## 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 : 10Cr, B2 : 35Cr)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATS0001-1</td>
<td><em>Foundations of data science</em> (english language) - Gilles LOUPPE</td>
<td>[55h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q1 25 10</td>
<td>+ 5</td>
</tr>
<tr>
<td>PROJ0021-1</td>
<td><em>Data science project</em> (english language) - Christophe DEBRUYNE, Pierre GEURTS, Gilles LOUPPE</td>
<td>[120h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q2 5 -</td>
<td>+ 5</td>
</tr>
<tr>
<td>DROI1357-1</td>
<td><em>European law, (big) data and artificial intelligence applications</em> seminar (english language) - - Suppl : Ljupcho GROZDANOFSKI</td>
<td></td>
<td>- Lalonde</td>
<td>B2 Q1 24 -</td>
<td>5</td>
</tr>
</tbody>
</table>

### Elective courses (B1 : 50Cr, 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</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEN0062-1</td>
<td><em>Introduction to machine learning</em> (english language) - Pierre GEURTS, Louis WEHENKEL</td>
<td>[40h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q1 30 5</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO8010-1</td>
<td><em>Deep learning</em> (english language) - Gilles LOUPPE</td>
<td>[55h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q2 25 10</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO9014-1</td>
<td><em>Knowledge representation and reasoning</em> (english language) - Christophe DEBRUYNE</td>
<td></td>
<td>- Lalonde</td>
<td>B1 Q2 24 20</td>
<td>5</td>
</tr>
<tr>
<td>INFO9016-1</td>
<td><em>Advanced Databases</em> (english language) - Christophe DEBRUYNE</td>
<td></td>
<td>- Lalonde</td>
<td>B1 Q2 24 20</td>
<td>5</td>
</tr>
<tr>
<td>MATH0461-2</td>
<td><em>Introduction to numerical optimization</em> (english language) - Quentin LOUVEAUX</td>
<td>[20h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q1 30 20</td>
<td>+ 5</td>
</tr>
<tr>
<td>MATH2021-1</td>
<td><em>High-dimensional statistics</em> (english language) - Gentiane HAESBROECK</td>
<td>[30h Proj.]</td>
<td>- Lalonde</td>
<td>B1 Q1 30 15</td>
<td>+ 5</td>
</tr>
</tbody>
</table>

In agreement with the Jury, choose a total of 20 credits for Block 1 and 25 credits for Block 2 in the following list, among those that have not already been credited before. (B1 : 20Cr, B2 : 25Cr)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Language</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEN0016-2</td>
<td><em>Computer vision</em> (english language) - Marc VAN DROOGENBROECK</td>
<td>[50h Proj.]</td>
<td>- Lalonde</td>
<td>Q1 30 10</td>
<td>+ 5</td>
</tr>
<tr>
<td>ELEN0060-2</td>
<td><em>Information and coding theory</em> (english language) - Louis WEHENKEL</td>
<td>[30h Proj.]</td>
<td>- Lalonde</td>
<td>Q2 30 15</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO0016-1</td>
<td><em>Introduction to the theory of computation</em> (english language) - Quentin LOUVEAUX</td>
<td></td>
<td>- Lalonde</td>
<td>Q1 26 26</td>
<td>5</td>
</tr>
<tr>
<td>INFO0027-2</td>
<td><em>Programming techniques</em> (english language)</td>
<td></td>
<td>- Lalonde</td>
<td>Q2 14 14</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO0054-1</td>
<td><em>Functional programming</em> - Christophe DEBRUYNE</td>
<td>[15h Proj.]</td>
<td>- Lalonde</td>
<td>Q1 28 24</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO0939-1</td>
<td><em>High performance scientific computing</em> (english language) - Christophe GEUZAIN - Suppl : David COLIGNON</td>
<td>[20h Proj.]</td>
<td>- Lalonde</td>
<td>Q1 30 15</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO0948-2</td>
<td><em>Introduction to intelligent robotics</em> (english language) - Pierre SACRÉ</td>
<td>[80h Proj.]</td>
<td>- Lalonde</td>
<td>Q2 30 4</td>
<td>+ 5</td>
</tr>
<tr>
<td>INFO2049-1</td>
<td><em>Web and Text Analytics</em> (english language) - Ashwin ITTOO</td>
<td></td>
<td>- Lalonde</td>
<td>Q1 30 -</td>
<td>5</td>
</tr>
<tr>
<td>INFO8003-1</td>
<td><em>Optimal decision making for complex problems</em> (english language)</td>
<td></td>
<td>- Lalonde</td>
<td>Q2 25 10</td>
<td>+ 5</td>
</tr>
</tbody>
</table>
INFO8004-1  Advanced Machine learning (english language) - Pierre GEURTS,
Gilles LOUPPE, Louis WEHENKELE - [45h Proj.]
- Q2 25 25 [-] 5
INFO9012-1  Parallel Programming (english language) - Pascal FONTAINE
- Q2 25 25 [-] 5
INFO9015-1  Logic for Computer Science (english language) - Pascal FONTAINE
- Q1 24 20 [-] 5
INGE0012-1  (pas organisé en 2022-2023) Scientific research in engineering and
its impact on innovation (english language) - Rodolphe SEPULCHRE
- Q2 26 26 [-] 5
MATH0462-1  Discrete optimization (english language) - Quentin LOUVEAUX -
[25h Proj.]
- Q2 30 20 [+][-] 5
MATH2022-1  Monte Carlo methods in statistics (english language)
- General course - Arnout VAN MESSEM - [10h Proj.]
- Project complement - Arnout VAN MESSEM - [30h Proj.]
- Q2 24 12 [+][-] 5
MQGE0002-3  Computational Optimization (english language) - Yves CRAMA
- Q2 30 - [-] 5
PROJ0017-1  Personal student project in Data Science (english language) -
Gilles LOUPPE - [150h Proj.]
- TA - [-] 5
BIOL0021-1  Biology of the systems - Patrick MEYER - [10h Mon. WS]
Corequisite : OCEA0089-1 - Introduction to marine ecosystems modelling
- Q1 10 - [+][-] 2
OCEA0089-1  Introduction to marine ecosystems modelling (english language) -
Marilaura GRÉGOIRE
Corequisite : BIOL0021-1 - Biologie des systèmes
- Q1 15 15 [-] 3
GEOG0057-1  Spatial analysis - François JONARD
- Q2 30 30 [-] 5
GEOG0059-1  Infrastructures of spatial data - Roland BILLENN
- Q1 30 30 [-] 5
GEST0832-4  Financial Markets - Georges HÜBNER
Corequisite : FINA0063-1 - Advanced Statistical Methods in Finance
- Q1 40 15 [-] 5
FINA0063-1  Advanced Statistical Methods in Finance (english language) -
Julien HAMBUCKERS
- Q1 30 - [-] 5
GEST3032-1  eBusiness and eCommerce (english language) - Ashwin ITTOO
- Q1 30 - [-] 5
GBIO0002-1  Genetics and bioinformatics (english language) - Franck DEQUIEDT,
Kristel VAN STEEN - [15h Proj.]
- Q1 30 15 [+][-] 5
GBIO0009-1  Topics in bioinformatics (english language) - Kristel VAN STEEN -
[35h Proj.]
- Q1 25 15 [+][-] 5
GBIO0030-1  Computational approaches to statistical generics (english language) -
Kristel VAN STEEN - [35h Proj.]
- Q2 25 15 [+][-] 5

[...]
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.

Optional company internships

Notice : the course units ASTG9008-1 and ASTG9009-1 are mutually exclusive

ASTG9008-1  Internship (coupled with Master thesis) (english language) -
Pierre GEURTS - [80d FW]
- B2 TA - [-] 5
ASTG9009-1  Internship (independent of Master thesis) - Pierre GEURTS - [40d FW]
- B2 TA - [-] 10

Additional credits Master in Data Science Engineering (120 ECTS)

University of Liège - Academic Affairs Department
Date of data : 25/12/2022 - Page 2 / 3
Students who are admitted to this master without having acquired equivalent courses must add them to the programme of their first year.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Room</th>
<th>Credits</th>
<th>Credits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH0002-4</td>
<td>Mathematical analysis I</td>
<td>Eric DELHEZ</td>
<td>B0</td>
<td>Q1</td>
<td>22</td>
</tr>
<tr>
<td>MATH0002-4</td>
<td>Mathematical analysis I</td>
<td>Eric DELHEZ</td>
<td>Q1</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>MATH0013-1</td>
<td>Algebra</td>
<td>Eric DELHEZ</td>
<td>B0</td>
<td>Q1</td>
<td>26</td>
</tr>
<tr>
<td>MATH0013-1</td>
<td>Algebra</td>
<td>Eric DELHEZ</td>
<td>Q1</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>MATH0062-1</td>
<td>Elements of probability calculus</td>
<td>Pierre SACRÉ</td>
<td>B0</td>
<td>Q2</td>
<td>15</td>
</tr>
<tr>
<td>MATH0062-1</td>
<td>Elements of probability calculus</td>
<td>Pierre SACRÉ</td>
<td>Q2</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>MATH0487-2</td>
<td>Elements of statistics</td>
<td>Pierre SACRÉ</td>
<td>B0</td>
<td>Q1</td>
<td>15</td>
</tr>
<tr>
<td>MATH0487-2</td>
<td>Elements of statistics</td>
<td>Pierre SACRÉ</td>
<td>Q1</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>MATH0488-1</td>
<td>Elements of stochastic processes</td>
<td>Maarten ARNST, Vincent DENOEL, Pierre GEURTS</td>
<td>B0</td>
<td>Q2</td>
<td>10</td>
</tr>
<tr>
<td>MATH0488-1</td>
<td>Elements of stochastic processes</td>
<td>Maarten ARNST, Vincent DENOEL, Pierre GEURTS</td>
<td>Q2</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>MATH0006-3</td>
<td>Introduction to numerical analysis (english language)</td>
<td>Quentin LOUVEAUX</td>
<td>B0</td>
<td>Q1</td>
<td>20</td>
</tr>
<tr>
<td>MATH0006-3</td>
<td>Introduction to numerical analysis (english language)</td>
<td>Quentin LOUVEAUX</td>
<td>Q1</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>MECA0003-2</td>
<td>Rational Mechanics</td>
<td>Eric DELHEZ</td>
<td>B0</td>
<td>Q1</td>
<td>20</td>
</tr>
<tr>
<td>MECA0003-2</td>
<td>Rational Mechanics</td>
<td>Eric DELHEZ</td>
<td>Q1</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>SYST0002-2</td>
<td>Introduction to signals and systems</td>
<td>Guillaume DRION</td>
<td>B0</td>
<td>Q1</td>
<td>26</td>
</tr>
<tr>
<td>SYST0002-2</td>
<td>Introduction to signals and systems</td>
<td>Guillaume DRION</td>
<td>Q1</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>INFO2009-2</td>
<td>Introduction to computer science</td>
<td>Bernard BOIGELOT</td>
<td>B0</td>
<td>Q1</td>
<td>24</td>
</tr>
<tr>
<td>INFO2009-2</td>
<td>Introduction to computer science</td>
<td>Bernard BOIGELOT</td>
<td>Q1</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>MATH0006-3</td>
<td>Introduction to numerical analysis (english language)</td>
<td>Quentin LOUVEAUX</td>
<td>B0</td>
<td>Q1</td>
<td>20</td>
</tr>
<tr>
<td>MATH0006-3</td>
<td>Introduction to numerical analysis (english language)</td>
<td>Quentin LOUVEAUX</td>
<td>Q1</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>MECA0003-2</td>
<td>Rational Mechanics</td>
<td>Eric DELHEZ</td>
<td>B0</td>
<td>Q1</td>
<td>20</td>
</tr>
<tr>
<td>MECA0003-2</td>
<td>Rational Mechanics</td>
<td>Eric DELHEZ</td>
<td>Q1</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>SYST0002-2</td>
<td>Introduction to signals and systems</td>
<td>Guillaume DRION</td>
<td>B0</td>
<td>Q1</td>
<td>26</td>
</tr>
<tr>
<td>SYST0002-2</td>
<td>Introduction to signals and systems</td>
<td>Guillaume DRION</td>
<td>Q1</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>INFO0902-1</td>
<td>Data structures and algorithms</td>
<td>Pierre GEURTS</td>
<td>B0</td>
<td>Q2</td>
<td>26</td>
</tr>
<tr>
<td>INFO0902-1</td>
<td>Data structures and algorithms</td>
<td>Pierre GEURTS</td>
<td>Q2</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>INFO0009-2</td>
<td>Database (general organisation)</td>
<td>Christophe DEBRUYNE</td>
<td>B0</td>
<td>Q2</td>
<td>26</td>
</tr>
<tr>
<td>INFO0009-2</td>
<td>Database (general organisation)</td>
<td>Christophe DEBRUYNE</td>
<td>Q2</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>INFO8006-1</td>
<td>Introduction to artificial intelligence (english language)</td>
<td>Gilles LOUPPE</td>
<td>B0</td>
<td>Q1</td>
<td>25</td>
</tr>
<tr>
<td>INFO8006-1</td>
<td>Introduction to artificial intelligence (english language)</td>
<td>Gilles LOUPPE</td>
<td>Q1</td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>