# MASTER IN COMPUTER SCIENCE FOR BUSINESS

**Main Language of Instruction:**
French ☑ English ○ Arabic ○

**Campus Where the Program is Offered:** CFDSS

## OBJECTIVES

The Master in Computer Science for Business trains professionals in information systems engineering who are capable of understanding an organization's operations, structures, and strategic imperatives. Upon completion of the program, graduates possess the necessary skills for their future careers, including architecture and design, business management principles, project management, decision making, devOps and the development and evolution of modern information systems.
The program emphasizes the use and mastery of new computer technologies and methodologies, enabling the creation and implementation of robust, interoperable, secure, and scalable IT solutions. This includes a focus on interoperability, artificial intelligence, machine learning, and microservices.
The program spans two years (M1, M2) and includes both theoretical and practical instruction (lectures, seminars), as well as the writing and defense of a thesis before a jury.

## PROGRAM LEARNING OUTCOMES (COMPETENCIES)

- Leading IT projects
- Apply the acquired understanding of organizations to manage a business and/or a team
- Implementing efficient, robust, and scalable architectures that support innovation and productivity
- Acquiring the transversal skills necessary for any engineering activity
- Communicating and persuading colleagues, partners, and clients through all possible media

## ADMISSION REQUIREMENTS

Candidates are selected based on the review of their application file.
- Admission to the first semester of the Master's program (M1) is open to candidates holding a Bachelor in Computer Science or an equivalent qualification.

## PROGRAM REQUIREMENTS

**Required Courses (120 credits).**
Automata, Languages, and Applications (4 Cr.). Artificial Intelligence and Reasoning (4 Cr.). Seminars (4 Cr.). Strategic Management (4 Cr.). Distributed Systems and Algorithms (6 Cr.). Audit (4 Cr.). Business Creation – Entrepreneurship (6 Cr.). Law, and Information and Communication Technologies (4 Cr.). Management and Analysis of Big Data (6 Cr.). Research Methodology (12 Cr.). Software Architecture and Interoperability (4 Cr.). Business Process Management (4 Cr.). Cyber Security (4 Cr.). Data Science (4 Cr.). DevOps (4 Cr.). Thesis (12 Cr.). Database Management Systems (4 Cr.). Deep Learning (4 Cr.). DevOps II (6 Cr.). Internet of Things (4 Cr.). Thesis - Final Part (12 Cr.). Project Management Applied to Software Development (4 Cr.).

## SUGGESTED STUDY PLAN

**Semester 1**

| Code | Course Name | Credits |
|---|---|---|
| 063CRENM1 | Business Creation - Entrepreneurship | 6 |
| 063CYBRM3 | Cyber Security | 4 |
| 063DVOPM2 | DevOps | 4 |
| 063DRIFM4 | Law, and Information and Communication Technologies | 4 |

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|---|---|---|
| 063INTAM1 | Artificial Intelligence and Reasoning | 4 |
| 063GPR1M3 | Project Management Applied to Software Development | 4 |
| 063MGSTM1 | Strategic Management | 4 |
| | **Total** | **30** |

**Semester 2**

| Code | Course Name | Credits |
|---|---|---|
| 063TLNGM1 | Automata, Languages, and Applications | 4 |
| 063BIGDM1 | Management and Analysis of Big Data | 6 |
| 063MMI1M2 | Research Methodology | 12 |
| 063SEMNM1 | Seminars | 4 |
| 063SRP1M1 | Distributed Systems and Algorithms | 6 |
| | **Total** | **32** |

**Semester 3**

| Code | Course Name | Credits |
|---|---|---|
| 063ALINM4 | Software Architecture and Interoperability | 4 |
| 063BPMGM4 | Business Process Management | 4 |
| 063DATSM3 | Data Science | 4 |
| 063MMI2M3 | Thesis | 12 |
| 063BD03M2 | Database Management Systems | 4 |
| | **Total** | **28** |

**Semester 4**

| Code | Course Name | Credits |
|---|---|---|
| 063AUDIM2 | Audit | 4 |
| 063DSCAM4 | Deep Learning | 4 |
| 063DVO2M4 | DevOps II | 6 |
| 063IOTHM4 | Internet of Things | 4 |
| 063MMI3M4 | Thesis - Final Part | 12 |
| | **Total** | **30** |

## COURSE DESCRIPTION

**063ALINM4 Software Architecture and Interoperability 4 Cr.**

This course contributes to the development of the following competencies:
· Implementing efficient, robust, and scalable architectures that support innovation and productivity.
· Developing an IT solution.
General Objectives:
· Identify potential improvements in an IT architecture.
· Choose an approach to integrate applications based on constraints.
· Define the services of a service-based or microservices architecture.

**063AUDIM2 Audit 4 Cr.**

This course aims to:
- Define information systems and their importance in today's business world within an information economy.
- Introduce the concepts of IT audit and raise students' awareness of its importance, utility, and necessity.
- Familiarize students with different approaches to IT auditing.
- Present examples of IT audits and introduce students to a systemic approach based on international standards.
- Raise awareness of IT security and cybersecurity risks.
- Discuss procedures for conducting IT audits, including reporting results and providing recommendations.

**063TLNGM1 Automata, Languages, and Applications 4 Cr.**

This course is offered to students with a background in computer science, enrolled in the Master in Computer Science for Business program, and is taught in the first semester. It requires basic computer science knowledge.
This course aims to:
- Understand the concepts of language, grammar, and the principle of automata to master automata technology.
- Develop applications using automata.
- Analyze an enterprise's software and hardware infrastructure needs and design an appropriate solution.

**063BPMGM4 Business Process Management 4 Cr.**

This course aims to:
- Analyze business processes and propose improvements.
- Model processes.
- Develop a functional and technical architecture for automating process management in an organization.

**063CRENM1 Business Creation - Entrepreneurship 6 Cr.**

This course introduces students to the entrepreneurial world, emphasizing the specific skills required in product design and business models. It highlights the crucial role of the entrepreneur's innovation and creativity at every stage of the business development cycle. This course aims to raise students' awareness of general business creation and financing rules, the personal skills required, and the stages a startup goes through before being offered for acquisition. It adopts a practical approach and includes role-playing exercises.

**063CYBRM3 Cyber Security 4 Cr.**

This course is a continuation of the Information Security course in the Master in Computer Science for Business program, detailing defensive measures to implement within an IT environment. It provides a comprehensive overview of the field by adopting a conceptual, theoretical, and practical approach based on ISO27001, NIST, and CIS standards.
This course aims to:
- Analyze threat agents, simulate predicted attacks, and implement defensive measures at all levels, including applications, databases, systems, and cloud.
- Analyze the causes and consequences of various modern attacks involving any component of the information system and proactively address vulnerabilities.

**063DATSM3 Data Science 4 Cr.**

This course familiarizes students with a wide range of models and algorithms for machine learning, and prepares them for research and/or the industrial application of machine learning techniques. It covers all the important modules a data scientist must know, including machine learning and the Python programming language. It also teaches key concepts such as data acquisition, data exploration, data processing, and data analysis. This course is designed with current industry trends and the skills required to become a successful data scientist in mind.

**063DSCAM4 Deep Learning 4 Cr.**

This course equips students with a basic understanding of modern neural networks and their main applications in computer vision (image recognition) and natural language understanding (NLP). Students will explore all popular building blocks of neural networks including fully connected layers, convolutional and recurrent layers. This course prepares them for research and/or the industrial application of deep learning techniques.
While the Data Science course focuses on building traditional machine learning models based on expert input features, the Deep Learning course focuses on Deep Learning models and their implementation using different neural network architectures (like DNN, CNN, RNN). Neural networks automatically learn data features that are most useful for a particular task, like automatically extracting features from photos to classify them.
This course aims to teach students the different neural network architectures, each suited to specific types of problems. Students will learn (1) Deep Neural Networks to build models that can predict hand-written digits; (2) Convolutional Neural Networks to recognize objects from photos; (3) Recurrent Neural Networks to apply it on sequential data, like predict the class (sentiment) of a text (since a text is sequential data).

**063DVOPM2 DevOps 4 Cr.**

This course aims to:
- Understand DevOps methodology
- Define the background and the mindset of DevOps
- Differentiate between Containerization and virtualization
- Create and deploy Dockers
- Practice Cloud computing using AWS

**063DVO2M4 DevOps II 6 Cr.**

This course aims to:
- Understand DevOps methodology
- Define the background and the mindset of Containerization and virtualization
- Define and work with Kubernetes
- Create and deploy Kubernetes cluster

**063DRIFM4 Law, and Information and Communication Technologies 4 Cr.**

This course provides students with a comprehensive understanding of ICT Law and imparts basic knowledge of legal issues and challenges that may arise during the creation or operation of activities in the ICT field.

**063BIGDM1 Management and Analysis of Big Data 6 Cr.**

This course contributes to the development of the following competencies:
- Developing an IT solution
- Managing databases

It aims to select or combine one or more big data management solutions based on business and technical problems.

**063INTAM1 Artificial Intelligence and Reasoning 4 Cr.**

This course aims to:
- Understand the basic principles and algorithms of AI
- Select and apply the appropriate family of AI algorithms for the type of problem to be solved

**063IOTHM4 Internet of Things 4 Cr.**

This course aims to:
- Understand the main levels of an IoT architecture and the components of each level
- Participate in the development of an IoT solution

**063MMI3M4 Thesis - Final Part 12 Cr.**

This part focuses on deepening a domain related to the student's work in a company or exploring a new technology based on topics proposed by the instructor. In the first case, students will deepen the business, technical, and/or methodological aspects of the domain (e.g., "CRM" or "Data mining"). In the second case, students will discover a new technology and address its main concepts. The work is divided into two parts: the first focuses on the theoretical approach to the topic, and the second involves practical implementation.

**063MMI1M2 Research Methodology 12 Cr.**

This is the first part of the student's master thesis, based on a topic proposed by the instructor or a topic proposed by the student and approved by the instructor. This first part focuses on the theoretical approach to the topic and the development of the corresponding state of the art.

**063MMI2M3 Thesis 12 Cr.**

This is the second part of the student's master thesis, based on a topic proposed by the instructor or a topic proposed by the student and approved by the instructor. It involves the practical implementation of the concepts studied in Part I, including the implementation of an original solution in the case of a software application.

**063GPR1M3 Project Management Applied to Software Development 4 Cr.**

This course introduces the core knowledge areas and processes of project management, as defined by PMI standards and best practices, to ensure effective project execution with reduced risks. It covers key PM terminologies and shows how the integration of an effective Project Management structure in the organization's work processes adds value for the business and its customers. It focuses on tools and techniques used mostly in Software Project Management to plan, monitor, track and manage schedules, costs, and quality.

**063SEMNM1 Seminars 4 Cr.**

These seminars are organized in partnership with companies and IT professionals. They introduce students to different technologies and/or IT career paths that may not be part of the curriculum or are addressed more pragmatically during these seminars. Led by specialists in the concerned domain, these seminars introduce students to new topics and deepen their knowledge of certain subjects.

**063MGSTM1 Strategic Management 4 Cr.**

This course introduces the key concepts, tools, and principles of strategy formulation and competitive analysis. It is concerned with managerial decisions and actions that affect the performance and survival of business enterprises. This course focuses on the information, analyses, organizational processes, skills, and business judgment managers must use to devise strategies, position their businesses, define firm boundaries and maximize long-term profits in the face of uncertainty and competition.
This course takes a general management perspective, viewing the firm as a whole, and examining how policies in each functional area are integrated into an overall competitive strategy. The key strategic business decisions of concern in this course involve selecting competitive strategies, creating and defending competitive advantages, defining firm boundaries and allocating critical resources over long periods. Decisions such as these can only be made effectively by viewing a firm holistically, and over the long term.

**063BD03M2 Database Management Systems 4 Cr.**

This course is offered to students with a background in computer science, enrolled in the Master in Computer Science for Business program, and is taught in the first semester. It requires a basic database course as a prerequisite. It enables students to understand indexing methodologies, query execution and optimization procedures, and transaction management to master relational database management system technology.

This course contributes to the development of the following competencies:
- Developing and testing an integrated IT solution
- Managing databases
- Analyzing an enterprise's software and hardware infrastructure needs and designing an appropriate solution

**063SRP1M1 Distributed Systems and Algorithms 6 Cr.**

This course contributes to the development of the following competencies:
- Modeling a distributed system
- Identifying components and rules of distributed systems
- Analyzing examples of distributed systems and providing solutions to several problems within these systems
- Implementing applicable solutions in a distributed system

It aims to:
- Understand and create algorithms executed in a distributed system environment
- Describe architectural and fundamental models.
- Understand the details of RPC and RMI protocols and create small applications using both protocols
- Manage distributed systems and describe communications, error management, and time management
- Understand the details of CORBA middleware, SOAP, and web services