School of Computer Science - The University of Manchester  
Programme Options

**Computer Science and Maths wIE BSc (Hons) options 2017-2018**

MANDATORY UNITS - 110 CREDITS  
OPTIONAL UNITS - 10 CREDITS

### Level 1 - compulsory units

All of the units in this pool are mandatory.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP10120</td>
<td>First Year Team Project</td>
<td>20</td>
</tr>
<tr>
<td>COMP16121</td>
<td>Object Oriented Programming with Java 1</td>
<td>20</td>
</tr>
<tr>
<td>COMP16212</td>
<td>Object Oriented Programming with Java 2</td>
<td>10</td>
</tr>
<tr>
<td>MATH10111</td>
<td>Foundations of Pure Mathematics B</td>
<td>15</td>
</tr>
<tr>
<td>MATH10131</td>
<td>Calculus and Vectors B</td>
<td>15</td>
</tr>
<tr>
<td>MATH10212</td>
<td>Linear Algebra</td>
<td>15</td>
</tr>
<tr>
<td>MATH10232</td>
<td>Calculus and Applications</td>
<td>15</td>
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### Level 1 - option pool 1

From this option pool choose 10 credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COMP11212</td>
<td>Fundamentals of Computation</td>
<td>10</td>
</tr>
<tr>
<td>COMP14112</td>
<td>Fundamentals of Artificial Intelligence</td>
<td>10</td>
</tr>
<tr>
<td>COMP18112</td>
<td>Fundamentals of Distributed Systems</td>
<td>10</td>
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</tbody>
</table>

### Level 2 options

MANDATORY UNITS - 70 CREDITS  
OPTIONAL UNITS - 50 CREDITS

### Level 2 - compulsory units

All of the units in this pool are mandatory.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
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</thead>
<tbody>
<tr>
<td>COMP23311</td>
<td>Software Engineering 1</td>
<td>10</td>
<td>Agile Methods</td>
</tr>
<tr>
<td>COMP23412</td>
<td>Software Engineering 2</td>
<td>10</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>COMP26120</td>
<td>Algorithms and Imperative Programming</td>
<td>20</td>
<td>Computer Languages</td>
</tr>
<tr>
<td>MATH20111</td>
<td>Real Analysis</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20142</td>
<td>Complex Analysis</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20201</td>
<td>Algebraic Structures 1</td>
<td>10</td>
<td>None</td>
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</table>

### Level 2 - option pool 1

From this option pool choose 10 credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP21111</td>
<td>Logic and Modelling</td>
<td>10</td>
<td>Rigorous Development</td>
</tr>
<tr>
<td>COMP23111</td>
<td>Fundamentals of Databases</td>
<td>10</td>
<td>Web and Distributed Systems</td>
</tr>
<tr>
<td>COMP24111</td>
<td>Machine Learning and Optimisation</td>
<td>10</td>
<td>Learning and Search in Artificial Intelligence</td>
</tr>
<tr>
<td>COMP25111</td>
<td>Operating Systems</td>
<td>10</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>COMP28411</td>
<td>Computer Networks</td>
<td>10</td>
<td>Mobile Computing and Networks</td>
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</table>

### Level 2 - option pool 2

From this option pool choose 10 credits.

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credits</th>
<th>Theme</th>
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</thead>
<tbody>
<tr>
<td>MATH10141</td>
<td>Probability 1</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20411</td>
<td>Partial Differential Equations and Vector Calculus B</td>
<td>10</td>
<td>None</td>
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</tbody>
</table>

### Level 2 - option pool 3

From this option pool choose 10 credits.

<table>
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<tr>
<th>Code</th>
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<th>Theme</th>
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</thead>
</table>
**Level 2 - option pool 4**

From this option pool choose 20 credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH20122</td>
<td>Metric Spaces</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20212</td>
<td>Algebraic Structures 2</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20302</td>
<td>Introduction to Logic</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20502</td>
<td>Fluid Mechanics</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20512</td>
<td>Classical Mechanics</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20602</td>
<td>Numerical Analysis 1</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20902</td>
<td>Discrete Mathematics</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>MATH20912</td>
<td>Introduction to Financial Mathematics</td>
<td>10</td>
<td>None</td>
</tr>
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</table>

**Level 3 options**

MANDATORY UNITS - 30 CREDITS

OPTIONAL UNITS - 90 CREDITS

You must register for the following

- A minimum of 50 COMP units (including the project)
- A minimum of 50 MATH units, of which at least 40 credits must be at level 3

The remaining 20 credits can be either COMP on level 3 or MATH on level 2 or 3.

Overall from the 120 credits, a minimum of 100 must be level 3

Please note that some combinations of course units may not be possible due to timetable clashes.

If you wish to enrol on optional units (COMP or MATH) that are not listed below you must have permission from the Programme Tutor - Dr Andrea Schalk.

**Level 3 - compulsory units**

All of the units in this pool are mandatory.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP30030</td>
<td>3rd Year Project (Joint Hons 30 Credits)</td>
<td>30</td>
<td>None</td>
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**Level 3 - option pool 1**

From this option pool choose a maximum of 40 credits and a minimum of 30 credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP31111</td>
<td>Verified Development</td>
<td>10</td>
<td>Rigorous Development</td>
</tr>
<tr>
<td>COMP31511</td>
<td>User Experience</td>
<td>10</td>
<td>Interactive Systems Design</td>
</tr>
<tr>
<td>COMP33711</td>
<td>Agile Software Engineering</td>
<td>10</td>
<td>Agile Methods</td>
</tr>
<tr>
<td>COMP33812</td>
<td>Software Evolution</td>
<td>10</td>
<td>Agile Methods</td>
</tr>
<tr>
<td>COMP34120</td>
<td>AI and Games</td>
<td>20</td>
<td>Learning and Search in Artificial Intelligence</td>
</tr>
<tr>
<td>COMP34412</td>
<td>Natural Language Systems</td>
<td>10</td>
<td>Natural Language, Representation and Reasoning</td>
</tr>
<tr>
<td>COMP35112</td>
<td>Chip Multiprocessors</td>
<td>10</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>COMP36111</td>
<td>Advanced Algorithms 1</td>
<td>10</td>
<td>Programming and Algorithms</td>
</tr>
<tr>
<td>COMP36212</td>
<td>Advanced Algorithms 2</td>
<td>10</td>
<td>Programming and Algorithms</td>
</tr>
<tr>
<td>COMP36512</td>
<td>Compiler</td>
<td>10</td>
<td>Computer Languages</td>
</tr>
<tr>
<td>COMP37111</td>
<td>Advanced Computer Graphics</td>
<td>10</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>COMP37212</td>
<td>Computer Vision</td>
<td>10</td>
<td>Visual Computing</td>
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<tr>
<td>COMP38120</td>
<td>Documents, Services and Data on the Web</td>
<td>20</td>
<td>Web and Distributed Systems</td>
</tr>
<tr>
<td>COMP38411</td>
<td>Cryptography and Network Security</td>
<td>10</td>
<td>Mobile Computing and Networks</td>
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<tr>
<td>COMP39112</td>
<td>Quantum Computing</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>COMP32412</td>
<td>The Internet of Things: Architectures and Applications</td>
<td>10</td>
<td>Web and Distributed Systems</td>
</tr>
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</table>

**Level 3 - option pool 2**

From this option pool choose a maximum of 70 credits and a minimum of 40 credits.
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Theme</th>
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</thead>
<tbody>
<tr>
<td>MATH30002</td>
<td>Mathematics Education</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH31001</td>
<td>Linear Analysis</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH31052</td>
<td>Topology</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH32001</td>
<td>Group Theory</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH32011</td>
<td>Commutative Algebra</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH32032</td>
<td>Coding Theory</td>
<td>10</td>
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<tr>
<td>MATH32051</td>
<td>Hyperbolic Geometry</td>
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<tr>
<td>MATH32062</td>
<td>Introduction to Algebraic Geometry</td>
<td>10</td>
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<tr>
<td>MATH32072</td>
<td>Number Theory</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH33011</td>
<td>Mathematical Logic</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH34001</td>
<td>Applied Complex Analysis</td>
<td>10</td>
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<tr>
<td>MATH34011</td>
<td>Asymptotic Expansions and Perturbation Methods</td>
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<tr>
<td>MATH35032</td>
<td>Mathematical Biology</td>
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<td>MATH36001</td>
<td>Matrix Analysis</td>
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<tr>
<td>MATH36032</td>
<td>Problem Solving by Computer</td>
<td>10</td>
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<tr>
<td>MATH36061</td>
<td>Convex Optimisations</td>
<td>10</td>
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<tr>
<td>MATH39001</td>
<td>Combinatorics and Graph Theory</td>
<td>10</td>
<td>None</td>
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<tr>
<td>MATH39032</td>
<td>Mathematical Modelling in Finance</td>
<td>10</td>
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