

# Master of science in Computer Science and Engineering

Focus Big Data Management and Analytics (Erasmus Mundus)

The 120 ECTS program covers a wide array of computer science topics including the following.

- > "Computational Intelligence", which enables the development of adaptive mechanisms capable of intelligent behavior in complex and dynamic environments.
- > "Software and critical system design" which covers the fundamental concepts of computer science and its practical applications, especially in the development of software applications.
- > "Web and Information Systems", which covers the management of digital information, both in structured form as in traditional databases and in semi-structured form on the web. It also covers business intelligence, and the development of applications on the Web.
- > "3D Graphics and Image Processing", which addresses the technologies related to the acquisition, processing and synthesis of multimedia data.
- > "Optimization and Algorithms", which covers the design of advanced algorithms and operations research, with a focus on optimization methods, on network applications and on computational geometry.
- > "Computer Engineering", which concerns the integrated development of hardware and software.
- > "Entrepreneurship and Management", which concerns computer-science specific issues such as the governance of enterprise IT, but also broader topics such as leadership, finance, and entrepreneurship.

By means of a total of 75 ECTS of required courses, the master program ensures a solid foundation in all of the wide array of Computer Science topics mentioned above. The student can complement her or his program in the topic(s) that she/he is most interested in (for a total of 45 ECTS of elective courses). With the approval of the jury, the student can also complement her/his program by other courses available at the ULB.

In particular, the structure of the program is as follows

## MASTER BLOCK 1

- > COMMON, REQUIRED COURSES (45 ECTS)
- > 1 COMPLETE MODULE (15 ECTS) OF ELECTIVE COURSES, CHOSEN AMONG:
- > MODULE 1.1 COMPUTATIONAL INTELLIGENCE AND OPTIMIZATION
- > MODULE 1.2 SOFTWARE AND CRITICAL SYSTEMS DESIGN
- > MODULE 1.3 WEB AND INFORMATION SYSTEMS

## MASTER BLOCK 2

- > COMMON, REQUIRED COURSES (30 ECTS)
- > 30 ECTS OF ELECTIVE COURSES, TO BE CHOSEN AMONG THE COURSES OF THE FOLLOWING MODULES (and the courses of modules 1.1-1.3 not chosen in Block 1)
- > MODULE 2.1 STAGE/INTERNSHIP
- > MODULE 2.2 COMPUTER ENGINEERING
- > MODULE 2.3 ENTREPRENEURSHIP AND MANAGEMENT
- > MODULE 2.4 COMPUTATIONAL INTELLIGENCE
- > MODULE 2.5 WEB & INFORMATION SYSTEMS
- > MODULE 2.6 3D GRAPHICS AND IMAGE PROCESSING
- > MODULE 2.7 ALGORITHMS
- > MODULE 2.8 OPTIMIZATION
- > MODULE 2.9 SOFTWARE AND CRITICAL SYSTEMS

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## MASTER BLOCK 1

- > COMMON, REQUIRED COURSES (45 ECTS)
- > 1 COMPLETE MODULE (15 ECTS) OF ELECTIVE COURSES, CHOSEN AMONG:
- > MODULE 1.1 COMPUTATIONAL INTELLIGENCE AND OPTIMIZATION

➤ MODULE 1.2 SOFTWARE AND CRITICAL SYSTEMS DESIGN

➤ MODULE 1.3 WEB AND INFORMATION SYSTEMS

## MASTER BLOCK 2

➤ COMMON, REQUIRED COURSES (30 ECTS)

➤ 30 ECTS OF ELECTIVE COURSES, TO BE CHOSEN AMONG THE COURSES OF THE FOLLOWING MODULES (and the courses of modules 1.1-1.3 not chosen in Block 1)

➤ MODULE 2.1 STAGE/INTERNSHIP

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➤ MODULE 2.9 SOFTWARE AND CRITICAL SYSTEMS

## Bloc 1 | M-IRIFB | MA-IRIF

### Business intelligence fundamentals - ULB - Block 1

INFO-H415	<a href="#">Advanced databases</a>   Esteban ZIMANYI (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h, practical work: 12h] 📅 first term 💬 English
INFO-H417	<a href="#">Database systems architecture</a>   Mahmoud SAKR (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 first term 💬 English
INFO-H419	<a href="#">Data warehouses</a>   Esteban ZIMANYI (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h, practical work: 12h] 📅 first term 💬 English
INFO-H420	<a href="#">Management of Data Science and Business Workflows</a>   Dimitrios SACHARIDIS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 36h] 📅 first term 💬 English
INFO-H423	<a href="#">Data Mining</a>   Mahmoud SAKR (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 first term 💬 English
LANG-H400	<a href="#">Humanities</a> ⌚ 5 credits [tutorial classes: 48h] 📅 first term 💬 French

### Big data fundamentals - UPC - Block 1

ETHI-Y400	<a href="#">Humanities : Debates on Ethics of Big Data</a> ⌚ 2 credits 📅 second term 💬 English
INFO-Y405	<a href="#">Big Data Management</a> ⌚ 6 credits 📅 second term 💬 English
INFO-Y406	<a href="#">Semantic Data Management</a> ⌚ 6 credits 📅 second term 💬 English
INFO-Y408	<a href="#">Big Data Seminar</a> ⌚ 2 credits 📅 second term 💬 English
INFO-Y508	<a href="#">Viability of business projects</a> ⌚ 6 credits 📅 second term 💬 English

INFO-Y512

[Machine Learning](#) | Ann NOWE (Coordinator)

🕒 6 credits [lecture: 26h, tutorial classes: 26h, personal assignments: 150h] 📅 first term 🗣️ Dutch

LANG-Y402

[Humanities : Foreign Language](#)

🕒 2 credits 📅 second term 🗣️ English

## European business intelligence and Big data summer school (summer) - Block 1

Students will attend the summer school organised annually by one partner institution. Presented by learning researchers in the field, it provides students with theoretical and practical skills in the domain. Industrial presentations will allow participants to understand the current product offer.

# Master of science in Computer Science and Engineering

## Focus Big Data Management and Analytics (Erasmus Mundus)

### Bloc 2 | M-IRIFB | MA-IRIF

## Choice of module - Block 2

### Business Process Analytics - TU/E (NL)

ETHI-Y500

#### Responsible Data Challenge

🕒 5 credits 📅 first term 🗨 English

INFO-Y543

#### Advanced Process Mining

🕒 5 credits 📅 first term 🗨 English

INFO-Y544

#### Foundations of Process Mining

🕒 5 credits 📅 first term 🗨 English

INFO-Y546

#### Longitudinal Data Analysis

🕒 5 credits 📅 first term 🗨 French

INFO-Y547

#### Seminar Process Analytics

🕒 5 credits 📅 first term 🗨 English

INFO-Y548

#### Applications of Data Science for Software Engineering

🕒 5 credits [lecture: 36h] 📅 first term 🗨 English

### Decision Support and Data Analytics - Centrale Supélec (FR)

INFO-Y565

#### Decision Modeling

🕒 5 credits 📅 first term 🗨 French

INFO-Y566

#### Advanced Machine Learning

🕒 5 credits 📅 first term 🗨 French

INFO-Y567

#### Visual Analytics

🕒 5 credits 📅 first term 🗨 French

INFO-Y568

#### Massive Graph Management & Analytics

🕒 5 credits 📅 first term 🗨 French

INFO-Y569

#### Big Data Research Project

🕒 5 credits [lecture: 24h] 📅 first term 🗨 French

INFO-Y570

#### Law and Intellectual Property

🕒 2.5 credits 📅 first term 🗨 French

LANG-Y505

#### French Language and European Culture

🕒 2.5 credits [lecture: 24h] 📅 first term 🗨 French

### Statistics and Deep Learning for Data Analytics - uniPD (IT)

INFO-Y583

#### Statistical Learning

🕒 6 credits [lecture: 36h] 📅 first term 🗨 French

INFO-Y584

#### Deep Learning and Human Data Analytics

🕒 6 credits [lecture: 36h] 📅 first term 🗨 French

INFO-Y585

#### Time-Series Analysis for Business Economic and Financial Data

🕒 6 credits [lecture: 36h] 📅 first term 🗨 French

Choose 2 of the following 3 courses

*Two courses chosen from the following*

INFO-Y580  
(optional)

**Law and data**

⌚ 6 credits [lecture: 36h] 📅 first term 💬 French

INFO-Y581  
(optional)

**Stochastic methods**

⌚ 6 credits [lecture: 36h] 📅 first term 💬 French

INFO-Y582  
(optional)

**Biological Data**

⌚ 6 credits [lecture: 36h] 📅 first term 💬 French

## Master's thesis - Block 2

(In main or associated partner)

MEMO-H511

**Thesis**

⌚ 30 credits 📅 academic year 💬 English