## Cycle view of the study programme

If one or several of the mandatory courses have already been credited when entering the Master of Data science program, they can be replaced by a corresponding amount of credits chosen among the elective courses.

### Compulsory Courses (B1 : 20Cr, B2 : 35Cr)

**Computer Science, Applied Mathematics and Data Science fundamentals :**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO0016-1</td>
<td><em>Introduction to the theory of computation</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>26</td>
</tr>
<tr>
<td>MATH0461-2</td>
<td><em>Introduction to numerical optimization</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>30</td>
</tr>
<tr>
<td>ELEN0060-2</td>
<td><em>Information and coding theory</em></td>
<td>English</td>
<td>B1 Q2</td>
<td>30</td>
</tr>
<tr>
<td>ELEN0062-1</td>
<td><em>Introduction to machine learning</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>30</td>
</tr>
</tbody>
</table>

**Master thesis**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATFE9009-1</td>
<td><em>Master thesis</em></td>
<td>English</td>
<td>B2 TA</td>
<td>750</td>
</tr>
</tbody>
</table>

**Management and legal issues**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DROI1357-1</td>
<td><em>European law, (big) data and artificial intelligence applications seminar</em></td>
<td>English, Ljupcho GROZANOVSki</td>
<td>B2 Q1</td>
<td>24</td>
</tr>
<tr>
<td>GEST3162-1</td>
<td><em>Principles of management</em></td>
<td>English</td>
<td>B2 Q1</td>
<td>30</td>
</tr>
</tbody>
</table>

[...] Students who have already acquired the skills and knowledge of GEST3162 (or equivalent) will replace it by a course of their choice of 5 ECTS

### Elective courses (B1 : 40Cr, B2 : 25Cr)

**Single focus (B1 : 30Cr)**

**Professional focus in data science (B1 : 30Cr)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2021-1</td>
<td><em>High-dimensional data analysis</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>30</td>
</tr>
<tr>
<td>INFO8002-1</td>
<td><em>Large-scale data systems</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>25</td>
</tr>
<tr>
<td>PROJ0016-1</td>
<td><em>Big data project</em></td>
<td>English</td>
<td>B1 TA</td>
<td>25</td>
</tr>
<tr>
<td>INFO9014-1</td>
<td><em>Knowledge representation and reasoning</em></td>
<td>English</td>
<td>B1 Q2</td>
<td>24</td>
</tr>
<tr>
<td>INFO8010-1</td>
<td><em>Deep learning</em></td>
<td>English</td>
<td>B1 Q2</td>
<td>25</td>
</tr>
</tbody>
</table>

**Corequisite :**

- INFO8006-1 - Introduction to artificial intelligence

Choose 10 credits in the following list, among those that have not already been credited before entering the Master programme: (B1 : 10Cr)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO8006-1</td>
<td><em>Introduction to artificial intelligence</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>25</td>
</tr>
<tr>
<td>INFO8003-1</td>
<td><em>Optimal decision making for complex problems</em></td>
<td>English</td>
<td>B1 Q2</td>
<td>25</td>
</tr>
<tr>
<td>INFO8004-1</td>
<td><em>Advanced Machine learning</em></td>
<td>English</td>
<td>B1 Q2</td>
<td>25</td>
</tr>
<tr>
<td>INFO2049-1</td>
<td><em>Web and Text Analytics</em></td>
<td>English</td>
<td>B1 Q1</td>
<td>30</td>
</tr>
<tr>
<td>ELEN0016-2</td>
<td><em>Computer vision</em></td>
<td>English</td>
<td>- Q1</td>
<td>30</td>
</tr>
</tbody>
</table>

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Choose 25 credits in the following topics, among those that have not already been credited in Block 1 or before entering this Master programme: (B2 : 25Cr)

**Elective courses in Data Science and Artificial Intelligence**

- **INFO8004-1** Advanced Machine learning (english language) - Pierre GEURTS, Gilles LOUPPE, Louis WEHENKEL - [45h Proj.] B2 Q2 25 - [+ 5]
- **INFO2049-1** Web and Text Analytics (english language) - Ashwin ITTOO B2 Q1 30 - - [+] 5
- **GEST5006-1** SAS Certification applied analytics (english language) - Michael SCHYNS B2 Q2 15 25 - [+] 5
  - Project complement - Arnout VAN MESSEM - [30h Proj.] - - [+5]
- **INFO8003-1** Optimal decision making for complex problems (english language) - Damien ERNST - [45h Proj.] B2 Q2 25 10 [+5] 5
- **INFO9482-2** Introduction to intelligent robotics (english language) - Pierre SACRÉ - [80h Proj.] B2 Q2 30 4 [+5] 5

**Elective courses in Computer Science and Applied Mathematics**

- **INFO0027-2** Programming techniques (english language) B2 Q2 5
  - Algorithmics - Laurent MATHY - [40h Proj.] 14 14 [+]
  - Software patterns - Laurent MATHY - [30h Proj.] 10 10 [+]
- **INFO0939-1** High performance scientific computing (english language) - Christophe GEUZAIN - [20h Proj.] B2 Q1 30 15 [+5] 5
- **INFO0010-4** Introduction to computer networking (english language) - Guy LEDUC - [12h Labo., 40h Proj.] B2 Q1 35 2 [+5] 5
- **INFO0940-1** Operating systems (english language) - Laurent MATHY - [30h Proj.] B2 Q2 30 6 [+5] 5
- **INFO0045-3** Introduction to computer security (english language) - Benoît DONNET - [10h Labo., 30h Proj.] B2 Q1 30 6 [+5] 5
- **INFO8011-1** Network infrastructures (english language) - Benoît DONNET, Guy LEDUC, Laurent MATHY - [12h Labo., 30h Proj.] (Odd years) B2 Q1 30 - [+5] 5
- **MATH0462-1** Discrete optimization (english language) - Quentin LOUVEAUX - B2 Q2 30 20 [+5] 5
MQGE0002-3  *Computational Optimization* (english language) - Yves CRAVA  
INFO9014-1  *Knowledge representation and reasoning* (english language) - Christophe DEBRUYNE

**Elective courses in bioinformatics**

GBIO0002-1  *Genetics and bioinformatics* (english language) - Franck DEQUEIET,  
GBIO0009-1  *Topics in bioinformatics* (english language) - Kristel VAN STEEN  
GBIO0030-1  *Computational approaches to statistical generics* (english language) - Kristel VAN STEEN

**Elective courses in management**

GEST3032-1  *eBusiness and eCommerce* (english language) - Ashwin ITTOO

**Optional company internships**

ASTG9008-1  *Internship (coupled with Master thesis)* (english language) - Pierre GEURTS  
ASTG9009-1  *Internship (independent of Master thesis)* - Pierre GEURTS

**Miscellaneous**

INGE0012-1  *Scientific research in engineering and its impact on innovation* (english language) - Rodolphe SEPULCHRE

[... ] With the agreement of the President of the Jury, students may also choose up to 15 credits in the application area of their Master thesis in other programmes of the university

[... ] With the agreement of the President of the Jury, students may also choose 5 credits in any other programme of the university.

**Extra credits Master in Data Science (120 ECTS)**

**Optional courses (B0 : 56Cr)**

The following courses are prerequisites for some courses of this master programme. Therefore, students who are admitted to this master without having acquired equivalent courses must add them to the programme of their first year. (B0 : 56Cr)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2007-1</td>
<td><em>General mathematics I</em> - Françoise BASTIN</td>
<td>30</td>
</tr>
<tr>
<td>MATH0499-1</td>
<td><em>Graph theory</em> - Michel RIGO</td>
<td>25</td>
</tr>
<tr>
<td>MATH0495-1</td>
<td><em>Elements for calculating probabilities</em> - Céline ESSER</td>
<td>15</td>
</tr>
<tr>
<td>MATH0487-2</td>
<td><em>Elements of statistics</em> - Pierre SACRÉ</td>
<td>15</td>
</tr>
</tbody>
</table>
| MATH1222-3  | *Introduction to stochastic processes* - Amir ABOUBACAR,  
Pierre GEURTS | 20 |
| INFO0946-1  | *Introduction to computer programming* - Benoît DONNET | 30 |
| INFO2050-1  | (pas organisé en 2021-2022) *Advanced computer programming* | 25 |
| INFO0009-2  | *Database (general organisation)* - Christophe DEBRUYNE | 26 |

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### Study programmes 2021-2022
#### Faculty of Applied Sciences
#### Master of Science (MSc) in Data Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH0500-1</td>
<td><em>Introduction to numerical algorithmic</em> - Quentin LOUVEAUX</td>
<td>[6h Labo., 45h Proj.]</td>
<td>5</td>
</tr>
<tr>
<td>INFO0054-1</td>
<td>Functional programming (pas organisé en 2021-2022) - Christophe DEBRUYNE</td>
<td>[15h Proj.]</td>
<td>5</td>
</tr>
<tr>
<td>INFO0062-1</td>
<td><em>Object-oriented programming</em> (english language)  - Bernard BOIGELOT</td>
<td>[20h Proj.]</td>
<td>5</td>
</tr>
<tr>
<td>MATH2019-1</td>
<td>Mathematics for computing 1 - Emilie CHARLIER, N...</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>MATH2020-1</td>
<td>Mathematics for computing 2 - Emilie CHARLIER, N...</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>INFO8006-1</td>
<td><em>Introduction to artificial intelligence</em> (english language) - Gilles LOUPPE</td>
<td>[45h Proj.]</td>
<td>5</td>
</tr>
</tbody>
</table>

**Students must have a level B2 in English**