




## MSC IN INFORMATION TECHNOLOGY "ICONE" PROGRAMME SOFTWARE ARCHITECT

### IDENTITY CARD

- > Domain : Sciences, Technologies and Health
- > Full time course
- > [Continuing Education](#)
- > Degree apprenticeships
- > [Master of Engineering](#)
- > [120 ECTS credits](#)
- > 4 semesters
- >  La Rochelle

### REGISTRATION

<https://www.univ-larochelle.fr/formation/admission-inscription-et-scolarité/candidatures-et-inscriptions/candidater-universite-la-rochelle/>

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### OBJECTIVES

#### > Presentation

“ Do you wish to acquire general computer skills while specializing in one of the fields offered by the Software or Data Architect course ?

At the end of these two courses of the IT MSc, you will be able to perfectly understand the organization of digital flows as well as the implementation of tools for exploiting the intangible heritage of a company or a community. In fact, you will be able to deal with data management and analysis issues, design information systems and also exploit and enhance digital content. As a future IT executive, you will also learn about the different support methodologies that can improve the functioning of an organization.



Jean Loup Guillaume

#### > At the end of this course, you will know

**> Design a system by implementing advanced modelling, specification and verification tools**

- Understand the problems related to software development, software engineering principle
- Know the main models of software life cycle
- Analyze and model for the different design phases
- Understand software quality standards
- Implement tests at different levels of the software lifecycle (components, integration, system) and in different ways (functional / non-functional : static techniques and code reviews, "black box" techniques, "white box" techniques) "
- Know the main software metrics and use them to improve quality
- Design architectures using software component assembly techniques
- Semi-formal modeling of component-based systems
- Have knowledge of the formal methods, models and associated logic to guarantee the quality of a system.
- Understand the algorithmic techniques of analysis and verification and proof (model-checking)
- Transform system requirements into properties and apply associated verifications

**> Understand the different aspects related to the distribution of data and calculations**

- Understand the structuring of an n-tier architecture and identify its different components
- Describe the main issues related to multi-tasking software
- Know the fundamental principles of distributed programming (RMI)
- Design and develop multi-agent systems
- Know the main principles of competition and the tools to manage it (competing processes, mutual exclusion, semaphores, etc.)
- Use several concurrent programming mechanisms (semaphore type via a C library, Java thread synchronization, etc.)
- Be able to develop highly distributed and scalable applications
- Know several application development frameworks
- Understand the different virtualization solutions - hypervisors / containers
- Be able to implement a virtualized architecture
- Virtualized SANs
- Be able to configure and manage virtual machines
- Know the categories of cloud computing services (IaaS, PaaS, SaaS)
- Understand the general concepts and architectures of cloud computing
- Understand the principles of application deployment
- Be able to deploy an application on an online platform
- Know the different hardware supports and data organization (partitions/FS)
- Understand the different mechanisms for implementing redundancy (RAID/Security/FS distributed)
- Master the different network storage solutions (storage networks, network storage server)
- Know data encryption solutions
- Know the main encryption methods used in data transfer
- Know the different flow filtering solutions
- Know how to implement network tunnels and in particular encrypted tunnels
- Be familiar with the general principles of intrusion detection systems (IDS)

**> Understand the specific issues related to massive data**

- Be able to implement graph processing tools in a massive data context
- Know the different hardware and software components of a Big Data system
- Know how to use different software tools (including open source) for data collection
- Know how to choose the right solution for massive data storage
- Know how to use one or more massive data processing frameworks (hadoop type and its ecosystem)
- Analyze the results

➤ **Master the various aspects related to information systems, whether in terms of their architecture, development (web services and other services), including the specific case of business intelligence information systems**

- To know the main principles of IS, their architecture, their urbanization
- Monitor the evolution of IS : Cloud, service-oriented architecture (SOA),...
- Understand the aspects related to IS security
- Model the company's organization and business processes
- Propose relevant ERP choices for an organization
- Understand the different phases of ERP implementation and operation
- Install, administer and use a CMS
- Manage CMS extensions
- Implement external authentications and bridges to other CMS
- Develop client applications that use an existing web service
- Develop server-side web services
- Understand the principles of service integration and composition
- Know the main principles of CIS : objectives, structures and architectures
- Understand the interests and application of dimensional modeling
- Design and operate a data warehouse
- Know the main methods of ETL procedures (import/export, processing, mapping)
- Develop ETL connectors
- Know service-oriented architectures and their uses
- Implement web services using technologies developed by the W3 consortium (SOAP/WSDL)
- Implement web services that respect the REST architecture
- Implement web services using an architecture based on the principle of micro-services (vs. services based on monolithic architectures)
- Produce digital documents using XSL and FOP technologies

➤ **Master the different principles of data coding, structuring and modeling**

- Master the syntax rules of XML language, single and multiple namespaces
- Design a DTD with integrity constraints
- Implement an XML file analyzer
- Master the methods of navigating an XML document using XPath
- Apply transformations of XML files to other formats with XSL(T)
- Know the main families of NoSQL database management systems
- Design a NoSQL database schema
- Know how to implement several NoSQL database management systems (IndexedDB, MongoDB, etc.)
- Understand the notion of object correspondence - relational algebra (ORM)
- Implement at least one MNO (doctrine, hibernate, etc.)
- Assimilate the notions of information theory
- Know the different types of data compression (with and without losses)
- Know the main compression techniques with and without loss (statistics, dictionary, transform, prediction)
- Know how to implement a correction code for broadcasting on a potentially noisy communication channel
- Know the compression mechanisms for different types and formats of data (image, video, sound, text), and know how to evaluate its performance.
- Know the principles of the main information encodings in sound and in images and image sequences : (Images : JPEG, JPEG2000 - Video sequences : MJPEG, MPEG 2, H263, MPEG 4 visual, H.264 - multimedia : MPEG-7 objectives, applications, MPEG-7 me-tadata, MPEG-7 description, MPEG-7 based search)
- Know the RDF data model, the use of RDFS ontologies and schemas and the formalization in OWL
- Implement queries on RDF/RDFS data using the SPARQL query language
- Know the use of RDF/RDFS formats in the context of linked data
- Know some particular schemes (e. g. Schema.org)
- Integrate data using semantic web technologies
- Set up a dematerialization project management in an organization (flow audit, survey, steering committee)
- Know the normative processes related to dematerialization
- Present various dematerialization scenarios depending on the input document (paper, equipment, digital information, etc.) and the type of organization
- Characterize Automatic, Semi-Automatic, Supervised Dematerialization Processes
- Master and propose information extraction algorithms to determine the nature of the document (categorization) as well as the content elements (Text, Graphic etc.)
- Integrate content recognition algorithms (OCR, ICR, etc.) into a document analysis or indexing system, and identify their limitations in the context of complex documents : manuscripts, dense letters, etc.
- Propose performance measurements of the proposed algorithms
- Identify the main principles of indexing (automatic, collaborative.), semantics (websemantics), and social indexing
- To know the normative aspects related to indexation, certification, legal archiving : W3c - DC, EAD, RDF
- Know the basic and advanced techniques in terms of search engine, text search tools, automatic language processing
- Know the techniques and limits of analysis of weakly structured documents (text, sound, video, etc.)
- Know the principles of digital information archiving : RM, SAE, digital safe, secure hosting, cloud...

### > Master the different methods used for data analysis and mining

- Master the aspects of data mining related to CIS
- Master the mathematical tools necessary for data mining (notions of linear algebra, probabilities, gradient descent, lagrangian)
- Perform dimensional reductions (analysis in main components, discriminating components)
- Know the supervised classification methods (classification annotation and quality measurement, Bayesian approaches, Markov fields, training and testing principle, discriminating linear approach, K nearest neighbours, multi-class classification)
- Know the methods of unsupervised classification (quality measurement of a clustering, clustering algorithms)
- Be familiar with interactive classification methods (information visualization, interactive data mining, interactive selection and adaptation of similarity measures)
- Set up a complete chain dedicated to supervised or unsupervised classification
- Implement the usual methods of supervised or unsupervised classification and know their complexity and cases of convergence
- Implement these techniques via software
- Use one or more software to implement simple data analysis techniques

### > Implement procedures for data recovery, analysis and visualization through one or more software programs

- Understand the different methods of data recovery
- Retrieve data in different formats via an API or directly via software
- Designing a web crawler
- Understand data preparation methods : automatic schema construction, data type detection, missing or duplicate values, etc. Implement these techniques via software
- Use one or more software to implement simple data analysis techniques
- Use one or more software to implement advanced data analysis techniques
- Know some solutions for massive data analysis
- Know the classical methods of data visualization : curves, dials, geographical maps, thermal maps, etc.
- Know how to use interactive capabilities to explore data
- Know how to use network data visualization software
- Understand how sensor or IoT data analysis influences data capture, preparation and analysis operations
- Integrate the geographical aspects of data into data analysis

### > Cross-curricular skills

- Communicate effectively in French and at least one foreign language (preferably English) on issues related to your field of expertise
- Implement a technological watch
- Develop an argumentation with a critical mind

### > Pre-professional skills

- Locate your role and mission within an organization to adapt and take initiatives
- Identify the process of production, dissemination and valorisation of knowledge
- Respect the principles of ethics, deontology and environmental responsibility
- Work in a team as well as independently and responsibly for a project
- Identify and locate the professional fields potentially related to the achievements of the mention as well as the possible paths to access them
- Characterize and enhance one's identity, skills and professional project according to a context
- Step back from a situation, assess yourself and question yourself to learn

## ✓ ADMISSION

### > Your profile

You have a bac+3, Bac+4 or equivalent (Bachelor's degree) : Bachelor's level knowledge in declarative and object programming, data structures, web languages, networks and protocols, client-server architecture and databases.

### > How to apply ?

In the 1st year of the Master's degree, the selection of candidates is made on the basis of their application documents.

You wish to apply for a 1st year Master's degree [1st year of Master](#)

You wish to apply for a 2nd year Master's degree [2nd year of Master](#)

## 📄 PROGRAMME

● Mandatory ■ Course option

### > Semester 1

#### > Advanced databases ●

Learning Outcomes

Implement at least one MNO (doctrine, hibernate, etc.)

Master the syntax rules of XML language, single and multiple namespaces  
 Design a DTD with integrity constraints  
 Implement an XML file analyzer  
 Master the methods of navigating an XML document using XPath  
 Apply transformations of XML files to other formats with XSL(T)  
 Know the main families of NoSQL database management systems  
 Design a NoSQL database schema  
 Know how to implement several NoSQL database management systems (IndexedDB, MongoDB, etc.)  
 Understand the notion of object correspondence - relational algebra (ORM)

### ● Advanced databases

#### Learning outcomes

During this course, students will :

- Implement at least one ORM (doctrine, hibernate, etc.)
- Understand the notion of object correspondence - relational algebra (ORM)
- Know how to implement several NoSQL database management systems (IndexedDB, MongoDB, etc.)
- Designing a NoSQL database schema
- Know the main families of NoSQL database management systems
- Apply transformations of XML files to other formats with XSL(T)
- Master the methods of navigating an XML document using XPath
- Implement an XML file analyzer
- Design a DTD with integrity constraints
- Master the syntax rules of XML language, single and multiple namespaces

#### Language used for teaching

French

#### Teaching time

57h (15h lectures - 15h tutorials - 18h practical work - 9h work in accompaniment)

#### 5 ECTS credits

#### Course code

C5-260121-INFO

## > Information systems ●

#### Learning Outcomes

Understand the structuring of an n-tier architecture and identify its different components  
 Describe the main issues related to multi-tasking software  
 Know the fundamental principles of distributed programming (RMI)  
 Design and develop multi-agent systems  
 Know the main principles of competition and the tools to manage it (competing processes, mutual exclusion, semaphores, etc.)  
 Use several concurrent programming mechanisms (semaphore type via a C library, Java thread synchronization, etc.)

### ● Information systems

#### Learning outcomes

During this course, students will :

- Know the main principles of IS, their architecture, their urbanization
- Monitor the evolution of IS : Cloud, service-oriented architecture (SOA),...
- Understand the aspects related to IS security
- Model the company's organization and business processes
- Propose relevant ERP choices for an organization
- Understand the different phases of ERP implementation and operation
- Install, administer and use a CMS
- Manage CMS extensions
- Implement external authentications and bridges to other CMS

#### Language used for teaching

French

#### Teaching time

57h (15h lectures - 33h practical work - 9h work in accompaniment)

#### 5 ECTS credits

#### Course code

C5-260131-INFO

## > Project work ●

- **Projet**

Language used for teaching

French

Teaching time

30h (3h lectures - 18h practical work - 9h work in accompaniment)

3 ECTS credits

Course code

C5-260161-INFO

## > **Software Engineering** ●

### Learning Outcomes

Understand the problems related to software development, software engineering principle

Know the main models of software life cycle

Analyze and model for the different design phases

Understand software quality standards

"Implement tests at different levels of the software lifecycle (components, integration, system) and in different ways (functional / non-functional : static techniques and code reviews, "black box" techniques, "white box" techniques) "

Know the main software metrics and use them to improve quality

Design architectures using software component assembly techniques

Semi-formal modeling of component-based systems

Have knowledge of the formal methods, models and associated logic to guarantee the quality of a system.

Understand the algorithmic techniques of analysis and verification and proof (model-checking)

Transform system requirements into properties and apply associated verifications

- **Software Engineering**

### Learning outcomes

During this course, students will :

- Transform system requirements into properties and enforce associated checks
- Understand the algorithmic techniques of analysis and verification and proof (model-checking)
- Have knowledge of the formal methods, models and associated logic to guarantee the quality of a system
- Model semi-formally component-based systems
- Know the main software metrics and use them to improve quality
- Implement tests at different stages of the software lifecycle (components, integration, system) and in different ways (functional / non-functional : static techniques and code reviews, black box techniques, white box techniques)
- Understand the quality standards of a software
- Know the main models of the software life cycle
- Understand the problems related to software development, principle of software engineering

Language used for teaching

French

Teaching time

57h (15h lectures - 15h tutorials - 18h practical work - 9h work in accompaniment)

5 ECTS credits

Course code

C5-260111-INFO

## > **Big data and infrastructures** ■

### Learning Outcomes

Be able to develop highly distributed and scalable applications

Know several application development frameworks

Be able to implement graph processing tools in a massive data context

Use one or more software to implement simple data analysis techniques

Understand data preparation methods : automatic schema construction, data type detection, missing or duplicate values, etc.

Implement these techniques via software

Designing a web crawler

Retrieve data in different formats via an API or directly via software

Understand the different methods of data recovery

- Storage and distributed calculations

Learning outcomes

At the end of this course, students will :

- Be able to develop highly distributed and scalable applications
- Know several application development frameworks
- Be able to implement graph processing tools in a context of massive data

Language used for teaching

French

Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

6 ECTS credits

Course code

C5-260151-INFO

## > Data analysis softwares ■

- Data Recovery, Preparation and Analysis / Secure Networks and Storage

Learning outcomes

During this course, students will :

- Understand the different data recovery methods
- Retrieve data in different formats via an API or directly via software
- Design a web crawler
- Understand data preparation methods : automatic schema construction, detection the type of data, missing values or duplicates, etc.
- Implement these techniques via data analysis software
- Use one or more software to implement simple techniques of data analysis

Language used for teaching

French

Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

6 ECTS credits

Course code

C5-260141-INFO

## > Marketing (ouverte au Master ICONE) ■

- Marketing

Language used for teaching

French

Teaching time

15h (9h lectures - 6h tutorials)

3 ECTS credits

Course code

A2-225113-BIOT

- Purchase and negotiation

Language used for teaching

French

Teaching time

24h (9h lectures - 9h tutorials - 6h work in accompaniment)

3 ECTS credits

Course code

A2-225110-MS

## > Cross-curricular courses ●

- Communication

Language used for teaching
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French
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Teaching time
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19h 30min (4h 30min lectures - 15h practical work)
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2 ECTS credits
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Course code
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C5-260102-COM
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- English

Language used for teaching
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French
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Teaching time
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24h (24h tutorials)
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2 ECTS credits
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Course code
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DC-260101-ANG
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- Quality and sustainable development

Language used for teaching
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French
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Teaching time
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19h 30min (4h 30min lectures - 15h practical work)
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2 ECTS credits
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Course code
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C5-260103-ODP
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## > Semester 2

### > Distributed computing ●

#### Learning Outcomes

To know the main principles of IS, their architecture, their urbanization

Monitor the evolution of IS : Cloud, service-oriented architecture (SOA),...

Understand the aspects related to IS security

Model the company's organization and business processes

Propose relevant ERP choices for an organization

Understand the different phases of ERP implementation and operation

Install, administer and use a CMS

Manage CMS extensions

Implement external authentications and bridges to other CMS

Know the main principles of CIS : objectives, structures and architectures

Understand the interests and application of dimensional modeling

Design and operate a data warehouse

Know the main methods of ETL procedures (import/export, processing, mapping)

Develop ETL connectors

Master the aspects of data mining related to CIS



- Distributed computing

Learning outcomes

During this course, students will :

- Use multiple concurrent programming mechanisms (semaphore type via C library, Java thread synchronization, etc.)
- Know the main principles of concurrency and the tools to manage it (competing processes, mutual exclusion, semaphores, etc.)
- Design and develop multi-agent systems
- Know the fundamentals of distributed programming (RMI)
- Describe the main issues related to multi-tasking software
- Understand the structuring of n-tier architectures and identify the different components

Language used for teaching

French

Teaching time

60h (15h lectures - 33h practical work - 12h work in accompaniment)

5 ECTS credits

Course code

C5-260211-INFO

> **Oriented architectures and services** •

Learning Outcomes

Develop client applications that use an existing web service

Develop server-side web services

Understand the principles of service integration and composition

- Service-oriented architectures

Learning outcomes

During this course, students will :

- Understand the principles of integration and composition of services
- Develop server-side web services
- Develop client applications that uses existing web service

Language used for teaching

French

Teaching time

60h (15h lectures - 15h tutorials - 18h practical work - 12h work in accompaniment)

4 ECTS credits

Course code

C5-260231-INFO

> **Secure networks and storage** •

Learning Outcomes

Know the different hardware supports and data organization (partitions/FS)

Understand the different mechanisms for implementing redundancy (RAID/Security/FS distributed)

Master the different network storage solutions (storage networks, network storage server)

Know data encryption solutions

Know the main encryption methods used in data transfer

Know the different flow filtering solutions

Know how to implement network tunnels and in particular encrypted tunnels

Be familiar with the general principles of intrusion detection systems (IDS)

- Secure Networks and storage

#### Learning outcomes

During this course, students will :

- Know how to implement network tunnels and in particular encrypted tunnels
- Know the different flow filtering solutions
- Know the main encryption methods used in data transfer
- Know the data encryption solutions
- Master the various network storage solutions (storage networks, network storage server)
- Understand the different mechanisms for implementing redundancy (RAID / Backups / Distributed FS)
- Know the different material supports and the organization of the data (partitions / FS)
- Know the general principles of intrusion detection systems (IDS)

#### Language used for teaching

French

#### Teaching time

60h (15h lectures - 33h practical work - 12h work in accompaniment)

#### 4 ECTS credits

#### Course code

C5-260221-INFO

## > Big data and infrastructures ■

#### Learning Outcomes

Know the principles of the main information encodings in sound and in images and image sequences : (Images : JPEG, JPEG2000 - Video sequences : MJPEG, MPEG 2, H263, MPEG 4 visual, H.264 - multimedia : MPEG-7 objectives, applications, MPEG-7 metadata, MPEG-7 description, MPEG-7 based search)

Know the compression mechanisms for different types and formats of data (image, video, sound, text), and know how to evaluate its performance.

Know how to implement a correction code for broadcasting on a potentially noisy communication channel

Know the main compression techniques with and without loss (statistics, dictionary, transform, prediction)

Know the different types of data compression (with and without losses)

Assimilate the notions of information theory

Understand the different virtualization solutions - hypervisors / containers

Be able to implement a virtualized architecture

Virtualized SANs

Be able to configure and manage virtual machines

Know the categories of cloud computing services (IaaS, PaaS, SaaS)

Understand the general concepts and architectures of cloud computing

Understand the principles of application deployment

Be able to deploy an application on an online platform

Know the classical methods of data visualization : curves, dials, geographical maps, thermal maps, etc.

Know some solutions for massive data analysis

Use one or more software to implement advanced data analysis techniques

Know how to use interactive capabilities to explore data

Know how to use network data visualization software

- Virtualization, cloud and application deployment

## Learning outcomes

## Virtualized architectures

- Understand different virtualization solutions - hypervisors / containers
- Be able to set up a virtualized architecture

## Virtualized SANs

- Be able to configure and manage virtual machines

## Cloud computing concepts

- Know the categories of cloud computing services ( IaaS, PaaS, SaaS)
- Understand the concepts and general architectures of cloud computing

## Deploy applications

- Understand the principles of application deployment
- Be able to deploy an application on an online platform

## Language used for teaching

French

## Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

## 6 ECTS credits

## Course code

C5-260251-INFO

## > Data analysis softwares ■

- Analysis and data visualization

## Learning outcomes

## Data Analysis

- Using one or more software to implement advanced data analysis techniques
- Knowing some solutions for massive data analysis Data

## Visualization

- Knowing classic data visualization methods Know how to use interactive capabilities to explore data
- Know how to use network data visualization software

## Language used for teaching

French

## Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

## 6 ECTS credits

## Course code

C5-260241-INFO

## > Marketing ■

- Consumer behavior

## Learning outcomes

At the end of this course students will :

- Understand decision processes and sources of satisfaction.
- Know the resistance movements of the customers.
- Be able to understand the cultural peculiarities of local consumers for a product and / or an ad hoc service and to formulate a critical opinion on the relevance of a marketing mix abroad

## Language used for teaching

French

## Teaching time

15h (9h lectures - 6h tutorials)

## 3 ECTS credits

## Course code

A2-225208-MARK

- International marketing

## Learning outcomes

The aim of this course is to be able to know the factors, individual or socio-cultural, that influence the behavior of the customer in a commercial situation.

## Language used for teaching

French

## Teaching time

15h (9h lectures - 6h tutorials)

## 3 ECTS credits

## Course code

A2-225209-MARK

## > Professionalization ●

- Internship (10 weeks)

## Language used for teaching

French

## 6 ECTS credits

## Course code

C5-260204-STAG

- Missions en entreprise (APPRENTISSAGE)

## Language used for teaching

French

## 6 ECTS credits

## Course code

C5-260205-PROF

## > Cross-curricular courses ●

- English

## Language used for teaching

French

## Teaching time

24h (24h tutorials)

## 2 ECTS credits

## Course code

DC-260201-ANG

- Industrial property and digital rights

## Language used for teaching

French

## Teaching time

30h (9h lectures - 21h practical work)

## 3 ECTS credits

## Course code

C5-260202-DRTTP

## > Semester 3

### > Implementation of big data systems ●

## Learning Outcomes

Know the different hardware and software components of a Big Data system

Know how to use different software tools (including open source) for data collection

Know how to choose the right solution for massive data storage

Know how to use one or more massive data processing frameworks (hadoop type and its ecosystem)

Analyze the results

## ● Implementation of big data systems

### Learning outcomes

During this course, students will :

- Analyze results
- Know how to use one or more massive data processing framework (hadoop type and its ecosystem)
- Know how to choose the right solution for massive data storage
- Know how to use different software tools (especially free) of data collection
- Know the different hardware and software bricks of a Big Data system

### Language used for teaching

French

### Teaching time

60h (15h lectures - 33h practical work - 12h work in accompaniment)

### 6 ECTS credits

### Course code

C5-260311-INFO

## > **Web 3.0** ●

### Learning Outcomes

Know the use of RDF/RDFS formats in the context of linked data

Implement queries on RDF/RDFS data using the SPARQL query language

Know the RDF data model, the use of RDFS ontologies and schemas and the formalization in OWL

Integrate data using semantic web technologies

Know some particular schemes (e. g. Schema.org)

## ● Web 3.0

### Learning outcomes

During this course, students will :

- Learn how to integrate data using semantic web technologies
- Know some particular schemes (Schema.org for example)
- Know the use of RDF / RDFS formats as part of the linked data Implement queries on RDF / RDFS data using the SPARQL query language
- Know the RDF data model, the use of RDFS ontologies and schemas, and OWL formalization

### Language used for teaching

French

### Teaching time

60h (15h lectures - 15h tutorials - 18h practical work - 12h work in accompaniment)

### 6 ECTS credits

### Course code

C5-260331-INFO

## > **Web services and mobility** ●

### Learning Outcomes

Know service-oriented architectures and their uses

Implement web services using technologies developed by the W3 consortium (SOAP/WSDL)

Implement web services that respect the REST architecture

Implement web services using an architecture based on the principle of micro-services (vs. services based on monolithic architectures)

Produce digital documents using XSL and FOP technologies

Identify the main principles of indexing (automatic, collaborative.), semantics (websemantics), and social indexing

To know the normative aspects related to indexation, certification, legal archiving : W3c - DC, EAD, RDF

Know the basic and advanced techniques in terms of search engine, text search tools, automatic language processing

Know the principles of digital information archiving : RM, SAE, digital safe, secure hosting, cloud...

Know the techniques and limits of analysis of weakly structured documents (text, sound, video, etc.)

- Web services and mobility

#### Learning outcomes

During this course, students will :

- Know the service-oriented architectures and their uses
- Implement web services using the technologies developed by the W3 consortium (SOAP / WSDL)
- Implement web services respecting the REST architecture
- Implement web services in using an architecture based on the principle of micro-services (vs services based on monolithic architectures)
- Produce digital documents using XSL and FOP technologies

#### Language used for teaching

French

#### Teaching time

60h (15h lectures - 15h tutorials - 18h practical work - 12h work in accompaniment)

#### 6 ECTS credits

#### Course code

C5-260321-INFO

## > Big data and infrastructures ■

### Learning Outcomes

Propose performance measurements of the proposed algorithms

Integrate content recognition algorithms (OCR, ICR, etc.) into a document analysis or indexing system, and identify their limitations in the context of complex documents : manuscripts, dense letters, etc.

Master and propose information extraction algorithms to determine the nature of the document (categorization) as well as the content elements (Text, Graphic etc.)

Characterize Automatic, Semi-Automatic, Supervised Dematerialization Processes

Present various dematerialization scenarios depending on the input document (paper, equipment, digital information, etc.) and the type of organization

Know the normative processes related to dematerialization

Set up a dematerialization project management in an organization (flow audit, survey, steering committee)

Set up a complete chain dedicated to supervised or unsupervised classification

Be familiar with interactive classification methods (information visualization, interactive data mining, interactive selection and adaptation of similarity measures)

Know the methods of unsupervised classification (quality measurement of a clustering, clustering algorithms)

Know the supervised classification methods (classification annotation and quality measurement, Bayesian approaches, Markov fields, training and testing principle, discriminating linear approach, K nearest neighbours, multi-class classification)

Perform dimensional reductions (analysis in main components, discriminating components)

Master the mathematical tools necessary for data mining (notions of linear algebra, probabilities, gradient descent, lagrangian)

Use one or more software to implement simple data analysis techniques

Implement these techniques via software

Implement the usual methods of supervised or unsupervised classification and know their complexity and cases of convergence

Understand how sensor or IoT data analysis influences data capture, preparation and analysis operations

Integrate the geographical aspects of data into data analysis

- Information architecture

#### Learning outcomes

At the end of this course, students will :

- Have identified the main principles of indexing (automatic, collaborative.), semantic (websemantic), and social
- Know the normative aspects related to indexing, certification, legal archiving : W3c - DC, EAD, RDF
- Know the basic techniques and advanced techniques in terms of search engine, text search tools, automatic language processing
- Know the techniques and limitations of analysis of weakly structured documents (text, sound, video, etc. .)
- Know the archiving principles of digital information : RM, SAE, digital safe, secure hosting, cloud ...

#### Language used for teaching

French

#### Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

#### 6 ECTS credits

#### Course code

C5-260351-INFO

## Data analysis softwares ■

### ● Mobile data analysis

#### Learning outcomes

At the end of this course, students will :

- Understand how sensor or IoT data analysis influences data capture, preparation and analysis operations
- Know how to integrate geographic aspects of data into data analysis

#### Language used for teaching

French

#### Teaching time

40h 30min (9h lectures - 22h 30min practical work - 9h work in accompaniment)

#### 6 ECTS credits

#### Course code

C5-260341-INFO

## > Marketing ■

### ● Brand gestion

#### Language used for teaching

French

#### Teaching time

15h (9h lectures - 6h tutorials)

#### 3 ECTS credits

#### Course code

A2-225314-MARK

### ● Pricing policies

#### Language used for teaching

French

#### Teaching time

15h (9h lectures - 6h tutorials)

#### 3 ECTS credits

#### Course code

A2-225313-MARK

## > Cross-curricular courses ●

### ● Initiation to research

#### Language used for teaching

French

#### Teaching time

54h (15h lectures - 39h work in accompaniment)

#### 4 ECTS credits

#### Course code

C5-260302-RECH

## > Foreign language ●

### ● English

#### Language used for teaching

French

#### Teaching time

24h (24h tutorials)

#### 2 ECTS credits

#### Course code

DC-260301-ANG

## > Semester 4

### > Minors ●

- Project work

Language used for teaching	French
Teaching time	66h (6h lectures - 24h practical work - 36h work in accompaniment)
6 ECTS credits	
Course code	C5-260441-PROJ

## > Professionalization ●

- Apprenticeship mission

Language used for teaching	French
24 ECTS credits	
Course code	C5-260403-PROF

- Internship (20 weeks)

Language used for teaching	French
24 ECTS credits	
Course code	C5-260402-STAG

## > Interaction with professionals

Many professionals are involved in the MSc (about 15%) either directly in the courses or through seminars integrated into the courses.

## > International

The ICONE IT MSc has multiple links with Vietnam. In particular, the second year can be done entirely in Hanoi, either in a francophone training (IFI) or an anglophone training (USTH).

## AFTERWARDS

### > Further Education

[PhD](#)

### > Professions

- Information systems architect
- Information system application manager
- Software development engineer
- Business intelligence engineer
- IT system engineer

Information subject to change

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