

DEPARTMENT OF COMPUTER SCIENCE

Student Handbook 2020-21 / Appendix B / Postgraduate Taught Contents

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CSMS MSc Computer Science

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Students follow either Full-Time Pathway of one-year duration, or Part-Time Pathway of minimum of two years and maximum of six years duration.

Structure

Year 1 Semester 1

Full-time:

The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.

At least 90 credits of the 120 taught credits available in the first two semesters must comprise level '7' modules. The remaining 30 may include selected level 6 modules with the proviso that a graduates of the University of Liverpool cannot elect to take a level 6 module if they have already taken that module as part of their undergraduate study.

Part-time:

From the set of taught modules available for full-time pathway students select modules totalling 120 credit points over period of minimum of two years and maximum of six years. The particular choice of modules over the years and semesters may be arbitrary provided the pre-requisites and conditions specified for full-time mode are satisfied. The further 60 credit points come from COMP702 (MSc Final Project) which is undertaken over the summer semester after all 120 credit points of taught modules are collected.

Note: for the part-time pathway the department cannot guarantee availability of modules for the whole duration of the programme. If a module becomes unavailable then it will be substituted by an alternative module in accordance with a modified programme specification or by approval of the appropriate Director of Studies.

Year 1 Semester 1 Full-time

Code	Module	Credit	Level	Type	Pathway(s)
COMP518	Database and Information Systems 2020-21	15	Level 7	Required	
COMP517	Programming Fundamentals 2020-21	15	Level 7	Required	

COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
COMP519	Web Programming 2020-21	15	Level 7	Required	

Year 1 Semester 1 Part-time

Code	Module	Credit	Level	Type	Pathway(s)
COMP518	Database and Information Systems 2020-21	15	Level 7	Optional	
COMP517	Programming Fundamentals 2020-21	15	Level 7	Optional	

Year 1 Semester 2

Full-time:

The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.

At least 90 credits of the 120 taught credits available in the first two semesters must comprise level '7' modules. The remaining 30 may include selected level 6 modules with the proviso that a graduates of the University of Liverpool cannot elect to take a level 6 module if they have already taken that module as part of their undergraduate study.

Part-time:

From the set of taught modules available for full-time pathway students select modules totalling 120 credit points over period of minimum of two years and maximum of six years. The particular choice of modules over the years and semesters may be arbitrary provided the pre-requisites and conditions specified for full-time mode are satisfied. The further 60 credit points come from COMP702 (MSc Final Project) which is undertaken over the summer semester after all 120 credit points of taught modules are collected.

Note: for the part-time pathway the department cannot guarantee availability of modules for the whole duration of the programme. If a module becomes unavailable then it will be substituted by an alternative module in accordance with a modified programme specification or by approval of the appropriate Director of Studies.

Year 1 Semester 2 Full-time

- Options totalling 60 credits from the following ten modules provided pre-requisites are satisfied.
- No more than 30 credits of level 6 modules can be selected.

Code	Module	Credit	Level	Type	Pathway(s)
COMP526	APPLIED ALGORITHMIC 2020-21	15	Level 7	Optional	
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	

COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2020-21	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2020-21	15	Level 6	Optional	
COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	
COMP315	TECHNOLOGIES FOR E-COMMERCE 2020-21	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2020-21	15	Level 7	Optional	

Year 1 Semester 2 Part-time

Options totalling 30 credits from the following modules provided pre-requisites are satisfied.

Code	Module	Credit	Level	Type	Pathway(s)
COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	

Year 1 Semester 2 Part-time - Other Optional Modules

1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.
2. No more than 30 credits of level 6 modules can be selected.

Code	Module	Credit	Level	Type	Pathway(s)
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2020-21	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2020-21	15	Level 6	Optional	
COMP315	TECHNOLOGIES FOR E-COMMERCE 2020-21	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2020-21	15	Level 7	Optional	

Year 1 Semester 3

Full-time students.

COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.

Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	

Year 2 Semester 1

Part-time students only.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP516	Research Methods in Computer Science 2021-22	15	Level 7	Required	
COMP519	Web Programming 2021-22	15	Level 7	Required	
Year 2 Semester 2					
Part-time students only.					
Options totalling 30 credits from the following modules provided pre-requisites are satisfied.					
Only 30 credits at level 6 can be selected.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP526	APPLIED ALGORITHMIC 2021-22	15	Level 7	Optional	
COMP575	Computational Intelligence 2021-22	15	Level 7	Optional	
COMP527	Data Mining and Visualisation 2021-22	15	Level 7	Optional	
Year 2 Semester 2 - Other Optional Modules					
1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.					
2. No more than 30 credits of level 6 modules can be selected.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP532	Machine Learning and BioInspired Optimisation 2021-22	15	Level 7	Optional	
COMP530	MSc Group Project 2021-22	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2021-22	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2021-22	15	Level 6	Optional	
COMP315	TECHNOLOGIES FOR E-COMMERCE 2021-22	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2021-22	15	Level 7	Optional	
Year 2 Semester 3					
Part-time students only.					
COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2021-22	60	Level 7	Required	

CSAD MSc Advanced Computer Science

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Students follow either Full-Time Pathway of one-year duration, or Part-Time Pathway of minimum of two years and maximum of six years duration.

Structure

Year 1 Semester 1

Full-time:

The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.

At least 90 credits of the 120 taught credits available in the first two semesters must comprise level '7' modules. The remaining 30 may include selected level 6 modules with the proviso that a graduates of the University of Liverpool cannot elect to take a level 6 module if they have already taken that module as part of their undergraduate study.

Part-time:

From the set of taught modules available for full-time pathway students select modules totalling 120 credit points over period of minimum of two years and maximum of six years. The particular choice of modules over the years and semesters may be arbitrary provided the pre-requisites and conditions specified for full-time mode are satisfied. The further 60 credit points come from COMP702 (MSc Final Project) which is undertaken over the summer semester after all 120 credit points of taught modules are collected.

Note: for the part-time pathway the department cannot guarantee availability of modules for the whole duration of the programme. If a module becomes unavailable then it will be substituted by an alternative module in accordance with a modified programme specification or by approval of the appropriate Director of Studies.

Year 1 Semester 1 Full-time

- Options totalling 45 credits from the following modules provided pre-requisites are satisfied.
- Please note that ELEC415 and ELEC319 must be taken as a pair.
- No more than 30 credits of level 6 optional modules can be selected.
- Each full-time PGT student is required to take 180 credits in total, including the project module.

Code	Module	Credit	Level	Type	Pathway(s)
COMP523	Advanced Algorithmic Techniques 2020-21	15	Level 7	Optional	

ENVS563	GEOGRAPHIC DATA SCIENCE 2020-21	15	Level 7	Optional	
ELEC319	IMAGE PROCESSING 2020-21	7.5	Level 6	Optional	
COMP521	Knowledge Representation 2020-21	15	Level 7	Optional	
COMP528	Multi-Core and Multi-Processor Programming 2020-21	15	Level 7	Optional	
COMP557	Optimisation 2020-21	15	Level 7	Optional	
COMP522	Privacy and Security 2020-21	15	Level 7	Optional	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	

Year 1 Semester 1 Part-time

Plus options totalling 15 to 30 credits from the following modules provided pre-requisites are satisfied (60 credits needed for the year).

Code	Module	Credit	Level	Type	Pathway(s)
COMP521	Knowledge Representation 2020-21	15	Level 7	Optional	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	

Year 1 Semester 1 Part-time - Other Optional Modules

1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.
2. Please note that ELEC415 and ELEC319 must be taken as a pair.

Code	Module	Credit	Level	Type	Pathway(s)
ENVS563	GEOGRAPHIC DATA SCIENCE 2020-21	15	Level 7	Optional	
ELEC319	IMAGE PROCESSING 2020-21	7.5	Level 6	Optional	
COMP557	Optimisation 2020-21	15	Level 7	Optional	

Year 1 Semester 2

 Full-time:

The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.

At least 90 credits of the 120 taught credits available in the first two semesters must comprise level '7' modules. The remaining 30 may include selected level 6 modules with the proviso that a graduates of the University of Liverpool cannot elect to take a level 6 module if they have already taken that module as part of their undergraduate study.

 Part-time:

From the set of taught modules available for full-time pathway students select modules totalling 120 credit points over period of minimum of two years and maximum of six years. The particular choice of modules over the years and semesters may be arbitrary provided the pre-requisites and conditions specified for full-time mode are satisfied. The further 60 credit points come from COMP702 (MSc Final Project) which is undertaken over the summer semester after all 120 credit points of taught modules are collected.

Note: for the part-time pathway the department cannot guarantee availability of modules for the whole duration of the programme. If a module becomes unavailable then it will be substituted by an alternative module in accordance with a modified programme specification or by approval of the appropriate Director of Studies.

Year 1 Semester 2 Full-time

- Options totalling 60 credits from the following modules provided pre-requisites are satisfied.
- Please note that ELEC415 and ELEC319 must be taken as a pair.
- No more than 30 credits of level 6 optional modules can be selected.
- Each full-time student must be registered for 180 credits in total, which includes the project module.

Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Optional	
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Optional	
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	
ELEC415	INFORMATION THEORY AND CODING 2020-21	7.5	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2020- 21	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2020-21	15	Level 6	Optional	
COMP525		15	Level 7	Optional	
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	
COMP315	TECHNOLOGIES FOR E- COMMERCE 2020-21	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2020-21	15	Level 7	Optional	

Year 1 Semester 2 Part-time

Plus options totalling 15 to 30 credits from the following modules provided pre-requisites are satisfied (60 credits needed for the year)

Code	Module	Credit	Level	Type	Pathway(s)
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COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	

Year 1 Semester 2 Part-time - Other Optional Modules

1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.
2. Please note that ELEC415 and ELEC319 must be taken as a pair.
3. No more than 30 credits of level 6 optional modules can be selected.

Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Optional	
ELEC415	INFORMATION THEORY AND CODING 2020-21	7.5	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2020- 21	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2020-21	15	Level 6	Optional	
COMP315	TECHNOLOGIES FOR E- COMMERCE 2020-21	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2020-21	15	Level 7	Optional	

Year 1 Semester 3

Full-time students only.

Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	

Year 2 Semester 1

Part-time students only.

Options totalling 30 credits from the following modules provided pre-requisites are satisfied (60 credits needed for the year).

Code	Module	Credit	Level	Type	Pathway(s)
COMP523	Advanced Algorithmic Techniques 2021-22	15	Level 7	Optional	
COMP528	Multi-Core and Multi- Processor Programming 2021-22	15	Level 7	Optional	

Year 2 Semester 1 - Other Optional Modules

1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.
2. Please note that ELEC415 and ELEC319 must be taken as a pair.

Code	Module	Credit	Level	Type	Pathway(s)
ENVS563	GEOGRAPHIC DATA SCIENCE 2021-22	15	Level 7	Optional	
ELEC319	IMAGE PROCESSING 2021-22	7.5	Level 6	Optional	
COMP557	Optimisation 2021-22	15	Level 7	Optional	

Year 2 Semester 2

Part-time students only.

Plus options totalling 30 credits from the following modules provided pre-requisites are satisfied (60 credits needed for the year).

Code	Module	Credit	Level	Type	Pathway(s)
COMP526	APPLIED ALGORITHMICS 2021-22	15	Level 7	Optional	
COMP575	Computational Intelligence 2021-22	15	Level 7	Optional	
COMP527	Data Mining and Visualisation 2021-22	15	Level 7	Optional	

Year 2 Semester 2 - Other Optional Modules

1. Unfortunately no timetabling availability can be guaranteed for the following optional modules.
2. Please note that ELEC415 and ELEC319 must be taken as a pair.
3. No more than 30 credits of level 6 optional modules can be selected.

Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2021-22	15	Level 7	Optional	
ELEC415	INFORMATION THEORY AND CODING 2021-22	7.5	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2021-22	15	Level 7	Optional	
COMP530	MSc Group Project 2021-22	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2021- 22	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2021-22	15	Level 6	Optional	
COMP315	TECHNOLOGIES FOR E- COMMERCE 2021-22	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2021-22	15	Level 7	Optional	

Year 2 Semester 3

Part-time students only.

COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.

Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2021-22	60	Level 7	Required	

CSAI MSc Advanced Computer Science with a Year in Industry

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Note: for the part-time pathway the department cannot guarantee availability of modules for the whole duration of the programme. If a module becomes unavailable then it will be substituted by an alternative module in accordance with a modified programme specification or by approval of the appropriate Director of Studies.

Structure					
<p>Year 1 Semester 1</p> <p>The programme MSc in Advanced Computer Science with a Year in Industry is divided into two equally weighted years (years 1 and 2). The first year runs concurrently with the normal first and second undergraduate semesters, and comprises taught modules to a total of 60 credits per semester (120 credits in total). The placement takes place in the second year typically running concurrently with the normal first and second undergraduate semesters. This counts for a further 120 credits, making a total of 240 credits over the two year period.</p> <p>At least 90 credits of the 120 taught credits available in the first two semesters must comprise level 'M' modules. The remaining 30 may include selected level 3 modules, taken from the Department's 3rd year module list, with the proviso that a graduate of the University of Liverpool cannot elect to take a level three module if they have already taken that module as part of their undergraduate study.</p>					
<p>Year 1 Semester 1 Year in Industry</p> <ol style="list-style-type: none"> Options totalling 45 credits from the following modules provided pre-requisites are satisfied. Please note that ELEC415 and ELEC319 must be taken as a pair). No more than 30 credits of level 6 optional modules can be selected. Each Year in Industry student must be registered for 120 credits in Year 1 and 120 credits in Year 2 (i.e. 240 credits in total). 					
Code	Module	Credit	Level	Type	Pathway(s)
COMP523	Advanced Algorithmic Techniques 2020-21	15	Level 7	Optional	
ENVS563	GEOGRAPHIC DATA SCIENCE 2020-21	15	Level 7	Optional	
ELEC319	IMAGE PROCESSING 2020-21	7.5	Level 6	Optional	
COMP521	Knowledge Representation 2020-21	15	Level 7	Optional	
COMP528	Multi-Core and Multi-Processor Programming 2020-21	15	Level 7	Optional	
COMP557	Optimisation 2020-21	15	Level 7	Optional	
COMP522	Privacy and Security 2020-21	15	Level 7	Optional	

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COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
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Year 1 Semester 2

Year 1 Semester 2 Year in Industry

1. Options totalling 60 credits from the following modules provided pre-requisites are satisfied.
2. Please note that ELEC415 and ELEC319 must be taken as a pair.
3. No more than 30 credits of level 6 optional modules can be selected.
4. Each Year in Industry student must be registered for 120 credits in Year 1 and 120 credits in Year 2 (i.e. 240 credits in total).

Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Optional	
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Optional	
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	
ELEC415	INFORMATION THEORY AND CODING 2020-21	7.5	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	
COMP310	MULTI-AGENT SYSTEMS 2020-21	15	Level 6	Optional	
COMP318	Ontologies and Semantic Web 2020-21	15	Level 6	Optional	
COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	
COMP315	TECHNOLOGIES FOR E-COMMERCE 2020-21	15	Level 6	Optional	
ENVS456	WEB MAPPING AND ANALYSIS 2020-21	15	Level 7	Optional	

Year 2 Semesters 1 & 2

Code	Module	Credit	Level	Type	Pathway(s)
COMP599	MSc Industrial Project 2021-22	60	Level 7	Required	
COMP598	MSc Placement Experience 2021-22	60	Level 7	Required	

CSCI MSc Advanced Computer Science with Internet Economics (Pathway A: with first degree in Computer Science, Pathway B: with first degree in Economics)

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1 Semester 1					
1. Only students who have not previously taken COMP323 (or an equivalent) as part of their undergraduate programme can take this module. 2. Students who have taken COMP323 (or an equivalent) as part of their undergraduate programme take COMP523.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP523	Advanced Algorithmic Techniques 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP323	Introduction to Computational Game Theory 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
ECON915	Microeconomic Analysis 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP557	Optimisation 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
Year 1 Semester 2					
----- Pathway A: with first degree in Computer Science ----- 1. Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 180 credits in total, which includes the project module (COMP702). 2. Students can choose at most one optional module at level 6 if COMP323 needs to be selected. 3. Students who took COMP323 as part of their undergraduate programme, replace COMP323 by COMP523 and no more than 30 credits of level 6 modules can be selected. 4. ECON915 normally has a prerequisite of an Economics undergraduate degree. It has been agreed with the Management School that a Computer Science degree will be considered to be equivalent for students on the MSc Advanced Computer Science with Internet Economics. -----					

Pathway B: with first degree in Economics

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- Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 180 credits in total, which includes the project module (COMP702).
 - Students can choose at most one optional module at level 6.

Code	Module	Credit	Level	Type	Pathway(s)
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP310	MULTI-AGENT SYSTEMS 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP315	TECHNOLOGIES FOR E-COMMERCE 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science

Year 1 Semester 3

COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.

Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	Pathway A: with first degree in Computer Science

Year 1 Semester 1

1. Only students who have not previously taken COMP323 (or an equivalent) as part of their undergraduate programme can take this module.
2. Students who have taken COMP323 (or an equivalent) as part of their undergraduate programme take COMP523.

Code	Module	Credit	Level	Type	Pathway(s)
COMP323	Introduction to Computational Game Theory 2020-21	15	Level 6	Required	Pathway B: with first degree in Economics
COMP557	Optimisation 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP517	Programming Fundamentals 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics

Year 1 Semester 2

 Pathway A: with first degree in Computer Science

1. Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 180 credits in total, which includes the project module (COMP702).
2. Students can choose at most one optional module at level 6 if COMP323 needs to be selected.
3. Students who took COMP323 as part of their undergraduate programme, replace COMP323 by COMP523 and no more than 30 credits of level 6 modules can be selected.
4. ECON915 normally has a prerequisite of an Economics undergraduate degree. It has been agreed with the Management School that a Computer Science degree will be considered to be equivalent for students on the MSc Advanced Computer Science with Internet Economics.

 Pathway B: with first degree in Economics

1. Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 180 credits in total, which includes the project module (COMP702).
2. Students can choose at most one optional module at level 6.

Code	Module	Credit	Level	Type	Pathway(s)
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics

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COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics

Year 1 Semester 3

COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.

Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	Pathway B: with first degree in Economics

CSCN MSc Advanced Computer Science with Internet Economics with a Year in Industry (Pathway A: with first degree in Computer Science, Pathway B: with first degree in Economics)

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1 Semester 1					
<p>The programme MSc in Advanced Computer Science with Internet Economics with a Year in Industry is divided into two equally weighted years (years 1 and 2). The first year runs concurrently with the normal first and second undergraduate semesters, and comprises taught modules to a total of 60 credits per semester (120 credits in total). The placement takes place in the second year typically running concurrently with the normal first and second undergraduate semesters. This counts for a further 120 credits, making a total of 240 credits over the two year period.</p> <p>1. Only students who have not previously taken COMP323 (or an equivalent) as part of their undergraduate programme can take this module. 2. Students who have taken COMP323 (or an equivalent) as part of their undergraduate programme take COMP523.</p>					
Code	Module	Credit	Level	Type	Pathway(s)
COMP523	Advanced Algorithmic Techniques 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP323	Introduction to Computational Game Theory 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
ECON915	Microeconomic Analysis 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP557	Optimisation 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
Year 1 Semester 2					
<p>----- Pathway A: with first degree in Computer Science -----</p> <p>1. Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 120 credits in Year 1 and 120 credits in Year 2 (240 credits in total for the PGT Year</p>					

in Industry programme).

2. Students can choose at most one optional module at level 6 if COMP323 needs to be selected.

3. Students who took COMP323 as part of their undergraduate programme, replace COMP323 by COMP523 and no more than 30 credits of level 6 modules can be selected.

4. ECON915 normally has a prerequisite of an Economics undergraduate degree. It has been agreed with the Management School that a Computer Science degree will be considered to be equivalent for students on the MSc Advanced Computer Science with Internet Economics.

 Pathway B: with first degree in Economics

1. Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 120 credits in Year 1 and 120 credits in Year 2 (240 credits in total for the PGT Year in Industry programme).

2. Students can choose at most one optional module at level 6.

Code	Module	Credit	Level	Type	Pathway(s)
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP310	MULTI-AGENT SYSTEMS 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	Pathway A: with first degree in Computer Science
COMP315	TECHNOLOGIES FOR E-COMMERCE 2020-21	15	Level 6	Optional	Pathway A: with first degree in Computer Science
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	Pathway A: with first degree in Computer Science

Year 2 Semesters 1 & 2

Preparation for the year in industry will begin in Year 1 through COMP516 “Research Methods in Computer Science” which is a 15 credit module. During the placement which is a 30-week minimum placement, the student should complete two-60 credit modules: (i) COMP598 MSc Placement Experience and (ii) COMP599 MSc Industrial Project. In order to receive the MSc degree, the student should pass both modules. COMP598 is a pass/fail module and will not contribute to the MSc degree classification and cannot be considered as a PG Dip exit award module since its emphasis is on gaining industrial experience. COMP599 is focused on doing an industrial research project and it will be chosen by the student by the end of semester 2 in Year One. In situations where a student is not able to find a placement by the end of semester 2, or fails to complete the industrial placement, the student will be able to transfer to the standard version of the programme and commence a new project at the University.

Code	Module	Credit	Level	Type	Pathway(s)
COMP599	MSc Industrial Project 2021-22	60	Level 7	Required	Pathway A: with first degree in Computer Science
COMP598	MSc Placement Experience 2021-22	60	Level 7	Required	Pathway A: with first degree in Computer Science

Year 1 Semester 1

The programme MSc in Advanced Computer Science with Internet Economics with a Year in Industry is divided into two equally weighted years (years 1 and 2). The first year runs concurrently with the normal first and second undergraduate semesters, and comprises taught modules to a total of 60 credits per semester (120 credits in total). The placement takes place in the second year typically running concurrently with the normal first and second undergraduate semesters. This counts for a further 120 credits, making a total of 240 credits over the two year period.

1. Only students who have not previously taken COMP323 (or an equivalent) as part of their undergraduate programme can take this module.
2. Students who have taken COMP323 (or an equivalent) as part of their undergraduate programme take COMP523.

Code	Module	Credit	Level	Type	Pathway(s)
COMP323	Introduction to Computational Game Theory 2020-21	15	Level 6	Required	Pathway B: with first degree in Economics
COMP557	Optimisation 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP517	Programming Fundamentals 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics

Year 1 Semester 2

 Pathway A: with first degree in Computer Science

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- Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 120 credits in Year 1 and 120 credits in Year 2 (240 credits in total for the PGT Year in Industry programme).
 - Students can choose at most one optional module at level 6 if COMP323 needs to be selected.
 - Students who took COMP323 as part of their undergraduate programme, replace COMP323 by COMP523 and no more than 30 credits of level 6 modules can be selected.
 - ECON915 normally has a prerequisite of an Economics undergraduate degree. It has been agreed with the Management School that a Computer Science degree will be considered to be equivalent for students on the MSc Advanced Computer Science with Internet Economics.

 Pathway B: with first degree in Economics

- Options totalling 30 credits from the following modules provided pre-requisites are satisfied - to be registered for 120 credits in Year 1 and 120 credits in Year 2 (240 credits in total for the PGT Year in Industry programme).
- Students can choose at most one optional module at level 6.

Code	Module	Credit	Level	Type	Pathway(s)
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	Pathway B: with first degree in Economics
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	Pathway B: with first degree in Economics

Year 2 Semesters 1 & 2

Preparation for the year in industry will begin in Year 1 through COMP516 “Research Methods in Computer Science” which is a 15 credit module. During the placement which is a 30-week minimum placement, the student should complete two-60 credit modules: (i) COMP598 MSc Placement Experience and (ii) COMP599 MSc Industrial Project. In order to receive the MSc degree, the student should pass both modules. COMP598 is a pass/fail module and will not contribute to the MSc degree classification and cannot be considered as a PG Dip exit award module since its emphasis is on gaining industrial experience. COMP599 is focused on doing an industrial research project and it will be chosen by the student by the end of semester 2 in Year One. In situations where a student is not able to find a placement by the end of semester 2, or fails to complete the industrial placement, the student will be able to transfer to the standard version of the programme and commence a new project at the University.

Code	Module	Credit	Level	Type	Pathway(s)
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COMP599	MSc Industrial Project 2021-22	60	Level 7	Required	Pathway B: with first degree in Economics
COMP598	MSc Placement Experience 2021-22	60	Level 7	Required	Pathway B: with first degree in Economics

CMBD MSc Big Data and High Performance Computing

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1 Semester 1					
The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP529	Big Data Analytics 2020-21	15	Level 7	Required	
COMP528	Multi-Core and Multi-Processor Programming 2020-21	15	Level 7	Required	
COMP557	Optimisation 2020-21	15	Level 7	Required	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
Year 1 Semester 2					
1. Options totalling 15 credits from the following semester 2 modules. 2. Each student on this programme should be registered for 180 credits for the academic year.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Optional	
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Required	
COMP530	MSc Group Project 2020-21	15	Level 7	Required	
Year 1 Semester 3					
COMP702 is the MSc 60 credit project module that will run over the summer from the week after the semester 2 exams to approximately one week before the start of the next academic year.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	

CMBI MSc Big Data and High Performance Computing with a Year in Industry

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1 Semester 1					
The programme is divided into two equally weighted years (years 1 and 2). The first year runs concurrently with the normal first and second undergraduate semesters, and comprises taught modules to a total of 60 credits per semester (120 credits in total). The placement takes place in the second year typically running concurrently with the normal first and second undergraduate semesters. This counts for a further 120 credits, making a total of 240 credits over the two year period.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP529	Big Data Analytics 2020-21	15	Level 7	Required	
COMP528	Multi-Core and Multi-Processor Programming 2020-21	15	Level 7	Required	
COMP557	Optimisation 2020-21	15	Level 7	Required	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
Year 1 Semester 2					
1. Options totalling 15 credits from the following semester 2 modules. 2. Each student on this programme should be registered for 180 credits for the academic year.					
Code	Module	Credit	Level	Type	Pathway(s)
COMP559	ALGORITHMIC GAME THEORY 2020-21	15	Level 7	Optional	
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP525	Due to COVID-19 this module will be unavailable in 2020/21.				
COMP524	SAFETY AND DEPENDABILITY 2020-21	15	Level 7	Optional	
COMP526	APPLIED ALGORITHMICS 2020-21	15	Level 7	Required	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Required	
COMP530	MSc Group Project 2020-21	15	Level 7	Required	
Year 2 Semesters 1 & 2					
During the placement which is a 30-week minimum placement, the student should complete two-60 credit modules: (i) COMP598 MSc Placement Experience					

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and
(ii) COMP599 MSc Industrial Project.

Code	Module	Credit	Level	Type	Pathway(s)
COMP599	MSc Industrial Project 2021-22	60	Level 7	Required	
COMP598	MSc Placement Experience 2021-22	60	Level 7	Required	

CDSM MSc Data Science and Artificial Intelligence

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1					
<p>The programme is divided into three, equally weighted semesters. The first two, which are run concurrently with the normal undergraduate semesters, comprise taught modules to a total of 60 credits per semester. An extended research based project, culminating in a dissertation, is undertaken full time over the summer period. This counts for a further 60 credits, making a total of 180.</p> <p>Note: In exceptional circumstances and with the approval of the programme Director of Studies, alternative modules may be substituted for optional and required modules, except COMP516</p>					
Year 1 Semester 1					
Code	Module	Credit	Level	Type	Pathway(s)
COMP533	Maths and Statistics for AI and Data Science 2020-21	15	Level 7	Required	
COMP517	Programming Fundamentals 2020-21	15	Level 7	Required	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
Year 1 Semester 1 optional modules					
Choose one module from the following, based on individual preference					
Code	Module	Credit	Level	Type	Pathway(s)
COMM718	Artificial Intelligence and Communication 2020-21	15	Level 7	Optional	
COMP518	Database and Information Systems 2020-21	15	Level 7	Optional	
COMP519	Web Programming 2020-21	15	Level 7	Optional	
Year 1 Semester 2					
Code	Module	Credit	Level	Type	Pathway(s)
COMP534	Applied Artificial Intelligence 2020-21	15	Level 7	Required	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Required	
Year 1 Semester 2 optional modules					
Choose two modules from the following, based on individual preference					
Code	Module	Credit	Level	Type	Pathway(s)

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COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	
Year 1 Semester 3					
Code	Module	Credit	Level	Type	Pathway(s)
COMP702	MSc Project 2020-21	60	Level 7	Required	

CZSM MSc Data Science and Artificial Intelligence with a Year in Industry

Students must ensure that Section 3.8.2 (Pre-requisite and Co-requisite Information for CS Modules) of the main Student Handbook file has been checked when considering which optional modules to select.

Structure					
Year 1					
<p>The programme MSc in Advanced Computer Science with a Year in Industry is divided into two equally weighted years (years 1 and 2). The first year runs concurrently with the normal first and second undergraduate semesters, and comprises taught modules to a total of 60 credits per semester (120 credits in total). The placement takes place in the second year typically running concurrently with the normal first and second undergraduate semesters. This counts for a further 120 credits, making a total of 240 credits over the two year period.</p> <p>Note: In exceptional circumstances and with the approval of the programme Director of Studies, alternative modules may be substituted for optional and required modules, except COMP516.</p> <p>Students can be transferred to the version of this programme w/o the year in industry (MSc Data Science and Artificial Intelligence), which has PGDip, PGCert, and PG Award options.</p>					
Year 1 Semester 1					
Code	Module	Credit	Level	Type	Pathway(s)
COMP533	Maths and Statistics for AI and Data Science 2020-21	15	Level 7	Required	
COMP517	Programming Fundamentals 2020-21	15	Level 7	Required	
COMP516	Research Methods in Computer Science 2020-21	15	Level 7	Required	
Year 1 Semester 1 optional modules					
Choose one module from the following, based on individual preference					
Code	Module	Credit	Level	Type	Pathway(s)
COMM718	Artificial Intelligence and Communication 2020-21	15	Level 7	Optional	
COMP518	Database and Information Systems 2020-21	15	Level 7	Optional	
COMP519	Web Programming 2020-21	15	Level 7	Optional	
Year 1 Semester 2					
Code	Module	Credit	Level	Type	Pathway(s)
COMP534	Applied Artificial Intelligence 2020-21	15	Level 7	Required	
COMP527	Data Mining and Visualisation 2020-21	15	Level 7	Required	

Year 1 Semester 2 optional modules

Choose two modules from the following, based on individual preference

Code	Module	Credit	Level	Type	Pathway(s)
COMP575	Computational Intelligence 2020-21	15	Level 7	Optional	
COMP532	Machine Learning and BioInspired Optimisation 2020-21	15	Level 7	Optional	
COMP530	MSc Group Project 2020-21	15	Level 7	Optional	

Year 2 Semesters 1 & 2

Preparation for the year in industry will begin in Year 1 through COMP516 “Research Methods in Computer Science” which is a 15-credit module. During the placement which is a 30-week minimum placement, the student should complete two-60 credit modules: (i) COMP598 MSc Placement Experience and (ii) COMP599 MSc Industrial Project. In order to receive the MSc degree, the student should pass both modules. COMP598 is a pass/fail module and will not contribute to the MSc degree classification and cannot be considered as a PG Dip exit award module since its emphasis is on gaining industrial experience. COMP599 is focused on doing an industrial research project and it will be chosen by the student by the end of semester 2 in Year One. In situations where a student is not able to find a placement by the end of semester 2, or fails to complete the industrial placement, the student will be able to transfer to the standard version of the programme and commence a new project at the University.

The placement and project will take place from an agreed starting date (typically September, but an earlier date is acceptable) to next May, in an appropriate IT environment. The department will have a dedicated advisor working with UoL’s Careers and Employability Services, so as to assist students in gaining a placement. As noted above if a student has failed to find a placement and project, the student will transfer to the one-year MSc Advanced Computer Science programme.

All placements, and the project work to be carried out as part of the placement, will be agreed by the students and industrial placement partners, and approved by the MSc Programme Director. Each student on placement will have an industrial supervisor in the company and an academic supervisor within the Department. A dedicated liaison advisor/coordinator will be appointed by the School/Department.

The supervisor at the University, working with the industrial supervisor, will be responsible for the assessment of the placement experience and the industrial project modules (COMP598 and COMP599). The placement experience module (COMP598) will be assessed in terms of a portfolio containing a number of documents as articulated in the COMP598 module specification. For the project module the assessment comprises: (i) an interim report (35% in January), (ii) an oral presentation (15% in May), and (iii) a final report (50% in May).

Code	Module	Credit	Level	Type	Pathway(s)
COMP599	MSc Industrial Project 2021- 22	60	Level 7	Required	
COMP598	MSc Placement Experience 2021-22	60	Level 7	Required	

Summary Information on Modules

Module Descriptions – Semester 1

COMP516 Research Methods in Computer Science

This module includes various "high order transferable skills" such as: searching for information on the WWW and libraries, reading and understanding research papers, writing papers (including referencing), a review of professional ethics and legal issues, problem solving, and the development and conduct of research programmes. There are 30 lectures and 10 hours of practical work.

COMP517 Programming Fundamentals

This module provides a comprehensive review of object oriented software development using the Java programming language. The module is designed to equip students without a computer science (or related) first degree with the appropriate software development capabilities required for the second semester research based modules and when they go on to seek employment within the IT industry. There are 22 lectures and 22 tutorials.

COMP518 Database and Information Systems

This module provides a comprehensive review of database and information system techniques. The module is intended for MSc students who do not have a computer science (or related) first degree to provide those students with the appropriate information systems capabilities required for the second semester research based modules, their final individual project and when they go on to seek employment within the IT industry. There are 22 lectures and 22 tutorials.

COMP519 Web Programming

This module covers topics such as: distributed systems, WWW and HTML, Applets and the WWW, introduction to Java script, programming in Perl, CGI scripting and protocols. The module is intended for MSc students who do not have a computer Science (or related first degree) to provide those students with the appropriate WWW programming capabilities that they may require to complete their individual project and when they go on to seek employment. There are 26 lectures and 18 tutorials.

COMP521 Knowledge Representation

This module covers topics such as introduction to knowledge representation (KR) and logic for KR, introduction to modal and description logics, applications of modal logic, and handling uncertain information through probability and decision theory. There are 30 lectures and 10 tutorials.

COMP522 Privacy and Security

This module covers topics such as: identification and authentication, monitoring, protocols, attacks and defences, legal and ethical issues and future directions. There are 30 lectures and 10 tutorials.

COMP523 Advanced Algorithmic Techniques

This module covers topics such as: the study of algorithmic problems and techniques on the boundary of current research, dealing with non-standard computational models, graph algorithms,

randomised algorithms, on-line algorithms, string algorithms and elements of probabilistic and number theory. There are 30 lectures and 10 tutorials.

COMP528 Multi-Core and Multi-Processing Programming

This module covers theoretical and practical aspects of parallel programming for multi-core architectures with the main focus on hands-on programming experience with latest multi-core and multi-processor platforms. The module was developed in collaboration with STFC Hartree Centre for High-Performance Computing and High-Performance Computing Services of University of Liverpool, whose facilities will be used in the practical sessions of the module. There are 24 lectures and 12 practicals.

COMP529 Big Data Analysis

This module provides an initial overview of the middleware used to provide solutions to Big Data and how to use this middleware to analyse data. There are 36 lectures and 12 tutorials.

COMP533 Maths and Statistics for AI and Data Science

Computer Science in general, and data Science in particular, has its roots in Mathematics. This module is designed to bring you up to speed with the necessary mathematical and statistical underpinning required to study Data Science and AI. The module aims to cover the key concepts and techniques from linear algebra, differential calculus, probability theory and statistics. The acquired knowledge will help you to interpret the results generated during data analysis.

COMP557 Optimisation

This module provides a foundation for modelling various continuous and discrete optimisation problems, related to real-world production and economics motivated applications which also involve big data. The tools and paradigms for the design and analysis of algorithms for such optimisation problems are introduced. Topics include linear programming, local search, algorithms and their complexity, algorithms for hard optimisation problems. Additionally, existing commercial optimisation software is introduced that allows to treat such problems. There are 30 lectures and 10 tutorials.

***COMP323 Introduction to Computational Game Theory
(FHEQ Level 6 module)***

This module aims to introduce students to the main subareas of algorithmic game theory, which is a novel academic field in the intersection of economics and computer science. This provides mathematical tools and models used for the analysis and implementation of existing Internet systems, mostly related to electronic commerce applications where emphasis is put on their algorithmic side. The module covers an introduction to basic economic game theory and applications like Google's sponsored search auctions, combinatorial auctions, Internet recommendation systems, mechanism design, price of anarchy. There are 30 lectures and 5 tutorials.

COMM718 Artificial Intelligence and Communication

The 3-hour continuous workshops will combine lectures with group activities and seminar discussions. The lecture phase will introduce the key concepts, approaches and tools and will be

hold asynchronously. Such notions will be applied through the analysis of case studies in the group work component. The seminar components will be devoted to the critical discussion of different perspectives and issues arisen during group activities. Seminars will allow students to explore and strengthen their understanding of different approaches through practice.

ECON915 Microeconomic Theory

This module, offered by the Management School, introduces students to the fundamental aspects of decision making under uncertainty, allowing for the presence of risk. It covers mostly microeconomic models related to non-cooperative game theory, which will serve as the economics related background for the students. Specific topics include the theory of production, choice under uncertainty, credit markets. There are 24 lectures and a series of seminars.

ELEC319 Image Processing

(7.5 credit module (level 6) offered as a pair with ELEC415 and taught by the Department of Electrical Engineering and Electronics)

This module covers the fundamentals of how images are generated, represented, compressed and processed to extract features of interest.

ENVS456 Web Mapping and Analysis

This module is taught by the School of Environmental Sciences. It has two main aims. First, it seeks to provide hands-on experience and training in the design and generation of web-based mapping and geographical information tools. Second, it seeks to provide hands-on experience and training in the use of software to access, analyse and visualise web-based geographical information. There are 10 lectures and 10 two hour practicals.

Module Descriptions – Semester 2

COMP524 Safety and Dependability

This module covers topics such as: safety critical systems, security, trusted systems, dependability and reliability, formal requirements engineering, design and development techniques and verification techniques. There are 22 lectures and 20 hours of practical work.

COMP525 Reasoning about Action and Change – Due to COVID-19, we will not be offering this module during 2020/21.

This module covers topics such as: temporal logic, dynamic logic, alternating-time temporal logic, dynamic epistemic logics and belief revision. There are 30 lectures and 10 hours of practical work.

COMP526 Applied Algorithmics

This module covers topics such as: the study of problems with strong algorithmic components, specialised data structures, engineering of algorithms data structures with applications to large data sets, data compression and network algorithms. There are 30 lectures and 10 hours of practical work.

COMP527 Data Mining and Visualisation

This module provides an in-depth, systematic and critical understanding of some of the current research issues at the forefront of the academic research domain of data mining. There are 30 lectures and 10 tutorials.

COMP530 MSc Group Project

This module aims at providing experience in working and collaborating in a software development team. You will gain experience of aspects of the development of an appropriate and effective solution to tackle industrially relevant issues and prepare you for the individual MSc project.

COMP532 Machine Learning and BioInspired Optimisation

In this module we focus on learning agents that interact with an initially unknown world. Since the world is dynamic this module will put strong emphasis on learning to deal with sequential data unlike many other machine learning courses. This module will cover the following topics: Introduction to parallel problem solving from nature/overview, Reinforcement Learning/Multi-Agent Reinforcement Learning/Replicator Dynamics, Swarm Intelligence: Ant System, Ant Colony Optimization/Bee System/Swarm Robotics, Deep Learning: Restricted Boltzmann Machines/Auto-Encoder Networks/Deep Belief Networks, Immune Systems and DNA computing. Lecture slides and reading material will be made available to the students.

COMP534 Applied Artificial Intelligence

This module will provide you with an introduction to key subsets in the field of Artificial Intelligence (AI), including Machine Learning, Deep Learning, Natural Language Processing (NLP) and Computer Vision. To present fundamental problems in all these areas and explain the common methods used to deal with these problems and to develop the practical skills necessary to build AI applications using data from different domains.

COMP575 Computational Intelligence

This module is divided into two parts: (i) Neural Networks and (ii) Evolutionary Computation and Fuzzy Systems. The Neural Network material covered includes the structure of such networks, the learning process (supervised and unsupervised) and applications. Part 2 covers evolutionary methods and optimisation, evolutionary optimisation and genetic algorithms, evolutionary programming, particle swarm intelligence, applications and fuzzy logic systems. This module consists of 24 lectures and 12 tutorials.

COMP559 Algorithmic Game Theory

This module presents an in-depth understanding of the research area of mechanism design which is widely present in the form of dedicated auction protocols used in existing electronic commerce systems. Such systems are implemented and used over the Internet, for instance various banking systems, or many kinds of Internet auctions. The emphasis is put on the algorithmic aspects of these systems where part of the input data (such as customers' preferences) are private data of selfish agents (customers) and the goal of the protocol, called a mechanism, is to efficiently elicit this information from the agents There are 30 lectures and 10 tutorials.

COMP310 Multi-Agent Systems
(FHEQ Level 6 module)

A multi-agent system is one composed of multiple interacting software components known as agents, which are typically capable of co-operating to solve problems that are beyond the abilities of any individual member. Multi-agent systems are important primarily because they have been found to have very wide applicability, in areas as diverse as industrial process control and electronic commerce. This module will begin by introducing the student to the notion of an agent, and will lead them to an understanding of what an agent is, how they can be constructed, and how agents can be made to co-operate effectively with one another to solve problems. The practical component of the module will be based on some of the many Java agent frameworks currently available (e.g. the Java-based based "Jack" programming language). There are 30 lectures.

COMP315 Technologies for E-Commerce
(FHEQ Level 6 module)

With the explosion in the use of the internet, there is an increasing interest in e-commerce: the use of the Internet as a means of exchanging goods and services for money. This has, in turn, led to a whole host of new problems for which software solutions are required. This module introduces students to some of these, in particular those which relate to security, privacy and cryptography. There are 30 lectures.

COMP318 Ontologies and Semantic Web
(FHEQ Level 6 module)

This module aims to provide students with guidelines, concepts and models for designing and evaluating applications utilising advanced web technologies. The module will also introduce students to Artificial Intelligence and Semantic Web techniques that can be applied to the application of advanced web technologies and the notion of semantic web applications intended to be used by software. There are 30 lectures and 10 hours of practical work.

ELEC415 Information Theory and Coding
(7.5 credit module offered as a pair with ELEC319 and taught by the Department of Electrical Engineering and Electronics)

This module aims to introduce students to the techniques used in source coding and error correcting codes, including the use of information as a measure. Topics covered include: Source coding (measuring information entropy of a zero memory source, variable-length codes, buffer management, vector coding and Shannon's noiseless coding theorem); channels (binary symmetric channels, equivocation, channel capacity, continuous channels, and the Shannon-Hartley law); and block codes (ideas of n-tuples, Hamming distance, least distance decoding, possibility of error-free messages, the Hamming bound, linear codes, generator and parity-check matrices, algebraic codes, cyclic codes, output error rates and coding gain). There are 12 lectures and 6 problem classes.

ENVS563 Geographical Information Systems
(taught by the School of Environmental Sciences)

This module introduces students to the fundamentals of Geographical Information Systems (GIS). It will enable students to develop both (i) theoretical knowledge of GIS and (ii) a practical ability to apply GIS in the handling and analysis of spatial data. The module aims to develop an understanding of how and why GIS may be useful in geography, planning and other disciplines. There are 11 lectures and 24 practicals.

NOTE: No more than two FHEQ Level 6 modules may be included in any individual student's programme over the two semesters. Also graduates of the University of Liverpool cannot elect to take a level three module if they have already passed that module as part of their undergraduate study.

Summer Project

COMP702 MSc Project (60 credits)

The MSc project is undertaken over the summer period, starting immediately after the announcement of the examination results, and leads to the submission of a written dissertation in September, when the programme finishes. This will investigate some real application of computing with the object of producing an agreed deliverable, in addition to the dissertation. The project work is usually associated with material covered in the taught research modules making up the programme. Alternatively, students can propose their own projects, or undertake projects based on the needs of local industries, provided that the proposal meets with the academic criteria for an MSc (level M) project.

Members of staff within the Department will manage the project, and students will be required to give regular progress reports and presentations on their work. This is extremely valuable experience, as such presentations are likely to be required in a future career.

Further details of project management, together with details of the projects on offer, will be provided closer to the project start date. There will also be information available on-line nearer the time.

Year in Industry Modules

COMP598 MSc Placement Experience **(FHEQ Level 7 module)**

The placement experience module will be assessed in terms of a portfolio containing a number of documents as articulated in the COMP598 module specification. For the project module the assessment comprises: (i) an interim report (35% in January), (ii) an oral presentation (15% in May), and (iii) a final report (50% in May).

COMP599 MSc Industrial Project **(FHEQ Level 7 module)**

This module is focused on doing an industrial research project and it will be chosen by the student by the end of semester 2 in Year One. In situations where a student is not able to find a placement by the end of semester 2, or fails to complete the industrial placement, the student will be able to transfer to the standard version of the programme and commence a new project at the University.