIS: des processus de gestion au système intégré d'applications. August-Wilhelm Scheer, Springer, 2002 - 169 pages
- [4] RUMBAUGH J., JACOBSON I., BOOCH G. [1998]. Unified Modeling Reference Manual. Addison-Wesley.
- [5] TARDIEU H., ROCHFELD O., COLLETI R., PANET G., VAHEE G. [1985]. La méthode Merise, démarche et pratiques. Editions d'Organisation, Paris.

**PRE-REQUISITE**

- basic expérience on modelling [entity-relation, flowcharts...]
- general knowledge on enterprise [main functions, typologies...]
- basic expérience on software platforms [applications, software design, modelling..]

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**Information Systems****4IF - Business Intelligence****IDENTIFICATION**CODE : IF-4-BDD  
ECTS : 2.0**HOURS**

Lectures :	9.0 h
Seminars :	0.0 h
Laboratory :	16.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	25.0 h
Total :	50.0 h

**ASSESSMENT METHOD**

written evaluation of the project  
Final examen (1h30), documents  
on paper can be used

**TEACHING AIDS**

Lecture slides

**TEACHING LANGUAGE**

French

**CONTACT**

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**AIMS**

The lecture objective is the learning of the models, methods and tools needed for the design and the implementation of BI projects.

Acquired skills are, being able to:

- Identify report objects and indicators for a BI project
- Design multidimensional models
- Contribute to the design and implementation of dashboards
- Elaborate OLAP requests
- Be able to operate in BI environments

**CONTENT**

4The course syllabus will address the 4 following main topics:

- Decisional information systems and multidimensional modelisation,
- Design and implementation of data warehouses,
- Information analysis based on a data warehouse (OLAP and reporting)
- Management of BI projects.

**BIBLIOGRAPHY**

- [1] Inmon W.H. Building the data warehouse. John Wiley and sons
- [2] Kimball R. The datawarehouse Toolkit. John Wiley and sons
- [3] Han Jiawei. Data mining concepts and technique. Elsevier
- [4] Spofford George. MDX solutions. Willey

**PRE-REQUISITE**

Relational database

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## Information Systems

### PLD SIE

#### AIMS

PLD-SIE is a long-time project focussing on information system life cycle, particularly on its beginning phasis. PLD-SIE also allows the practice both of project management and development methodology of information systems.

More precisely, the aim of this teaching is :

- 1) to acquire knowledge in the field of enterprise information systems on the level of methodologies and ERP [Enterprise Resource Planning].
- 2) to be aware to the problematic of enterprise digitalisation
- 3) to develop competencies for realization of such systems :
  - Modeling and building consistency models
  - Applying a method and adapt it to a project
  - Configuring project area from business referential
  - Using modeling platform such as ARIS to conceive models

#### IDENTIFICATION

CODE : IF-4-PLD-SIE  
ECTS : 4.0

#### HOURS

Lectures :	12.0 h
Seminars :	0.0 h
Laboratory :	32.0 h
Project :	0.0 h
Teacher-student contact :	44.0 h
Personal work :	20.0 h
<b>Total :</b>	<b>64.0 h</b>

#### ASSESSMENT METHOD

The evaluation of this teaching is done during the project. The modalities are :

- speech
- reports
- quizz

#### TEACHING AIDS

Numerical materials are available on MOODLE platform of INSA Lyon

#### TEACHING LANGUAGE

French

#### CONTACT

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M. OU HALIMA Mohamed  
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Phone : 0472438702

#### CONTENT

Organisation :

A - Lectures in two parts :

- 1) Part 1 : the objective of this part is to allow students to build solutions of refundation or renewal of enterprise information system. The main points which are examined in this lecture are :
  - Requirements analysis
  - Solutions building
  - Scenarii evaluation
- 2) Part 2 : the objective of this part is to discover :
  - the context and the definition of ERP [Information System, standardisation, ERP history]
  - application architecture and ERP functionalities
  - ERP projects methodologies

B - Project : optimize enterprise processes. The content of this project comes from real case study. The aim is :

- to answer to a functional field
- to propose differents informatics solutions [ERP base, market solutions, specific solution, ...]
- to integrate notion of ROI [Return On Investment]

#### BIBLIOGRAPHY

- [1] UML en action, P. Roques et F. Vallée, Ed. Eyrolles
- [2] Urbanisation des systèmes d'information, J. Sassoon, 1998
- [3] Le processus unifié de développement logiciel, I. Jacobson, Ed. Eyrolles
- [4] OOM. La conception objet des systèmes d'information, M. Bouzeghoub, A. Rochefeld.
- [5] Alter S., Information systems : a management perspective. Benjamin/Cummings Publisher, 1996
- [6] Callaway E. Enterprise Resource Planning : Integrating Applications and Business Processes Across the Enterprise. Computer Technology Research, 1999
- [7] Deixonne J.L., Piloter un projet ERP. Dunod, 2001
- [8] Jacobs, F. and D. Wybark. Why ERP? McGraw-Hill, 2000
- [9]Kremzar M.H., M. Kremzar and T.F. Wallace. ERP: Making it happen: The implementers guide to success with Enterprise Resource Planning. Wiley, John and Sons Inc. 2001
- [10] Reix, R., Systèmes d'information et management des organisations. Vuibert, 2002

#### PRE-REQUISITE

IF-3-MD, IF-3-UML, IF-3-BDR, 4IF-GP

**Information Systems****Web Technologies and Service-oriented Architectures for Organizations****IDENTIFICATION**CODE : IF-4-WASO  
ECTS : 1.0**HOURS**Lectures : 6.0 h  
Seminars : 0.0 h  
Laboratory : 8.0 h  
Project : 0.0 h  
Teacher-student  
contact : 14.0 h  
Personal work : 10.0 h  
Total : 24.0 h**ASSESSMENT METHOD****TEACHING AIDS****TEACHING LANGUAGE**

French

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MME SERVIGNE - MARTIN  
Sylvie  
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Phone : 0472438483**AIMS**

The first objective of this module is to study a methodology for designing service and micro-service - oriented architectures for IS applications, based on the UML formalism: a) analysis of functional situations; b) identification of business objects; c) identification of services and service layers; d) specification of services; e) distribution on the technical architecture.

The second objective is the discovery of technologies for the implementation of these architectures: Web services, application servers, data management middleware, communication middleware.

The target skills in this module are:

- 1) Apply a method for analysis and design of IS:
  - Using UML models as part of an IS design method
  - Analyze business and requirements of clients
  - Identify business objects, business services, and associated GUI
- 2) Design application cartography and technical cartography:
  - Identify application blocks and information flows
  - Design a technical architecture to deploy application components
- 3) Design and implement applications for IS:
  - Write IS specifications documents
  - Implement an application from IS specification documents

**CONTENT**

- Methodology for design of service-oriented Information Systems and development of multi-tier application architectures
- Technical Architectures for Web Services
- Technologies of Application Servers
- Middlewares for data management and communication

**BIBLIOGRAPHY**

Micro Service: Patterns and Applications, L. Krause, 2015

**PRE-REQUISITE**

Application Development for Information Systems  
UML Modeling  
Databases  
Algorithmic and Object-oriented Programming  
Java development

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## Operating Systems and Networking

### Network basics

#### AIMS

This course aims at providing the necessary knowledge and competencies to design and manage a distributed infrastructure, supporting corporates information system (including industrial and SCADA computing resources). These technical knowledge and competencies include:

- [1] understanding protocol engineering models and methods
- [2] providing the necessary knowledge on telecommunication infrastructure (from signal processing techniques and constraints to the introduction routing principles)
- [3] understanding and being able to implement a method to design and configure a distributed infrastructure

TDs and labs provide realistic use-cases to support a learning by example strategy.

#### IDENTIFICATION

CODE : IF-3-RE2  
ECTS : 2.0

#### HOURS

Lectures :	9.0 h
Seminars :	8.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	25.0 h
<b>Total :</b>	<b>50.0 h</b>

#### ASSESSMENT METHOD

Personal works associated to each TD and lab and a final exam (documents are allowed)

#### TEACHING AIDS

Paper copy of the slides of the course. Basic exercises and Lab description. Videos and on line exercises associated to key points / practical works will be available on the Moodle Platform (in french).

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

Part 1: Protocol engineering

1.1: Models used to implement communication stacks including finite state automata based descriptions, activity encapsulation and data structure (i.e. PDU, SDU and PCI) organisation  
1.2: Specification methods including automata meta-model, SDL descriptions, organisation of a testing strategy

1.3: Algorithmic patterns including variables, windows and time management

Part 2: Telecommunication systems and infrastructure

2.1: Information transmission and signal processing including signal processing basics, modulation techniques and how to provide a functional design of a modem and of an interface protocol

2.2: LAN organisation and Medium Access Control methods

2.3: Routing principles and introduction to IP

Part 3: Method to design and configure a distributed infrastructure

3.1: Requirements and traffic analysis

3.2: Wired infrastructure organisation and interconnection principles

3.3: Configuration management & Introduction to DHCP and DNS protocols

TD and labs use a realistic use case (namely a network infrastructure designed for a SME) to support practical works. Simulators and virtual machines are used to allow practicing network design and configuration as well as introducing network management basic toolset.

#### BIBLIOGRAPHY

- [1] G. Pujolles. Les Réseaux
- [2] A. Tannenbaum. Réseaux : architecture, protocoles, applications.
- [3] G. Beuchot. Téléinformatique : Tome 1. Polycopié INSA.
- [4] L. Toutain. Réseaux locaux et Internet

#### PRE-REQUISITE

3IF-RE1 - Network programming skills.

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## Operating Systems and Networking

### Operating Systems

#### IDENTIFICATION

CODE : IF-3-SYS  
ECTS : 2.0

#### HOURS

Lectures : 9.0 h  
Seminars : 8.0 h  
Laboratory : 8.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h

#### ASSESSMENT METHOD

Written exam [1h30] + continuous  
assessment

#### TEACHING AIDS

Lecture notes for the course, work  
sheets for classwork and labs [in  
French]

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

The aim of this course is to get a basic understanding of the fundamental concepts and issues in the topic of operating systems: management and sharing of hardware resources, program isolation, and user interaction. Without going into implementation details, we will give an overview of the various services offered by a typical OS, and learn how to use them appropriately when writing a program.

#### Expected skills:

- navigate in a directory tree
- write a multithreaded program with synchronization
- leverage OS services when developing an application

#### CONTENT

- purpose and structure of an operating system. concept of "shell"
- concept of process: execution time sharing (thread) and address space isolation
- memory management: contiguous allocation (malloc/free), input-output (mmap)
- file systems: directory structure (VFS), volume (mounting), inodes
- synchronization: interleaving, race conditions, critical section, lock (mutex)

#### BIBLIOGRAPHY

- [1] Operating System Concepts Essentials, A. Silberschatz P. Galvin and G. Gagne, Wiley.
- [2] The C Language. Brian W. Kernighan, Dennis M. Ritchie.
- [3] Computer Organization and Design. David Patterson, John L. Hennessy.

#### PRE-REQUISITE

- mathematics: convert between decimal and binary , use the hexadecimal notation
- architecture: registers vs ALU, CPU vs bus vs memory, the Von Neumann cycle, address space vs memory size.
- programming: control flow and variables, functions, loops, simple data structures such as arrays and linked lists.
- C language: write, run and debug simple programs on linux. design data structures including pointer fields, strings.

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## Operating Systems and Networking

### Compiler Project

#### IDENTIFICATION

CODE : IF-4-PLD-COMP  
ECTS : 4.0

#### HOURS

Lectures :	9.0 h
Seminars :	0.0 h
Laboratory :	32.0 h
Project :	0.0 h
Teacher-student contact :	41.0 h
Personal work :	30.0 h
Total :	71.0 h

#### ASSESSMENT METHOD

Presentation and demonstration

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

The purpose of this project is to write a compiler from scratch.

#### Target skills:

- Design, analyze and transform a formal grammar
- Use techniques and tools for lexical and syntactic analysis
- Define and exploit abstract program representations
- Produce low-level code (assembly language, code generation, application binary interface)

#### CONTENT

##### Lectures:

- Tools for lexical analysis
- Tools for syntactic analysis
- Code generation from an expression tree
- Execution environment
- Code generation for control structures
- Introduction to compiler optimization

##### Project:

- Design and implementation of a working compiler from a language specification
- Functional validation

#### BIBLIOGRAPHY

- Aho, Lam, Sethi Ullman. Compilers: Principles, Techniques and Tools.
- <https://gcc.gnu.org/wiki/ListOfCompilerBooks>

#### PRE-REQUISITE

- Notions of formal grammars, e.g. IF-4-LG
- Notions of computer architecture, e.g. IF-3-AO

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## Operating Systems and Networking

### Methodology for Design and Deployment of Network and Service Architecture

#### IDENTIFICATION

CODE : IF-4-PLD-MARS  
ECTS : 4.0

#### HOURS

Lectures :	10.5 h
Seminars :	0.0 h
Laboratory :	32.0 h
Project :	0.0 h
Teacher-student contact :	42.5 h
Personal work :	60.0 h
Total :	102.5 h

#### ASSESSMENT METHOD

Project oral defense  
(présentations and architecture  
demonstration)

#### TEACHING AIDS

Paper copy of the slides  
concerning the lecture. Videos  
containing key points regarding  
the configuration of the network  
architecture will be made  
available on Moodle.

#### TEACHING LANGUAGE

French

#### CONTACT

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Phone : 0472438483

#### AIMS

This project picked from real cases, aims at designing and prototyping a distributed architecture to support a 360 ° customer vision management tool in a multi-agency and multi-site business. The objective is to understand business needs and translate them into physical, technical, and application-level solutions. It comes to designing application architecture (service layers objects), and technical and physical architecture (including the system organization and network infrastructure). The design should take into account Information System security requirements including providing concrete answers to ensure the service continuity (Organization of a disaster recovery plan / computer backup) on this new feature. The implementation of a Proof of Concept using virtualization technologies will validate the architectural choices and demonstrate the feasibility.

More specifically, the objectives of this project are

- Analysis and understand a real professional context
- Use UML to design and develop the application architecture
- Implement a service-oriented Web application architecture design methodology (Identify and model business objects, Design and specify the service layer, Designing technical support architecture)
- Prototype and deploy services
- Give a concrete vision of the Organization of a real infrastructure using virtual machines, organize and implement a distributed architecture and associated networking services and prepare this architecture in a ready-to-manage style.

#### CONTENT

This module has different units of courses:

Architectures and technologies for services-oriented information systems  
Urbanization of information systems and services-oriented design method  
Design of architectures distributed and secured and put into operation  
The objective is an implementation on a concrete case:

- Study and design of a distributed services-based architecture
- Establishment of a POC of the distributed architecture

#### BIBLIOGRAPHY

- [1] G. Pujolles. Les Réseaux
- [2] A. Tannenbaum. Réseaux : architecture, protocoles, applications
- [3] C. Longépé. Le projet d'urbanisation du SI, 2014
- [4] P. Desfray, G. Raymond . TOGAF en pratique - Modèles d'architecture d'entreprise, 2014
- [5] Softeam. SOA : Architecture Logique. Livre blanc, Avril 2011 & <http://www.softeam.fr/sites/default/files/files/Livre%20blancSOA%20Architecture%20Logique.pdf>

#### PRE-REQUISITE

Skills in Information System modelling method, Information system design, network infrastructure organization

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**Operating Systems and Networking****PLD SMART****IDENTIFICATION**CODE : IF-4-PLD-SMART  
ECTS : 4.0**HOURS**Lectures : 1.5 h  
Seminars : 2.0 h  
Laboratory : 32.0 h  
Project : 0.0 h  
Teacher-student  
contact : 35.5 h  
Personal work : 60.0 h  
Total : 95.5 h**ASSESSMENT METHOD**Oral examination (45 minutes  
for each group of 6 students) +  
a 2 minutes video recording to  
present the project outcomes**TEACHING AIDS**

- Open data provided by GrandLyon
- specific documents available on the moodle platform

**TEACHING LANGUAGE**

French

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Marian  
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The project's main goal is to stimulate students' creativity by leading a complex project with societal impacts in the domain of smart cities. This project emphasises on specific invariants related to engineers in ICT:

- Strong technical expertise: students are confronted with a complex problem requiring technical skills acquired in the last two years of the programme. these includes multidisciplinary topics from different areas such as software development, data mining, image processing, project management, team work etc.
- capabilities to develop innovative solutions for the society: the complex problem requires the creation of a useful service to deliver to inhabitants in smart cities (residents, visitors or managers)
- Self-management: students design and develop a quality demonstrator and apply an agile project management process, a risk assessment and mitigation, a rigorous time management
- Communication: students establish an effective communication strategy within the team (mobilizing, exchange, use the skills of the other), and with external actors (instructors, external jury members, experts, ...) - generating client "empathy".

**Acquired Skills;**

- Design complex systems using problem and domain related languages and tools in the field of computer science.
- Develop distributed complex technical and software architectures techniques;
- Manage software development projects
- Analyse business and customer requirements
- Interact and collaborate with project team members

**CONTENT**

- A short course (1.5 hours) to kick off the project as a call for a tender "Development of an innovative digital service for a smart city (Grand Lyon)"
- A session (2hours /group of 30 students) to assist students to write a response to the tender with a particular focus on the following aspects: innovation, bussiness model, value analysis, market research
- Individualised tutoring (1 hour per group consisting of 6 students) as support for point B
- 8 "technical" sessions reserved to the effective implementation of the project and to deliver a demonstrator

**BIBLIOGRAPHY**<http://data.grandlyon.com/>

The bibliography depends on the digital service to be developed and its technical requirements

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## Operating Systems and Networking

### Security and Network

#### IDENTIFICATION

CODE : IF-4-SERE  
ECTS : 2.0

#### HOURS

Lectures :	10.5 h
Seminars :	4.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	26.5 h
Personal work :	60.0 h
<b>Total :</b>	<b>86.5 h</b>

#### ASSESSMENT METHOD

1h30 exam; written documents and copy of the lecture slides are authorized.

Written and/or oral evaluation of the labs.

#### TEACHING AIDS

Lecture slides.

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

Design and implement a security policy.

Analyze threats and vulnerabilities of a system.

Design and implement a security architecture.

Adapt security policy and enforcement architecture to new threats raised by emerging technologies (clouds, mobility, ubiquity, P2P, IoT...).

Leverage new technologies to design and implement reliable and secure distributed applications and systems.

Note: the network and security administration is mainly addressed in the PLD IF-4-SMART.

#### CONTENT

Lectures:

- Methodologies of risk assessment; security policy modeling; typology of threats and attacks.
- Techniques and protocols of encryption, steganography, authentication, signature, and certificates.
- Architecture, functionalities, and implementation of firewalls; address translation, packet filtering, intrusion detection.
- Access control models. Introduction to trust and reputation.
- Architecture, functionalities, and implementation of VLAN, VPN, IPsec, DLP.
- Scientific and technological challenges.

Labs:

- Cryptography.
- Firewall.
- Case studies on the askcypert.org platform.

#### BIBLIOGRAPHY

Introduction to Security, 9th Edition. R. Fischer and E. Halibozeck.

Applied Cryptography: Protocols, Algorithms, and Source Code in C. Bruce Schneier.

The Fundamentals of Network Security. John E. Canavan.

#### PRE-REQUISITE

IF-3-RE1  
IF-3-RE2

## Operating Systems and Networking Systems

### AIMS

The purpose of this course is to understand the design and operation of modern operating systems.

#### Target skills:

- concurrent programming
- analysing the behaviour of an OS
- mastering OS performance

### IDENTIFICATION

CODE : IF-4-SYS  
ECTS : 2.0

### HOURS

Lectures :	9.0 h
Seminars :	8.0 h
Laboratory :	8.0 h
Project :	0.0 h
Teacher-student contact :	25.0 h
Personal work :	25.0 h
Total :	50.0 h

### ASSESSMENT METHOD

Written exam (1h30)

### TEACHING AIDS

Lecture slides; lab subjects.

### TEACHING LANGUAGE

French

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### CONTENT

Lectures and labwork will provide

- Privileges (CPU and kernel)
- Time sharing, scheduling and performance (CPU bound vs. I/O bound)
- Synchronisation on multicore (memory consistency, atomicity)
- Virtual memory (paging, isolation)
- Virtualisation mechanisms (hypervisors, virtual machines)
- Safety, system exploit (buffer overflow)

### BIBLIOGRAPHY

Silberschatz and Galvin: Operating System Concepts

### PRE-REQUISITE

Basic operating system course, e.g. IF-3-SYS

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