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)
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 / Development cooperation project | 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 five following

Module Algorithms, Cryptography and Quantum Computing 1

INFO-F413
(optional)   Randomized algorithms | Jean CARDINAL (Coordinator)
5 credits [lecture: 24h, tutorial classes: 12h, project: 60h]   first term   English

INFO-F514
(optional)

Protocols, cryptanalysis and mathematical cryptology | Christophe PETIT (Coordinator)

🕐 5 credits [lecture: 24h]   📅 second term   💬 English

INFO-H514
(optional)

Quantum information and computation | Ognyan Oreshkov (Coordinator)

🕐 5 credits [lecture: 24h, tutorial classes: 36h]   📅 first term   💬 English

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

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

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

or

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)

🕐 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

Master of science in Computer Science and Engineering
Focus Professional

Bloc 2 | M-IRIFS | MA-IRIF

Tronc commun / Core courses - Block 2

INFO-H505   **Cloud Computing** | Dimitrios SACHARIDIS (Coordinator) and Mahmoud SAKR
🕐 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 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)
🕐 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 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)   **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)
🕐 5 credits [lecture: 24h, project: 60h]   📅 second term   💬 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

INFO-Y004
(optional)   **Natural language processing** | VAN EECKE Paul
🕐 6 credits [lecture: 26h, tutorial classes: 26h]   📅 first 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 Data Science 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 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

Module Embedded Design 2

ELEC-H505
(optional)

Advanced digital architecture | Dragomir MILOJEVIC (Coordinator) and Jan Tobias Mühlberg
5 credits [lecture: 24h, practical work: 36h] second term English

ELEC-H550
(optional)

Embedded System Security | Jan Tobias Mühlberg (Coordinator)
5 credits [lecture: 24h, practical work: 36h] second term English

INFO-F410
(optional)

Embedded systems design | Jean-François RASKIN (Coordinator)
5 credits [lecture: 12h, tutorial classes: 12h, project: 60h] 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 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-H518
(optional)

Immersive Multimedia Technologies | Gauthier LAFRUIT (Coordinator)
5 credits [lecture: 30h, project: 15h] second term English

INFO-Y106
(optional)

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

Module Algorithms, Cryptography, and Quantum Computing 1

INFO-F413
(optional)

Randomized algorithms | Jean CARDINAL (Coordinator)
5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] first term English

INFO-F514
(optional)
Protocols, cryptanalysis and mathematical cryptology | Christophe PETIT (Coordinator)
🕐 5 credits [lecture: 24h]   📅 second term   💬 English

INFO-H514
(optional)
Quantum information and computation | Ognyan Oreshkov (Coordinator)
🕐 5 credits [lecture: 24h, tutorial classes: 36h]   📅 first term   💬 English

Module Algorithms, Cryptography, and Quantum Computing 2

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-H517
(optional)
Quantum information and Computation II | Nicolas CERF (Coordinator) and Jérémie ROLAND
🕐 5 credits [lecture: 24h, tutorial classes: 24h, project: 12h]   📅 second term   💬 English

Elective courses

GEST-S483
(optional)
Digital and IT Governance | Georges ATAYA (Coordinator)
🕐 5 credits [lecture: 24h]   📅 second term   💬 English

INFO-F530
(optional)
Computer science seminar | Tom LENAERTS (Coordinator), Bernard FORTZ, John IACONO and Olivier MARKOWITCH
🕐 5 credits [seminars: 36h, project: 60h]   📅 first and second terms   💬 English

STAG-H500
(optional)
Internship (3 months) | Frédéric ROBERT (Coordinator)
🕐 10 credits [work placement: 300h]   📅 first term   💬 French

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]   📅 first 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, personal assignments: 100h]   📅 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)

Ethique de l'ingénieur
🕐 3 credits [lecture: 12h, tutorial classes: 12h, practical work: 12h]   📅 second term   💬 French

GEST-S101
(optional)

Comptabilité financière | Laurent GHEERAERT (Coordinator) and Gilles GEVERS
🕐 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)
🕐 5 credits [tutorial classes: 48h, personal assignments: 12h]   📅 first and second terms   💬 English

PROJ-H421
(optional)

Projet polydaire: expériences didactiques innovantes pour le secondaire | Simon-Pierre GORZA (Coordinator)
🕐 5 credits [project: 150h]   📅 academic year   💬 French