

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 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)
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Bloc 1 | M-IRIFB | MA-IRIF

Business intelligence fundamentals - ULB - Block 1

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

Big data fundamentals - UPC - Block 1

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| ETHI-Y400 | Humanities : Debates on Ethics of Big Data ⌚ 2 credits 📅 second term 🗨 English |
| INFO-Y405 | Big Data Management ⌚ 6 credits 📅 second term 🗨 English |
| INFO-Y406 | Semantic Data Management ⌚ 6 credits 📅 second term 🗨 English |
| INFO-Y408 | Big Data Seminar ⌚ 2 credits 📅 second term 🗨 English |
| INFO-Y508 | Viability of business projects ⌚ 6 credits 📅 second term 🗨 English |



INFO-Y586

Machine Learning

🕒 6 credits 📅 second term 🗨 English

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.



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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

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|-------------------------|---|
| 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)

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| MEMO-H511 | Thesis ⌚ 30 credits 📅 academic year 🗨 English |
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