

Master of science in Computer Science and Engineering

Focus Professional

Bloc 1 | M-IRIFS | MA-IRIF

Tronc commun / Core courses

- ELEC-H417 **Communication networks : protocols and architectures** | Jean-Michel DRICOT (Coordinator)
 5 credits [lecture: 36h, practical work: 24h] first term English
- ELEC-H473 **Microprocessor architecture** | Dragomir MILOJEVIC (Coordinator)
 5 credits [lecture: 24h, practical work: 36h] second term English
- INFO-F403 **Introduction to language theory and compiling** | Gilles GEERAERTS (Coordinator)
 5 credits [lecture: 24h, tutorial classes: 24h, project: 30h] first term English
- INFO-F405 **Introduction to cryptography** | Christophe PETIT (Coordinator) and Gilles VAN ASSCHE
 5 credits [lecture: 24h, tutorial classes: 24h, project: 30h] first term English
- INFO-H410 **Techniques of artificial intelligence** | Hugues BERSINI (Coordinator)
 5 credits [lecture: 24h, tutorial classes: 12h] second term English
- INFO-H417 **Database systems architecture** | Mahmoud SAKR (Coordinator)
 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] first term English
- INFO-H422 **Theory of information coding computing and complexity** | Nicolas CERF (Coordinator) and Jérémie ROLAND
 5 credits [lecture: 48h, tutorial classes: 12h] second term English
- INFO-H500 **Image acquisition and processing** | Olivier DEBEIR (Coordinator)
 5 credits [lecture: 24h, practical work: 24h] first term English

One course chosen from the following

- PROJ-H402 (optional) **Computing project** | Mauro BIRATTARI (Coordinator) and Mehrdad TERATANI
 5 credits [project: 150h] academic year English
- PROJ-H417 (optional) **Projet coopération au développement** | Antoine NONCLERCQ (Coordinator)
 5 credits [project: 150h] first and second terms French
 Only on selection : see the Development Unit of the Polytechnic School of Brussels (<http://polytech.ulb.be/en/international/development-cooperation>)
- PROJ-H418 (optional) **Hands-on learning: project manager (chef de projet)** | Peter BERKE (Coordinator)
 5 credits [project: 150h] first and second terms French

Elective courses - Block 1

Choisissez 1 module parmi les modules des Electives 1 / Choose 1 complete module among the modules of Electives

An alternative chosen from the four following

- INFO-F422 (optional) **Module Computational intelligence and optimization 1**
Statistical foundations of machine learning | Gianluca BONTEMPI (Coordinator)
 5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] second term English

INFO-F424
(optional)

Combinatorial optimization | Bernard FORTZ (Coordinator) and RENAUD CHICOISNE
⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 12h, project: 30h] 📅 second term 🗨 English

INFO-H413
(optional)

Heuristic optimisation | Thomas,T STUTZLE (Coordinator)
⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 second term 🗨 English

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or

Module Data science 1

INFO-H415
(optional)

Advanced databases | Esteban ZIMANYI (Coordinator)
⌚ 5 credits [lecture: 24h, tutorial classes: 24h, practical work: 12h] 📅 first term 🗨 English

INFO-H420
(optional)

Management of Data Science and Business Workflows | Dimitrios SACHARIDIS (Coordinator)
⌚ 5 credits [lecture: 24h, tutorial classes: 36h] 📅 first term 🗨 English

INFO-H509
(optional)

Geo-Spatial and web technologies | Mahmoud SAKR (Coordinator)
⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 second term 🗨 English

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or

Module embedded design 1

ELEC-H409
(optional)

Digital architectures and design | Dragomir MILOJEVIC (Coordinator)
⌚ 5 credits [lecture: 12h, practical work: 36h] 📅 first term 🗨 English

ELEC-H410
(optional)

Real-time computer systems | François QUITIN (Coordinator)
⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English

INFO-F412
(optional)

Formal verification of computer systems | Jean-François RASKIN (Coordinator)
⌚ 5 credits [lecture: 36h, tutorial classes: 12h] 📅 second term 🗨 English

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or

Module multimedia 1

INFO-H502
(optional)

Virtual Reality | Gauthier LAFRUIT (Coordinator)
⌚ 5 credits [lecture: 24h, practical work: 24h, project: 12h] 📅 first term 🗨 English

INFO-H503
(optional)

GPU computing | Gauthier LAFRUIT (Coordinator) and Jan LEMEIRE
⌚ 5 credits [lecture: 24h, practical work: 24h, project: 24h] 📅 second term 🗨 English

INFO-H516
(optional)

Visual Media Compression | Mehrdad TERATANI (Coordinator) and Gauthier LAFRUIT
⌚ 5 credits [lecture: 24h, practical work: 24h, personal assignments: 12h] 📅 second term 🗨 English

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Master of science in Computer Science and Engineering

Focus Professional

Bloc 2 | M-IRIFS | MA-IRIF

Tronc commun / Core courses - Block 2

GEST-S483	Digital and IT Governance Georges ATAYA (Coordinator) ⌚ 5 credits [lecture: 24h] 📅 second term 🗨 English
INFO-H505	Cloud Computing Dimitrios SACHARIDIS (Coordinator) and Mahmoud SAKR ⌚ 5 credits [lecture: 24h] 📅 second term 🗨 English
MEMO-H504	Mémoire de fin d'études en Informatique Dimitrios SACHARIDIS (Coordinator) ⌚ 20 credits [mfe/tfe: 600h] 📅 academic year 🗨 French

COURS ELECTIVES/ELECTIVE COURSES - Block 2

Electives 1 and 2

Pour arriver à un total de 60 ECTS, choisissez 35 ECTS de cours parmi les cours d'ELECTIVES 1 pas encore choisi en 1ere année d'étude et les cours d' ELECTIVES 2. Avec l'accord du jury et du titulaire, vous pouvez

aussi choisir maximum 10 ECTS de cours offert dans un autre programme de l' Ecole (y compris les cours des modules transversaux de l'Ecole) et/ou maximum 6 ECTS de cours hors faculté.

Choose, to arrive at a total of 60 credits, 30 credits of courses among the courses of ELECTIVES 1 not chosen in the block 1 of study and the courses of ELECTIVES 2. With the approval of the jury and the lecturer, you may also complete your program by choosing at most 10 credits of courses offered in the other programs of the School (including the courses of the transversal modules of the school) and/or at most 6 credits of courses offered outside of the School.

Up to 35 credits chosen from the following

Module Computational intelligence and optimization 1

INFO-F422 (optional)	Statistical foundations of machine learning Gianluca BONTEMPI (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] 📅 second term 🗨 English
INFO-F424 (optional)	Combinatorial optimization Bernard FORTZ (Coordinator) and RENAUD CHICOISNE ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 12h, project: 30h] 📅 second term 🗨 English
INFO-H413 (optional)	Heuristic optimisation Thomas,T STUTZLE (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 second term 🗨 English

Module Data science 1

INFO-H415 (optional)	Advanced databases Esteban ZIMANYI (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h, practical work: 12h] 📅 first term 🗨 English
INFO-H420 (optional)	Management of Data Science and Business Workflows Dimitrios SACHARIDIS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 36h] 📅 first term 🗨 English
INFO-H509 (optional)	Geo-Spatial and web technologies Mahmoud SAKR (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 second term 🗨 English

Module Embedded design 1

ELEC-H409 (optional)	Digital architectures and design Dragomir MILOJEVIC (Coordinator) ⌚ 5 credits [lecture: 12h, practical work: 36h] 📅 first term 🗨 English
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ELEC-H410
(optional)

[Real-time computer systems](#) | François QUITIN (Coordinator)

5 credits [lecture: 24h, practical work: 36h] second term English

Module Multimedia 1

INFO-H502
(optional)

[Virtual Reality](#) | Gauthier LAFRUIT (Coordinator)

5 credits [lecture: 24h, practical work: 24h, project: 12h] first term English

INFO-H503
(optional)

[GPU computing](#) | Gauthier LAFRUIT (Coordinator) and Jan LEMEIRE

5 credits [lecture: 24h, practical work: 24h, project: 24h] second term English

INFO-H516
(optional)

[Visual Media Compression](#) | Mehrdad TERATANI (Coordinator) and Gauthier LAFRUIT

5 credits [lecture: 24h, practical work: 24h, personal assignments: 12h] second term English

Module Computational intelligence and optimization 2

INFO-F409
(optional)

[Learning dynamics](#) | Tom LENAERTS (Coordinator)

5 credits [lecture: 24h, project: 60h] first term English

INFO-F439
(optional)

[Advanced Methods in Bioinformatics](#) | Matthieu DEFRANCE (Coordinator) and Wim VRANKEN

5 credits [lecture: 24h, project: 90h] second term English

INFO-F524
(optional)

[Continuous optimization](#) | Bernard FORTZ (Coordinator) and Dimitrios PAPADIMITRIOU

5 credits [lecture: 24h, project: 60h] second term English

INFO-F530
(optional)

[Computer science seminar](#) | Tom LENAERTS (Coordinator), Jérôme De Boeck, Bernard FORTZ, John IACONO and Olivier MARKOWITCH

5 credits [seminars: 36h, project: 60h] first and second terms English

INFO-H414
(optional)

[Swarm Intelligence](#) | Marco DORIGO (Coordinator) and Mauro BIRATTARI

5 credits [lecture: 12h, practical work: 48h] second term English

INFO-H512
(optional)

[Current trends in artificial intelligence](#) | Hugues BERSINI (Coordinator)

5 credits [lecture: 24h, project: 30h] second term English

Module DataScience 2

INFO-H419
(optional)

[Data warehouses](#) | Esteban ZIMANYI (Coordinator)

5 credits [lecture: 24h, tutorial classes: 24h, practical work: 12h] first term English

INFO-H423
(optional)

[Data Mining](#) | Mahmoud SAKR (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] first term English

INFO-H515
(optional)

[Big Data: Distributed Data Management and Scalable Analytics](#) | Dimitrios SACHARIDIS (Coordinator) and Gianluca BONTEMPI

5 credits [lecture: 24h, tutorial classes: 12h, project: 24h] second term English

Module Multimedia 2

INFO-H501
(optional)

[Pattern recognition and image analysis](#) | Olivier DEBEIR (Coordinator) and Christine DECAESTECKER

5 credits [lecture: 36h, practical work: 24h] second term English

INFO-Y004
(optional)

[Natural language processing](#) | Paul VAN EECKE

6 credits [lecture: 26h, tutorial classes: 26h] first term English

INFO-Y106
(optional)

[Information visualisation](#) | Beat SIGNER

6 credits [lecture: 26h, tutorial classes: 26h] academic year

Module Algorithms 2

INFO-F413
(optional)

[Data structures and algorithms](#) | Jean CARDINAL (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] first term English

INFO-F420
(optional)

[Computational geometry](#) | Stefan LANGERMAN F. SWARZBERG (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] first term English

INFO-F521
(optional)

[Graph theory](#) | Gwenaël JORET (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] first term English



INFO-H514 <small>(optional)</small>	<p>Quantum information and computation Nicolas CERF (Coordinator), Ognyan Oreshkov and Jérémie ROLAND</p> <p>🕒 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English</p>
Module Embedded design 2	
ELEC-H505 <small>(optional)</small>	<p>Advanced digital architecture Dragomir MILOJEVIC (Coordinator)</p> <p>🕒 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English</p>
INFO-F410 <small>(optional)</small>	<p>Embedded systems design Jean-François RASKIN (Coordinator)</p> <p>🕒 5 credits [lecture: 12h, tutorial classes: 12h, project: 60h] 📅 second term 🗨 English</p>
INFO-F412 <small>(optional)</small>	<p>Formal verification of computer systems Jean-François RASKIN (Coordinator)</p> <p>🕒 5 credits [lecture: 36h, tutorial classes: 12h] 📅 second term 🗨 English</p>
INFO-Y082 <small>(optional)</small>	<p>Distributed and mobile programming paradigms Elisa GONZALEZ BOIX</p> <p>🕒 6 credits [lecture: 26h, tutorial classes: 26h, project: 30h] 📅 first term 🗨 English</p>
INFO-Y085 <small>(optional)</small>	<p>Functional programming Wolfgang DE MEUTER (Coordinator)</p> <p>🕒 6 credits [lecture: 26h, tutorial classes: 26h] 📅 second term 🗨 English</p>
INFO-Y087 <small>(optional)</small>	<p>Declarative programming WIGGINS Geraint and VAN EECKE Paul</p> <p>🕒 6 credits [lecture: 26h, tutorial classes: 26h] 📅 second term 🗨 English</p>
INFO-Y099 <small>(optional)</small>	<p>Multicore programming SWALLENS Janwillem</p> <p>🕒 6 credits [lecture: 26h, tutorial classes: 26h] 📅 second term 🗨 English</p>
INFO-Y532 <small>(optional)</small>	<p>Higher order programming Jens Nicolay (Coordinator)</p> <p>🕒 6 credits [lecture: 26h, tutorial classes: 26h] 📅 first term</p>
Module Entrepreneurship and management 2	
GEST-H501 <small>(optional)</small>	<p>Logistics Engineering and Management Alassane Ballé NDIAYE (Coordinator)</p> <p>🕒 5 credits [lecture: 12h, tutorial classes: 36h] 📅 first term 🗨 English</p>
GEST-H502 <small>(optional)</small>	<p>Supply Chain Performance Analytics Alassane Ballé NDIAYE (Coordinator)</p> <p>🕒 5 credits [lecture: 12h, tutorial classes: 36h, personal assignments: 12h] 📅 second term 🗨 English</p>
GEST-S318 <small>(optional)</small>	<p>Introduction to theoretical finance Laurent GHEERAERT (Coordinator)</p> <p>🕒 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English</p>
GEST-S421 <small>(optional)</small>	<p>Entrepreneurial ecosystems Judith BEHRENS (Coordinator)</p> <p>🕒 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English</p>
Module Stage/Internship	
STAG-H500 <small>(optional)</small>	<p>Internship (3 months) Frédéric ROBERT (Coordinator)</p> <p>🕒 10 credits [work placement: 300h] 📅 first term 🗨 French</p>

Free elective courses

Students have also the opportunity to choose courses among the courses of the 'transversal modules' of the School.

English : LANG-H500

Engineering and society : PROJ-H421 - GEST-H509 - BIME-G5505 - PHYS-F517

Sustainability : GEST-S492 - ENVI-F405 - CHIM-H504 - ENVI-F452 - ENVI-F454 - ELEC-Y514

Finance, accounting, management, marketing, logistics and quality : GEST-S101 - GEST-S318 - GEST-S421 - GEST-Y501 - GEST-H501 - GEST-H502

Participation to a summer school : EDUC-H601

Free elective courses

Up to six credits chosen from the following



BIME-G5505 (optional)	Interfaculty and interdisciplinary program in Healthcare Innovation Hilde STEVENS (Coordinator) ⌚ 5 credits [lecture: 40h, tutorial classes: 20h] 📅 second term 🗨 English
CHIM-H504 (optional)	Engineering aspects of circular economy Prakash VENKATESAN (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English
DROI-C5174 (optional)	Approche interdisciplinaire du droit de la propriété intellectuelle/Interdisciplinary Approach to In Julien CABAY (Coordinator) ⌚ 5 credits [lecture: 24h] 📅 first term 🗨 English/French
EDUC-H601 (optional)	Summer School Johan GYSELINCK (Coordinator) ⌚ 5 credits [personal assignments: 5h] 📅 academic year 🗨 English
ELEC-Y514 (optional)	Sustainability : an interdisciplinary Approach Cathy MACHARIS (Coordinator) and Waldo Galle ⌚ 6 credits [lecture: 36h, practical work: 24h] 📅 academic year 🗨 English
ENVI-F405 (optional)	Climat: sciences et politiques Frank PATTYN (Coordinator) and Louise Knops ⌚ 5 credits [lecture: 40h] 📅 second term 🗨 French
ENVI-F452 (optional)	Environmental impact analysis and management Wouter ACHTEN (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 12h, project: 24h] 📅 first term 🗨 English/French
ENVI-F454 (optional)	Energie: Société et environnement Michel HUART (Coordinator) and Nadine MATTIELLI ⌚ 5 credits [lecture: 30h, practical work: 12h, project: 24h] 📅 first term 🗨 French
GEST-H501 (optional)	Logistics Engineering and Management Alassane Ballé NDIAYE (Coordinator) ⌚ 5 credits [lecture: 12h, tutorial classes: 36h] 📅 first term 🗨 English
GEST-H502 (optional)	Supply Chain Performance Analytics Alassane Ballé NDIAYE (Coordinator) ⌚ 5 credits [lecture: 12h, tutorial classes: 36h, personal assignments: 12h] 📅 second term 🗨 English
GEST-H509 (optional)	📅 unknown term
GEST-S101 (optional)	Comptabilité financière Gilles GEVERS (Coordinator) and Laurent GHEERAERT ⌚ 5 credits [lecture: 36h, tutorial classes: 8h] 📅 second term 🗨 French
GEST-S318 (optional)	Introduction to theoretical finance Laurent GHEERAERT (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English
GEST-S421 (optional)	Entrepreneurial ecosystems Judith BEHRENS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English
GEST-S492 (optional)	Energy policy, sustainability & management Adel EL Gammal (Coordinator), Julien BLONDEAU and Michel HUART ⌚ 5 credits [lecture: 36h, seminars: 24h] 📅 first term 🗨 English
GEST-Y501 (optional)	Business Management and Entrepreneurship Marc GOLDCHSTEIN (Coordinator) ⌚ 3 credits [lecture: 33h] 📅 first term 🗨 English
LANG-H500 (optional)	English for professional purposes Alexander CORNFORD (Coordinator) and Matthew LANGSLEY ⌚ 5 credits [tutorial classes: 48h, personal assignments: 12h] 📅 first and second terms 🗨 English
PHYS-F517 (optional)	How To Make (almost) Any Experiment Using Digital Fabrication Denis TERWAGNE (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 24h] 📅 first term 🗨 French
PROJ-H421 (optional)	Projet polydaire: expériences didactiques innovantes pour le secondaire Simon-Pierre GORZA (Coordinator) ⌚ 5 credits [project: 150h] 📅 academic year 🗨 French

