UNDERGRADUATE COURSE HANDBOOK

PARTS A & B

For students entering the second year of their course in 2021

Computer Science
Computer Science & Philosophy
Mathematics & Computer Science

2021

Version 1
Welcome

This is a supplement to the Computer Science Handbook. It is designed to give you all the course-specific information you will need in your second and third years, complete with all important deadlines.

Please don’t hesitate to get in touch with one of the academic admin staff at academic.administrator@cs.ox.ac.uk if you have any questions.
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Disclaimer
This handbook supplement applies to students entering the second year of their degree in Computer Science, Mathematics & Computer Science or Computer Science & Philosophy in Michaelmas term 2021. The information in this handbook may be different for students starting their second year in other years.

The Examination Regulations relating to this course will be available online at https://examregs.admin.ox.ac.uk/.

If there is a conflict between information in this handbook and the Examination Regulations then you must follow the Examination Regulations. If you have any concerns please contact the academic admin team at academic.administrator@cs.ox.ac.uk.

The information in this handbook is accurate as at October 2021. It may be necessary for changes to be made in certain circumstances, as explained at www.ox.ac.uk/coursechanges webpage. If such changes are made the department will publish a new version of this handbook, together with a list of the changes, and you will be informed.

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1 Courses

Please find information on Course Aims and Intended Learning Outcomes for each degree in the Undergraduate Course Handbook for the Preliminary Examinations.

For all undergraduate courses, you will have been entered initially for the 4-year degree, and will need to decide early in your third year whether you wish to carry on into the fourth year or leave at the end of the third year with a BA.

Please note that each third year course in Computer Science will require about 10 hours of study a week.

1.1 Computer Science

The Department of Computer Science offers the following degrees in Computer Science at undergraduate level:

- BA – Computer Science, 3-year
- MCompSci – Computer Science, 4-year

1.1.1 Second and third years

Synopses for all courses can be found at www.cs.ox.ac.uk/teaching/courses/.

Second-year Computer Science candidates will take four core subjects and four optional subjects from Schedules A1 and A2. The four core subjects in Schedule A1 are:

- Compilers
- Concurrent Programming
- Algorithms and Data Structures
- Models of Computation

The list of courses in Schedule A2 can be found at www.cs.ox.ac.uk/teaching/bacompsci/PartA/. These eight courses will be examined at the end of your second year.

In the third year you are required to take a total of six optional courses from Schedules B1 and B2 (with no more than two from Schedule B2). The list of courses in Schedules B1 and B2 can be found at https://www.cs.ox.ac.uk/teaching/bacompsci/PartB/. These six courses will be examined at the end of your third year. You will not be able to offer an optional subject in Part B that you have already offered in Part A of the examination.

Please take any Trinity Term courses in your second year. They will be examined in your third year, with your options for Part B.

The examination papers will have three questions, and you may attempt two of them. In finals papers, questions are marked out of 25. The marks for each part of each question will be indicated on the examination paper.
In the third year you are also required to submit a project report. The third-year project counts as three courses. Please find more information on Computer Science Projects here.
1.2  **Mathematics & Computer Science**

The Department of Computer Science offers the following joint degrees with the Department of Mathematics:

- BA – Mathematics and Computer Science, 3-year
- MMathCompSci – Mathematics and Computer Science, 4-year

1.2.1  **Second and Third years**

Second year Mathematics and Computer Science students take the following Maths papers:

- A0 Linear Algebra
- A2 Metric Spaces and Complex Analysis

In addition, you must offer either two papers from A3-A5, A7-A11 or one paper from A3-A5, A7-A11 and paper ASO.

- A3 Rings and Modules
- A4 Integration
- A5 Topology
- A7 Numerical Analysis
- A8 Probability
- A9 Statistics
- A10 Fluids and Waves
- A11 Quantum Theory
- ASO Short Options

You must also take the two core Computer Science courses:

- Algorithms and Data Structures
- Models of Computation

In addition, you must offer two optional subjects from Schedules A1(M&CS) and A2(M&CS). A list of courses on this schedules can be found here: [https://www.cs.ox.ac.uk/teaching/mcs/PartA/](https://www.cs.ox.ac.uk/teaching/mcs/PartA/)

These courses will be examined at the end of the second year.

It is particularly important to choose courses in your second year that will lead on to the options that you wish to take in the third year, especially if you want to spend more than half of your time on Maths courses in the third year. You should consult your college tutor for advice about this.

Please take any Trinity Term courses in your second year. They will be examined in your third year, with your options for Part B.

In your **third year, for Computer Science**, you must offer eight optional subjects from Schedules B1(M&CS), B2(M&CS) subject to the conditions that:
You must offer at least two subjects from Schedule B1(M&CS).

You must offer at least two subjects from Schedule B2(M&CS).

You will not be able to offer an optional subject in Part B that you have already offered in Part A of the examination. You can find a list of the courses on Schedules B1(M&CS) and B2(M&CS) on the Computer Science website: https://www.cs.ox.ac.uk/teaching/mcs/PartB/

Synopses for Computer Science courses can be found at www.cs.ox.ac.uk/teaching/courses/.

Synopses for Mathematics courses can be found at https://courses.maths.ox.ac.uk/overview/undergraduate.
1.3 **Computer Science and Philosophy**

The Department of Computer Science offers the following joint degrees with the Faculty of Philosophy:

- BA – Computer Science and Philosophy, 3-year
- MCompPhil – Computer Science and Philosophy, 4-year

### 1.3.1 Second and Third Years

As well as the two Computer Science Part A core courses, you have to take an equivalent of 14 option "course-equivalents", with at least four from Computer Science, and at least six from Philosophy. The remaining four may be chosen from either discipline without restriction. Each Philosophy option is worth two "course-equivalents" and each Computer Science option is worth one. The possible combinations are:

- four Computer Science options and five Philosophy options;
- six Computer Science options and four Philosophy options;
- eight Computer Science options and three Philosophy options.

**Computer Science**

In the second year of the degree you are required to take the core Computer Science subjects:

- **Algorithms and Data Structures**
- **Models of Computation**

In addition, you must offer at least two and no more than four optional subjects from Schedules A1(CS&P) and A2(CS&P). These courses will also be examined at the end of your second year. You can find a list of the courses on Schedules A1(CS&P) and A2(CS&P) on the Computer Science website: [https://www.cs.ox.ac.uk/teaching/csp/PartA/](https://www.cs.ox.ac.uk/teaching/csp/PartA/)

These core and optional subjects will be examined at the end of your second year, in your **Part A** examination.

Please take any Trinity Term courses in your second year. They will be examined in your third year, with your options for Part B.

In your third year, for your **Part B** examination, you must choose between two and six Computer Science courses from Schedules B1(CS&P) and B2(CS&P), which you can find on the Computer Science website: [https://www.cs.ox.ac.uk/teaching/csp/PartB/](https://www.cs.ox.ac.uk/teaching/csp/PartB/) You will also take three, four or five Philosophy courses, from [this list of courses.](#)
You will also be able to offer a Philosophy thesis as specified in the Regulations for Philosophy in all Honour Schools including Philosophy (subject 199).

Please note that you can not offer more than two subjects from Schedule B2(CS&P) and that you must offer at least two Philosophy subjects from 101, 102, 103, 104, 108, 122, 124, 125, and 127.

You can find details of Philosophy courses on the Philosophy Faculty Website.

Note that each Philosophy option is twice the weight of a Computer Science option.

You will not be able to offer an optional subject in Part B that you have already offered in Part A of the examination.
2 **Group Design Practical**

The second year course also includes a group design practical as part of the practical requirements for the year. This will allow you to practise the skills you learnt in the core programming courses, and to begin to develop a range of further skills including team-working, project and time management, and presentation skills.

The group design practical is intended to take you 20-30 hours, mainly during Hilary term. There will be a briefing meeting early in Hilary term, setting out the aims and format of the exercise and listing several possible problems to tackle. You will then be allocated to a team of around 5 people to work on one particular problem together. Each team will be allocated a member of staff to act as a supervisor, and will have three meetings with their supervisor during the project.

The first meeting with the supervisor will take place at the beginning of Hilary term, where the group will present a specification and project plan.

The second meeting with the supervisor will take place in Hilary term: the group will present their initial module implementations and test results.

The third meeting will take place in Trinity term: the group will demonstrate their product and deliver a brief final report. Each student will also deliver to the supervisor a one-page summary of their individual contribution.

Finally, the groups will present their work to students, members of the Department, and guests, and prizes will be presented.

The final group report and summary of individual contribution will be assessed as S+, S, Pass or Fail. The group design practical counts as one-third of the total practical mark for the second year and candidates are required to achieve at least a Pass. Your supervisor will submit your group report and the summary of your individual contribution to the Examiners to be considered along with your other practical reports.
3 Examinations for Parts A and B

3.1 Computer Science

The examinations for Part A will be sat at the end of your second year:

Concurrent Programming, Algorithms and Models of Computation will each be examined by a 2 hour written examination.

Compilers will be examined by an assessed practical (35% of the marks) and a 2 hour written examination (65%). Instructions for the assessed practical will be handed out on Friday in week 8 of Michaelmas term, and the practical report must be uploaded to Inspera by noon on Friday of week 2 of Hilary term. The assessed practical will incorporate and extend elements of the lab exercises that were set during term. As always, the work you submit must be your own, except where explicitly acknowledged.

Examinations of the optional subjects will be two hours long with three questions, and you may attempt two of them. In finals papers, questions are marked out of 25. The marks for each part of each question will be indicated on the examination paper.

Appendix A of the Course Handbook sets out the standards that are expected in this regard. Please see also the University’s guidelines for academic good practice.

The examinations for Part B will be sat at the end of your third year.

The examination papers will be two hours long with three questions, and you may attempt two of them. In finals papers, questions are marked out of 25. The marks for each part of each question will be indicated on the examination paper.

In the third year you are also required to submit a project report.

3.2 Mathematics & Computer Science

The examinations for Part A will be sat at the end of your second year:

Second year Mathematics and Computer Science students take the following Maths papers:

A0 Linear Algebra (1.5 hours). This paper includes three questions and you should answer two; each question is marked out of 25.
A2 Metric Spaces and Complex Analysis (3 hours). This paper includes six questions and you should answer four. The best four questions count towards a candidate’s total mark for the paper.

In addition, candidates must offer either two papers from papers A3-A5, A7-A11, ASO.

You must also take two core Computer Science courses: Algorithms and Models of Computation, and two optional Computer Science subjects.

The examinations for Part B will be sat at the end of your third year

In your third year, for Computer Science, you must offer eight optional subjects from Schedules B1(M&CS), B2(M&CS) subject to the conditions that:

- You must offer at least two subjects from Schedule B1(M&CS).
- You must offer at least two subjects from Schedule B2(M&CS).

For Computer Science Part B at the end of your third year, the examination papers will be two hours long with three questions, and you may attempt two of them. In finals papers, questions are marked out of 25. The marks for each part of each question will be indicated on the examination paper. The Compilers course will be examined by assessed practical and written paper as for Computer Science (see above).

3.3 Computer Science and Philosophy

The examinations for Part A will be sat at the end of your second year:

Second year Computer Science and Philosophy students are examined on the two Computer Science Part A core courses (Algorithms and Models of Computation) and at least two, but not more than four optional subjects at the end of their second year.
The examinations for Part B will be sat at the end of your third year.

You have to take an equivalent of 14 option "course-equivalents", with at least four from Computer Science, and at least six from Philosophy, as outlined above.

Your Computer Science options will be examined in your Part B examination at the end of your third year. The examination papers will be 2-hours long three questions, and you may attempt two of them. In finals papers, questions are marked out of 25. The marks for each part of each question will be indicated on the examination paper. The Compilers course will be examined by assessed practical and written paper as for Computer Science (see above).

Your Philosophy options will also be examined in your Part B examination.
4 Important Dates

4.1 Dates of term 2021-22:

Michaelmas term: Sunday 10th October 2021 – Saturday 4th December 2021
Hilary term: Sunday 16th January 2022 – Saturday 12th March 2022
Trinity term: Sunday 24th April 2022 – Saturday 18th June 2022

Dates of Full Term for future years are available on the University’s website.

4.2 Hand-In Dates – Practicals and Project Reports

Practicals reports

By noon on Friday of week 5, Trinity term (to Inspera)

2nd Year Compilers Practical Assignment

By noon on Friday of week 2, Hilary term (to Inspera)

2nd Year Group Design Practical

Final Report – By Friday of week 2, Trinity term – you can find more information on the Department’s website.
Presentation – Week 3, Trinity term – day to be confirmed.

3rd Year Computer Science Project Report

By noon on Monday of week 4, Trinity term (to Inspera).
## 5  Recommended Patterns of Teaching

Please compare the [list of courses on the Departmental Website](#). If in doubt, please refer to the website.

### 5.1  Computer Science

<table>
<thead>
<tr>
<th>Paper</th>
<th>Term</th>
<th>Faculty</th>
<th>College</th>
<th>Comments</th>
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<tr>
<td>Core courses</td>
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<tr>
<td>1. Models of Computation</td>
<td>MT</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Compilers</td>
<td>MT</td>
<td>16</td>
<td>4</td>
<td>This course also has practicals.</td>
</tr>
<tr>
<td>3. Concurrent Programming</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td>This course also has practicals.</td>
</tr>
<tr>
<td>4. Algorithms and Data Structures</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5. Group Design Practical</td>
<td>HT/TT</td>
<td>7</td>
<td></td>
<td>6-7 one-hour seminars on software engineering/testing/working in teams and version control</td>
</tr>
</tbody>
</table>

Students are required to take 10 optional subjects over the course of the second and third years, to be examined at the end of the third year. The recommendation is that they take four of these in the second year.

<table>
<thead>
<tr>
<th>Optional courses</th>
<th>Term</th>
<th>Faculty</th>
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</tr>
<tr>
<td>Computer Aided-Formal Verification</td>
<td>MT</td>
<td>16</td>
<td>4</td>
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<tr>
<td>Computer Graphics</td>
<td>HT</td>
<td>16</td>
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<td>This course also has practicals.</td>
</tr>
<tr>
<td>Databases</td>
<td>MT</td>
<td>16</td>
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<td>This course also has practicals.</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
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<td>This course also has practicals.</td>
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<tr>
<td>Machine Learning</td>
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<tr>
<td>Principles of Programming Languages</td>
<td>MT</td>
<td>16</td>
<td>4</td>
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<tr>
<td>Computational Complexity</td>
<td>HT</td>
<td>16</td>
<td>6</td>
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<td>Computer Architecture</td>
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</tr>
<tr>
<td>Computers in Society</td>
<td>HT</td>
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<td>MT</td>
<td>16</td>
<td>4</td>
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</tr>
<tr>
<td>Knowledge Representation &amp; Reasoning</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lambda Calculus and Types</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
### Design and Analysis of Operating Systems
- **Term**: HT
- **Faculty**: 16
- **Class**: 4
- **Comments**: This course also has practicals.

### Quantum Information
- **Term**: HT
- **Faculty**: 16
- **Class**: 4

### Logic and Proof
- **Term**: TT
- **Faculty**: 16
- **Class**: 4

### Concurrency
- **Term**: TT
- **Faculty**: 16
- **Class**: 4
- **Comments**: This course also has practicals.

### Computer Networks
- **Term**: TT
- **Faculty**: 16
- **Class**: 4

### Notes:
- Second year core courses are accompanied by tutorials organised by colleges; the norm is 4 45-minute tutorials.
- Problem classes will be organised centrally for the computer science optional courses, although colleges may alternatively organise tutorials. The group design practical, which is part of the practical requirements for the year, is intended to take 20-30 hours, mainly during Hilary term (with some work in Trinity term).
- Students are also required to undertake a Computer Science Project in the 3rd year which is expected to take about a third of the year.

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### 5.2 Mathematics and Computer Science

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<td>MT</td>
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<td><strong>Core Mathematics courses</strong></td>
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<td>A0 Linear Algebra</td>
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<td>A2 Metric Spaces and Complex Analysis</td>
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<td>Computer Architecture</td>
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<td>Concurrent Programming</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td>This course has practicals.</td>
</tr>
<tr>
<td>Knowledge Representation &amp; Reasoning</td>
<td>HT</td>
<td>16</td>
<td>4</td>
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</tr>
<tr>
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<td>16</td>
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</tr>
</tbody>
</table>
Computer Networks | TT | 16 | 4 | This course has practicals.
Design and Analysis of Operating Systems | HT | 16 | 4

**Mathematics Options B**

| B1.1 – B8.5 | MT/HT | 16 | 6 |

**Notes:**
- Second year core courses are accompanied by tutorials organised by colleges; the norm is 4 45-minute tutorials.
- Problem classes will be organised centrally for the computer science optional courses, although colleges may alternatively organise tutorials.
- The group design practical, which is part of the practical requirements for the year, is intended to take 20-30 hours, mainly during Hilary term (with some work in Trinity term).

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### 5.3 Computer Science and Philosophy

<table>
<thead>
<tr>
<th>Paper</th>
<th>Term</th>
<th>Faculty</th>
<th>College</th>
<th>Comments</th>
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<tbody>
<tr>
<td><strong>Core courses</strong></td>
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<tr>
<td>1. Models of Computation</td>
<td>MT</td>
<td>16</td>
<td>4</td>
<td></td>
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<tr>
<td>2. Algorithms and Data Structures</td>
<td>HT</td>
<td>16</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3. Group Design Practical</td>
<td>HT/TT</td>
<td>7</td>
<td>6-7 one-hour seminars on software engineering/testing/working in teams and version control</td>
<td></td>
</tr>
</tbody>
</table>

Students are required to take 10 optional subjects over the course of the second and third years, to be examined at the end of the third year. The recommendation is that they take four of these in the second year.

**Computer Science options**

<p>| Mathematics for Computer Science and Philosophy | MT | 17 | 4 | |
| Computer Security | MT | 16 | 4 | This course also has practicals.|
| Computer Aided-Formal Verification | MT | 16 | 4 | This course also has practicals.|
| Computer Graphics | HT | 16 | 4 | This course also has practicals.|
| Databases | MT | 16 | 4 | This course also has practicals.|
| Artificial Intelligence | HT | 16 | 4 | This course also has practicals.|
| Machine Learning | MT | 20 | 4 | This course also has practicals.|
| Principles of | MT | 16 | 4 | |</p>
<table>
<thead>
<tr>
<th>Course</th>
<th>Period</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Languages</td>
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<tr>
<td>Computational Complexity</td>
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<tr>
<td>Computer Architecture</td>
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<tr>
<td>Computer in Society</td>
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<td>Database Systems Implementation</td>
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<td>Geometric Modelling</td>
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<tr>
<td>B8.4 Information Theory</td>
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<td>Taught by the Mathematics Institute</td>
</tr>
<tr>
<td>B1.2 Set Theory</td>
<td></td>
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