UNIVERSITY OF LONDON

Programme Regulations 2021–2022

Computer Science
Computer Science (Data Science)
Computer Science (Games Development)
Computer Science (Machine Learning and Artificial Intelligence)
Computer Science (Physical Computing and Internet of Things)
Computer Science (User Experience)
Computer Science (Virtual Reality)
Computer Science (Web and Mobile Development)

BSc
Graduate Diploma
Graduate Certificate

Important document – please read
This document contains important information that governs your registration, assessment and programme of study

Contents

Important information regarding the Programme Regulations

About this document

Last revised: 7 July 2021

As a student registered with the University of London you are governed by the current General Regulations and Programme Regulations associated with your programme of study.

These Programme Regulations are designed and developed by Goldsmiths which is responsible for the academic direction of the programme.

In addition to Programme Regulations, you will have to abide by the General Regulations. These regulations apply to all students registered for a programme of study with the University of London and provide the rules governing registration and assessment on all programmes; they also indicate what you may expect on completion of your programme of study and how you may pursue a complaint, should that be necessary. Programme Regulations should be read in conjunction with the General Regulations.

The relevant General Regulations and the Programme Regulations relating to your registration with us are for the current year and not the year in which you initially registered.

On all matters where the regulations are to be interpreted, or are silent, our decision will be final.

Further information about your programme of study is outlined in the Programme Specification which is available on the relevant Courses page of the website. The Programme Specification gives a broad overview of the structure and content of the programme as well as the learning outcomes you will achieve as you progress.

To note

Throughout the Regulations, 'we' 'us' and 'our' mean the University of London; 'you' and 'your' mean the student, or where applicable, all students.

For the BSc Computer Science programmes, you should note the following terminology:

Module: Individual units of the programme are called modules. Each module is a self-contained, formally structured learning experience with a coherent and explicit set of learning outcomes and assessment criteria.

Core module: Core modules are central to the teaching and learning on the programme and may introduce concepts and ideas that appear in the compulsory and optional modules..

Compulsory module: Compulsory modules introduce concepts and ideas that appear in optional modules. Students must take these modules as part of their studies.

Optional module: Optional modules are designed to extend the concepts and ideas introduced in core and compulsory modules and to introduce other relevant concepts and techniques. Students select optional modules from a list.

Significant changes made to the Computer Science programme regulations 2021-2022

- Graduate Certificate and Graduate Diploma awards are due to launch in April 2022 and are now included
- Requests for Recognition of Prior Learning are now permitted for Level 5 and Level 6 modules
- Progression from the Performance Based Admissions route to the full award (BSc) has been updated
- Appendix D 'Transferring from Computing Information Systems or Creative Computing' has been added
- The following modules will be assessed by coursework only Type III assessment:
    - Virtual Reality [CM3025]
    - Games Development [CM3030]

Alternative Assessments during the Coronavirus (COVID-19) Outbreak

In these unprecedented times, the University has and continues to respond quickly to the impact of COVID-19, which has resulted in changes to our assessment processes.

In line with our current General Regulations, the University may offer you alternative assessments where necessary. This includes holding online timed assessments in place of written examinations, which are usually held at examination centres. Please note that this statement replaces any published information relating to assessments or written examinations in any of our materials including the website. Previously published materials relating to examinations should therefore be read in conjunction with this statement.

The University of London continues to work towards supporting the academic progression of all its students. The University also continues to be mindful of the health and wellbeing of its students during this pandemic, whilst protecting the academic standards of its awards.

1 Structure of the programme

See Appendix A for the full programme structure and Appendix B for module outlines.

Qualifications

1.1

The following qualifications are awarded under these regulations:

- Bachelor of Science in Computer Science
- Bachelor of Science in Computer Science (Data Science)
- Bachelor of Science in Computer Science (Machine Learning and Artificial Intelligence)
- Bachelor of Science in Computer Science (Web and Mobile Development)
- Bachelor of Science in Computer Science (User Experience)
- Bachelor of Science in Computer Science (Physical Computing and Internet of Things)
- Bachelor of Science in Computer Science (Games Development)
- Bachelor of Science in Computer Science (Virtual Reality)
- Graduate Diploma in Data Science
- Graduate Diploma in Machine Learning and Artificial Intelligence
- Graduate Diploma in Web Development
- Graduate Diploma in User Experience
- Graduate Diploma in Mobile Development
- Graduate Diploma in Physical Computing and Internet of Things
- Graduate Diploma in Games Development
- Graduate Diploma in Virtual Reality
- Graduate Certificate in Data Science
- Graduate Certificate in Machine Learning and Artificial Intelligence
- Graduate Certificate in Web Development
- Graduate Certificate in User Experience
- Graduate Certificate in Mobile Development
- Graduate Certificate in Physical Computing and Internet of Things
- Graduate Certificate in Games Development
- Graduate Certificate in Virtual Reality

The Diploma of Higher Education and Certificate of Higher Education are only available as exit/intermediate qualifications to students studying a Bachelor of Science programme.

The Bachelor of Science (unclassified/pass degree) is only available as an exit qualification.

- Diploma of Higher Education in Computer Science
- Certificate of Higher Education in Computer Science
- Bachelor of Science in Computer Science (unclassified/pass degree)

Degree structures

1.2

For the award of Bachelor of Science (BSc) Computer Science you must complete:

- one **core** module and seven **compulsory** modules at FHEQ Level 4 totalling 120 credits, plus
- eight **compulsory** modules at FHEQ Level 5 totalling 120 credits, plus
- six **optional** modules and a **compulsory** project at FHEQ Level 6 totalling 120 credits

1.3

For the award of BSc Computer Science with a named specialism you must complete:

- one **core** module and seven **compulsory** modules at FHEQ Level 4 totalling 120 credits, plus
- eight **compulsory** modules at FHEQ Level 5 totalling 120 credits, plus
- five specialist **core** modules, **one** optional module and a **compulsory** project at FHEQ Level 6 totalling 120 credits

1.4

For the award of a **Graduate Diploma** you must complete:

- three **core** modules totalling 45 credits, plus
- three **compulsory** modules totalling 45 credits, plus
- a **compulsory** project totalling 30 credits

1.5

For the award of a **Graduate Certificate** you must complete:

- three **core** modules totalling 45 credits, plus
- one **compulsory** module totalling 15 credits

1.6

There are two study sessions each year beginning in **April** and **October**. The maximum number of modules you are allowed to register for in any one session is **five** (or three plus the final project).

This can be a combination of new modules and resits (with a maximum of **four** new modules), or resits only.

Over a 22 week session, a 15 credit module will typically require 150 hours of notional study hours. Each module, excluding the final project, is organised into 10 topics, with approximately 10-12 hours of study required per topic. The remaining study time is intended for coursework and written examination preparation.

Intermediate qualifications

1.7

An intermediate qualification or qualifications (i.e. a Certificate of Higher Education and/or Diploma of Higher Education in Computer Science) may be awarded if you are registered on any of the BSc programmes. You may accumulate these qualifications as you progress through your BSc studies.

1.8

A Graduate Certificate may be granted as an intermediate qualification if you are registered on the Graduate Diploma. You may accumulate this qualification as you progress through your Diploma studies.

1.9

You must apply to be awarded these qualifications; they will not be awarded automatically.

1.10

Providing you satisfy the requirements, you may apply for intermediate qualifications at any point between making an examination entry for assessments that, if successfully completed, would make you eligible for the qualification, and making your final examination entry on the programme on which you are registered.

1.11

If you do not apply for an intermediate qualification at, or prior to, your final examination entry for the programme on which you are registered, you will not be awarded these qualifications at a later date.

Exit qualifications

1.12

If you are registered on any of the BSc programmes and are unable to complete your studies for academic or personal reasons you may be eligible for an exit qualification.

1.13

We may award the Certificate of Higher Education in Computer Science as an exit qualification if you have successfully completed a minimum of **120 credits**. Neither Recognition of Prior Learning nor marginal condonement is permitted.

1.14

We may award the Diploma of Higher Education in Computer Science as an exit qualification if you have successfully completed a minimum of **240 credits**, with a minimum of 90 credits at Level 5. A maximum of 30 condoned credits and a maximum of 60 credits for Recognition of Prior Learning are permitted.

1.15

If you are registered on a Graduate Diploma and are unable to complete your studies, we may award the related Graduate Certificate as an exit qualification if you have successfully completed a minimum of **60 credits,** with a minimum of 45 credits at Level 6. Condoned credit is not permitted.

1.16

Exit qualifications are awarded at the discretion of the Board of Examiners. Once you have accepted a Certificate or Diploma of Higher Education in Computer Science as an exit qualification we will not normally permit you to register or re-register for a BSc under these regulations at a later date.

2 Registration

There are two Entry Routes into the BSc programmes: the Direct Entry Route and Performance Based Admission. See Entrance Requirements in the Programme Specification, and the Requirements tab on the programme's web-page, for full details.

Effective date of registration

2.1

Your effective date of registration will be either:

- **1 October** if you first register before the September registration deadline,
- **1 April** if you first register before the March registration deadline.

BSc registration

2.2

To complete the BSc programme within three years, you must aim to study and pass four modules per session. It is not possible to complete the programme within three years if you study less than four modules per session.

The minimum period of registration for BSc Computer Science is three years.

The maximum period of registration for BSc Computer Science is six years.

2.3

If you are registered on the Performance Based Admissions route, you will have a maximum of three years to complete the two required modules. Your six year registration period will begin from the point at which you register on the full BSc programme.

2.4

You may request a one-year extension to your BSc registration. This will be granted at the discretion of the Programme Director in exceptional circumstances only and should be requested at the end of your final year of registration.

Graduate Diploma and Graduate Certificate registration

2.5

The minimum period of registration for the Graduate Diploma is one year.

The maximum period of registration for the Graduate Diploma is five years.

2.6

The minimum period of registration for the Graduate Certificate is six months.

The maximum period of registration for the Graduate Diploma is five years.

2.7

Graduate Diploma or Graduate Certificate modules can be studied in any order.

Date of first written examinations

2.8

If your effective date of registration is:

- **1 October**, you will take your first written examination(s) in March of the following year,
- **1 April**, you will take your first written examination(s) in September of the same year.

Module availability

Not all modules will run in every study session.

The Level 4 module Computational Mathematics is only available in the April session.

The Level 4 module Discrete Mathematics is only available in the October session.

You must take module availability into account when planning to progress from Level 4 modules to Level 5 modules and later, when progressing from Level 5 modules to Level 6 modules.

2.9

Where we are unable to provide an appropriate learning experience to meet the learning outcomes of the module due to insufficient student registrations, we may withdraw the module from that session.

We will inform you of any such changes as early as possible and provide you with reasonable alternative arrangements.

3 Recognition of prior learning and credit transfer

Recognition of prior learning

See the General Regulations (Section 3) for more rules relating to Recognition of prior learning.

3.1

If you are registered on a full BSc programme, you may apply for recognition of prior learning (RPL) for up to **120 credits**.

3.2

If you are registered on the Performance Based Admissions entry route, we will not recognise or accredit prior learning for either of the two required modules. These must be passed in order to progress onto the full BSc programme.

3.3

We consider RPL on the basis of studies successfully completed at an appropriate level.

3.4

There will be no RPL for modules included in the award of a Certificate of Higher Education in Computer Science. A maximum of 60 credits for RPL are permitted in the award of a Diploma of Higher Education in Computer Science.

3.5

We will not recognise or accredit prior learning for the Graduate Diploma or Graduate Certificate programmes.

Completing a graduate award then studying a BSc

3.6

Students who have completed a Graduate Diploma or Graduate Certificate are permitted to study a BSc award (subject to a new application). Students who have not yet completed their Graduate award will be required to complete this before studying a BSc.

3.7

Students who join the BSc after completing a Graduate award will be provided with a new registration period.

3.8

A credit transfer will be applied where there is an overlap between the structure of the Graduate Award and the chosen BSc specialism.

Transfer arrangements

3.9

Students currently registered on the following University of London programmes are permitted to transfer to BSc Computer Science:

- Computing and Information Systems
- Creative Computing

The transfer parameters, and specific details regarding the transfer process, are available within Appendix D.

4 Assessment for the programme

In line with our current General Regulations, the University may offer you alternative assessments where necessary. This includes holding online timed assessments in place of written examinations, which are usually held at examination centres. Please refer to Programme Specifications for details on equipment that may be required for alternative assessments.

Assessment methods

4.1

Each module, excluding the Final Project, is summatively assessed either by coursework or a combination of coursework and a two-hour unseen written examination.

4.2

The pass mark for any element of assessment is 40%.

4.3

The structure of assessment can take one of three types:

Assessment Structure	Element of assessment	Element weighting	To pass the module you must get:
Type I	Coursework	50%	At least 35% in each element of summative assessment and a combined weighted average of at least 40%, subject to the application of rules for condonement (regulations 4.25 to 4.31)
	Timed written examination	50%	
Type II	Coursework I	50%	At least 35% in each element of summative assessment and a combined weighted average of at least 40%, subject to the application of rules for condonment (regulations 4.25 to 4.31)
	Coursework II	50%	
Type III	Coursework I: Initial Report	30%	At least 35% in each element of summative assessment and a combined weighted average of at least 40%, subject to the application of rules for condonement (regulations 4.25 to 4.31)
	Coursework II: Final Report	70%	

Refer to Appendix B for the assessment structure for each module.

4.4

If you have a combined weighted average of 40% or above but you have achieved less than 35% in either element of assessment, your mark will be capped at 39% Fail (which will be subject to the application of rules for condonement at the point of classification).

4.5

Each coursework element may consist of multiple items of assessment.

Final Project

4.6

The summative assessment for the Final Project consists of both coursework and a written examination, weighted in the ratio 80:20. The examination will be a two-hour written exam consisting of questions relating to your project.

4.7

The coursework will consist of multiple items which you should submit according to the prescribed deadlines set out on the VLE.

4.8

Each item of coursework, totalling 80% of the overall mark for the Final Project, is weighted as follows:

Summative Assessment	Percentage of Overall Module
Project proposal	Pass/ Fail
Progress logs	5%
Preliminary Project Report	10%
Project presentation video	5%
Final project report and code	60%

Taking assessments

Refer to the rules on assessment and assessment offences in the General Regulations.

See the website for the list of examination centres.

4.9

Written examinations take place in March and September, at the end of each study session, with retakes in the next available session.

4.10

When you register for a module, you must take all elements of assessment in the session you have registered onto. If you do not take the assessment during the session for which you have registered, you will be required to pay a module continuation fee and take the assessment in a subsequent session.

4.11

For coursework and project items, you should not exceed the word limits by more than 10%. If the word count is between 10% to 20% above the word limit, five marks will be deducted. If the word count exceeds the word limit by more than 20%, you will receive a mark of zero for your work.

The content within the main body of text comprises the overall word count, including in-text citations, references, quotes, heading and sub-headings. The cover page, reference list and any appendices do not count towards the overall word count.

Plagiarism

This section should be read in conjunction with Section 8 of the General Regulations.

4.12

Some items of assessment for this programme will require group work and, in some cases, a joint submission.

4.13

Where group work is required, and an allegation of plagiarism has been made, the work submitted will be subject to consideration as set out in the General Regulations and on the website.

4.14

Following an investigation, any penalty imposed may be applied to all members of the group on behalf of whom the work was submitted.

4.15

All other work submitted for assessment must be entirely your own.

Resitting an element of assessment

If you retake one or more elements of assessment for a module you will have to pay a module continuation fee when you register for the module to retake the assessment. You may only register for a retake once your results have been ratified.

4.16

The maximum number of attempts permitted at any element of assessment is **three.**

4.17

If your overall result for a module is a fail, you may resit any element of assessment for which you achieved less than 40%, provided that you do not exceed the maximum number of attempts.

4.18

You will not be permitted to resit any element which you have passed.

4.19

If you retake an element of assessment, your most recent mark will be used for classification.

4.20

If you fail a **core** module at the third attempt, your registration on the degree will cease. If this is a core Level 6 module, you may be permitted to transfer to another BSc degree under these regulations, subject to the rules in Section 6.

4.21

If you fail a **compulsory** module at the third attempt or an **optional** module which you cannot or do not choose to swap, you will no longer be eligible for the degree with honours. You may continue your studies to obtain a pass degree (unclassified) only.

See Section 7 for the full scheme of award.

Swapping an optional module

4.22

You will be permitted to swap up to **two optional modules** for an alternative, where possible, providing you are still within the maximum period of registration. If you do so:

- You must inform us that you wish to withdraw from your current module
- You may commence the new module(s) at the next available opportunity
- You will have the full three attempts to pass the new module(s)

4.23

If you fail an **optional** module at the third attempt, you may register for an alternative module. Your mark for the new module will be used for the purposes of classification.

4.24

You will not be permitted to swap any module which you have already passed.

You are permitted to withdraw from a module within **14 days of the module start date,** with no financial penalty. After this point, you will need to pay a new module fee should you decide to swap for an available alternative.

Marginal condonement

4.25

If you fail a module with a mark of between 35% and 39%, you may be condoned, and have credit awarded in the same way as for passed modules, providing the mean average mark for the Level is 45% or above.

4.26

We will **not** permit marginal condonement for core modules or the Final project. They must be passed in order to be awarded a BSc qualification.

4.27

Condonement may be applied by the Board of Examiners at the point of classification only.

4.28

Where you obtain a mark in the condonable range, you may choose to resit until you become eligible for the final award, subject to the maximum number of attempts.

4.29

If, at the first attempt, you achieve a condonable fail mark for a module and, in subsequent attempts to redeem the failure, achieve further condonable fail marks, the highest mark obtained will be used for the purposes of classification.

4.30

A maximum of 30 credits may be condoned at any given Level.

4.31

The total credit value for which marginal condonement can be permitted may not exceed the amount specified for the programme as follows:

Qualification	Maximum credit value of marginal condonement
Certificate of Higher Education (Exit award)	0
Diploma of Higher Education (Exit award)	30
BSc	60 (no more than 30 at any one level)

Deferring an assessment

You will be notified of the deadlines for deferring a module during the study session. To defer, you must notify us via the *defer exams* button on the *my study* page in the student portal. Student Relationship Managers will provide instructions on this process during the study session once examination entry is closed.

If you defer taking a written examination, you have to pay a module continuation fee when you register for the session in which you wish to take the written examination.

4.32

Following the mid-term assessment, you may defer taking the final examination of a module if you notify us by the deadline. You may only do so once per module.

4.33

You are only allowed to defer written examinations. You will not be permitted to defer a coursework element. If you miss the deadline for submission, you will be given a mark of zero for the assessment element and it **will** count as an attempt.

4.34

If you defer the final examination, but you obtained a mark of 40% or above in the coursework element, that mark will be carried forward.

4.35

If you defer the final examination, but you obtained a mark below 40% in the coursework, you must resit that element of assessment. This **will** be deemed a second attempt.

4.36

If you defer the final examination, you will not be deemed to have made an attempt at that element of assessment.

4.37

When you resume study of a deferred module, this will count towards the maximum number of credits you are permitted to study in any one session.

4.38

If you do not notify us of your deferral and do not attend the final examination, you will be given a mark of zero for that assessment element and it **will** count as an attempt.

Mitigating Circumstances

Mitigating circumstances are any serious circumstances beyond a student's control which may have adversely affected their academic performance. For more information about mitigating circumstances, see Section 11 of the General Regulations and the Examinations section of our website.

4.39

You must bring any mitigating circumstances to our attention as soon as you become aware that your performance may be adversely affected by serious circumstances beyond your control. You should do this before the deadline date for coursework, project items, and no later than three weeks after the written examination date.

For details on how to submit notifications and evidence of mitigating circumstances, see the assessment resources section of the student portal.

4.40

If you have provided evidence of mitigating circumstances you may submit a request for an alternative session to continue your module studies.

4.41

This will be granted at the discretion of the Board of Examiners and in such cases we will allow you to defer all outstanding elements of assessment.

5 Progression within the programme

BSc Performance Based Admissions

5.1

To enter the BSc via the Performance Based Admission route, you must first register for Introduction to Programming I and **either** Discrete Mathematics **or** Computational Mathematics. You will not be permitted to register on the remaining Level 4 modules until you meet the progression requirements.

5.2

If your final module grade for Introduction to Programming I is a pass, and your final module grade for **either** Discrete Mathematics **or** Computational Mathematics is a pass, you will be permitted to register on the remaining Level 4 modules.

5.3

If you achieve a mark of 50% or above in the mid-term assessments for Introduction to Programming I and **either** Discrete Mathematics **or** Computational Mathematics , you will be permitted to register on the remaining Level 4 modules in the next study session, before you receive your final module grade. This applies to modules taken for the first time and any modules being retaken.

5.4

If you achieve a mark of 49% or below in the mid-term assessments for Introduction to Programming I or **either** Discrete Mathematics **or** Computational Mathematics, you may continue to the final assessment.

5.5

If you fail Introduction to Programming I and **either** Discrete Mathematics **or** Computational Mathematics but achieve an overall mark of **40% or above**, **with at least 40% in each element of assessment**, you will be permitted to register on the remaining Level 4 modules in the next available session. You will be required to resit the module(s) you have failed, subject to any relevant progression rules.

5.6

If you fail Introduction to Programming I and **either** Discrete Mathematics **or** Computational Mathematics by 39% or less, you must resit the module(s), providing you have not exhausted all attempts and you are still within the maximum period of registration. If you do not resit, you will not be permitted to register on the remaining Level 4 modules.

5.7

You will be permitted **three** attempts at each of: Introduction to Programming I, Computational Mathematics, and Discrete Mathematics. If you fail **any** of these modules at the third attempt, your registration will cease and you will not be eligible to continue studies. Marginal condonement will not be applicable to these modules.

5.8

If you need to resit Discrete Mathematics or Computational Mathematics, you will be permitted to register on to the Mathematics module that you have not yet attempted.

5.9

If you register onto one Mathematics module then defer the assessment, for the following session you will be permitted to register on to the other Mathematics module.

See Deferring an Assessment for rules regarding deferrals.

Requirements to progress through the BSc

5.10

Pending RPL for qualifications that have not yet been awarded does not meet the progression requirements. If you request to progress based on pending RPL, you will be told to wait until the RPL is awarded before you can progress.

5.11

To progress to FHEQ Level 5 modules, you must have:

- passed, or been awarded credit through recognition of prior learning, for at least 45 credits at Level 4, including Introduction to Programming I and either Discrete or Computational Mathematics; and
- made an attempt at a further 30 credits at Level 4, including Introduction to Programming II; and
- registered for any Level 4 modules not yet attempted alongside Level 5 modules, excluding either Discrete or Computational Mathematics (owing to availability in the current registration session) and any for which you have been awarded credit through recognition of prior learning.

When planning your studies, you must take into account the time it will take for these assessments to be marked and graded. Modules that are attempted in a session, will have results released during the following session and not before.

For example, if you register for Introduction to Programming I and Discrete Mathematics in the October 2021 session, your results for these modules would not be available before the April 2022 session. Instead, your results for these modules would become available *during* the April 2022 session and you would then be able to progress to Level 5 in the October 2022 session.

5.12

To progress to FHEQ Level 6 modules, you must have:

- passed at least 45 credits at Level 5 including Object Oriented Programming **or** Software Design and Development; and

- made an attempt at a further 45 credits at Level 5 including Object Oriented Programming **or** Software Design and Development; and
- registered for any Level 5 modules not yet attempted alongside your Level 6 modules. If, for exceptional reasons, you have not attempted any Level 4 modules, you must also register on these alongside your Level 6 modules.

When planning your studies, you must take into account the time it will take for these assessments to be marked and graded. Modules that are attempted in a session, will have results released during the following session and not before.

For example, if you register for Object Orientated Programming or Software Design and Development in the October 2021 session, your results for these modules would not be available before the April 2022 session. Instead, your results for these modules would become available *during* the April 2022 session, and you would then be able to progress to Level 6 in the October 2022 session.

BSc Final Project

5.13

To register for the BSc Final Project, you must have:

- passed, or exhausted all permitted attempts, at all modules at Levels 4 and 5, excluding any for which you have been awarded credit through recognition of prior learning; and;
- made an attempt at a minimum of 60 credits at Level 6

5.14

Where you have failed a compulsory module at the third attempt or an optiona**l** module which you cannot or do not choose to swap, you will be permitted to take the Final Project, and continue studies towards achieving a pass degree (unclassified) only. You will not be eligible for the BSc degree with honours.

Refer to Regulations 4.36 to 4.38 for information on what will be deemed an attempt.

Graduate Diploma Final Project

5.15

In order to register for the Graduate Diploma Final Project, you must have made an attempt at a minimum of 60 credits from any combination of modules.

6 Transfer of Registration prior to graduation

6.1

If you transfer from one programme to another, you will not be granted a new period of registration.

Transfer between BSc programmes within the Computer Science suite of awards

6.2

You may apply to transfer between BSc programmes offered under these regulations provided that:

- you have selected, or are still able to select, the core modules on the degree to which you wish to transfer;

- you are still within your maximum period of registration;
- you have not failed at the final attempt, a module that is core on the degree to which you wish to transfer;
- you have not passed more than one Level 6 module which does not fit on the degree to which you wish to transfer;
- you are not yet eligible for the BSc award upon which you are currently registered.

6.3

Upon transfer, you will be permitted to discard one passed module only which is not available on the degree to which you wish to transfer.

6.4

If your passed modules do not fit on to an alternative specialist degree, you may apply to transfer to the BSc in Computer Science only.

6.5

If you transfer between degree programmes we will transfer credit for:

- any modules that you have already passed provided they fit onto your new degree; and
- credit awarded for recognition of prior learning provided this remains applicable to your new degree.

6.6

The marks obtained in modules you have already passed, excluding any discarded module, will be taken into consideration for classification purposes. If you have been awarded credit for a module, we will not allow you to resit it upon transfer.

6.7

Any failed attempts made will be carried forward and will be counted towards the number of attempts permitted for the same modules following transfer.

6.8

If you are permitted to transfer between BSc programmes offered under these regulations, all modules studied will be listed on your final transcript when you receive your award. This includes modules which are discarded upon transfer.

Transfer between Graduate Certificates and Graduate Diplomas

6.9

You may apply to transfer your registration to an alternative Graduate Certificate or Graduate Diploma award provided that:

- you have selected, or are still able to select, the core and compulsory modules on the degree to which you wish to transfer;
- you are still within your maximum period of registration;
- you have not failed at the final attempt, a module that is core or compulsory on the programme to which you wish to transfer;
- you have not passed more than one module which does not fit on to the degree to which you wish to transfer;
- you are not yet eligible for the award upon which you are currently registered.

7 Scheme of award

BSc

7.1

To be considered for the qualification of a BSc degree with honours you are required to have passed modules to the value of **360 credits**. This may include recognition of prior learning for Level 4 modules and/or compensated fails where permitted.

7.2

A BSc will be classified according to the following scale:

Final average	Classification
70% or above	First Class Honours
60% - 69%	Second Class Honours (Upper Division)
50% - 59%	Second Class Honours (Lower Division)
40% - 49%	Third Class Honours
0 - 39%	Fail

7.3

Each module is worth 15 credits and the Final Project is worth 30 credits. To calculate the final grade for the degree, the marks for the modules are weighted according to credit value.

7.4

The final weighted average will be based on the marks obtained from **all** modules, including those eligible for inclusion through the marginal condonement rules.

7.5

When calculating a candidate's final degree classification, a relative weighting of 1:3:5 will be applied to modules at Levels 4, 5 and 6 respectively.

7.6

If you have credit for any module through RPL, the examiners will assess your class of Honours only upon the grades received for the modules you have undertaken with us for this programme.

Graduate Diploma and Graduate Certificate

7.7

To be considered for the award of the Graduate Diploma you are required to have attempted and passed modules to the value of **120 credits,** with a minimum of 90 being at Level 6.

7.8

For the Graduate Diploma, each module is worth 15 credits except the Final Project which is worth 30 credits. To calculate the final grade for the award, the marks for **all** modules are weighted according to credit value.

7.9

To be considered for the award of the Graduate Certificate you are required to have attempted and passed modules to the value of **60 credits,** with a minimum of 45 being at Level 6.

7.10

For the Graduate Certificate, the final average will be based on the marks obtained from **all** modules.

7.11

Both the Graduate Certificate and the Graduate Diploma will be classified according to the following scale:

Final average	Classification
70% or above	Distinction
60% - 69%	Merit
50% - 59%	Pass
40% - 49%	Pass
0 - 39%	Fail

Intermediate qualifications

7.12

The scale used for classification of any intermediate qualification is:

Final average	Classification
40% or above	Pass
0 - 39%	Fail

Exit qualifications

7.13

If you are registered on a BSc and are unable to pass modules to a total value of 360 credits due to exhausting the permitted number of attempts, you may be eligible for an exit qualification of either a Certificate of Higher Education in Computer Science or a Diploma of Higher Education in Computer Science.

7.14

If you are registered on a Graduate Diploma and are unable to pass modules to a total value of 120 credits due to exhausting the permitted number of attempts, you may be eligible for an exit qualification of a Graduate Certificate relating to the specialism of your Graduate Diploma.

7.15

The scale used for classification of any exit qualification is:

Final average	Classification
40% or above	Pass
0 - 39%	Fail

Diploma of Higher Education in Computer Science, Certificate of Higher Education in Computer Science, and Pass degree (unclassified)

The Diploma of Higher Education and Certificate of Higher Education are only available as exit/intermediate qualifications for students studying a Bachelor of Science programme.

The Bachelor of Science (unclassified/pass degree) is only available as an exit qualification.

7.16

If you are studying a BSc and have successfully completed at least **240 credits**, with a minimum of 90 credits at Level 5, you may be considered for the **Diploma of Higher Education in Computer Science** qualification.

7.17

The final Diploma of Higher Education in Computer Science mark is determined by an average of the marks obtained from each of the 16 modules studied; it will not include any module where credit was awarded for RPL.

7.18

If you are studying a BSc and have successfully completed at least **120 credits**, with a minimum of 90 credits at Level 4, you may be considered for the **Certificate of Higher Education in Computer Science** qualification. There will be no marginal condonement for modules included in this qualification.

7.19

The final Certificate of Higher Education in Computer Science mark is determined by an average of the marks obtained from each of the eight modules studied. Prior learning will not be recognised or accredited.

7.20

If you are registered on any of the BSc programmes, where you have attempted all 22 modules and the Final Project and have successfully completed at least **300 credits**, but less than 360, including Introduction to Programming I, you may be considered for a pass (unclassified) degree in Computer Science. You will not be eligible for any of the specialist degree qualifications.

Appendix A – Structure of the programme

Refer to Appendix B for full module descriptions.

It is expected that students who are registered on a specialist degree programme will complete a final project in line with the specialist subject area.

Some modules have additional hardware and software requirements. Refer to the Programme Specification for further information.

BSc Computer Science

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Six optional modules chosen from the list:

- Data science [CM3005]

- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Artificial intelligence [CM3020]
- Virtual reality [CM3025]
- Games development [CM3030]
- Advanced web development [CM3035]
- Physical computing and internet of things [CM3040]
- 3D graphics and animation [CM3045]
- Mobile development [CM3050]
- Interaction design [CM3055]
- Natural language processing [CM3060]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Data Science)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]

- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Data science [CM3005]
- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Advanced web development [CM3035]
- Natural language processing [CM3060]

+

One optional module chosen from the list:

- Artificial intelligence [CM3020]
- Virtual reality [CM3025]
- Games development [CM3030]
- Physical computing and internet of things [CM3040]
- 3D graphics and animation [CM3045]
- Mobile development [CM3050]
- Interaction design [CM3055]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Machine Learning and Artificial Intelligence)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Natural language processing [CM3060]
- Artificial intelligence [CM3020]
- Intelligent signal processing [CM3065]

+

One optional module chosen from the list:

- Data science [CM3005]
- Virtual reality [CM3025]
- Games development [CM3030]
- Advanced web development [CM3035]
- Physical computing and internet of things [CM3040]
- 3D graphics and animation [CM3045]

- Mobile development [CM3050]
- Interaction design [CM3055]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (User Experience)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Virtual reality [CM3025]
- Advanced web development [CM3035]

- Physical computing and internet of things [CM3040]
- Mobile development [CM3050]
- Interaction design [CM3055]

+

One optional module chosen from the list:

- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Artificial intelligence [CM3020]
- Data science [CM3005]
- Games development [CM3030]
- 3D graphics and animation [CM3045]
- Natural language processing [CM3060]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Web and Mobile Development)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]

- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile Software Projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Databases and advanced data techniques [CM3010]
- Advanced web development [CM3035]
- 3D graphics and animation [CM3045]
- Mobile development [CM3050]
- Interaction design [CM3055]

+

One optional module chosen from the list:

- Data science [CM3005]
- Machine learning and neural networks [CM3015]
- Artificial intelligence [CM3020]
- Virtual reality [CM3025]
- Games development [CM3030]
- Physical computing and internet of things [CM3040]
- Natural language processing [CM3060]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Physical Computing and the Internet of Things)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Databases and advanced data techniques [CM3010]
- Advanced web development [CM3035]
- Physical computing and internet of things [CM3040]
- Interaction design [CM3055]
- Intelligent signal processing [CM3065]

+

One optional module chosen from the list:

- Data science [CM3005]
- Machine learning and neural networks [CM3015]
- Artificial intelligence [CM3020]
- Virtual reality [CM3025]
- Games development [CM3030]

- 3D graphics and animation [CM3045]
- Mobile development [CM3050]
- Natural language processing [CM3060]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Games Development)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Artificial intelligence [CM3020]

- Virtual reality [CM3025]
- Games development [CM3030]
- 3D graphics and animation [CM3045]
- Interaction design [CM3055]

+

One optional module chosen from the list:

- Data science [CM3005]
- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Advanced web development [CM3035]
- Physical computing and internet of things [CM3040]
- Mobile development [CM3050]
- Natural language processing [CM3060]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

BSc Computer Science (Virtual Reality)

Level 4

One core module:

- Introduction to programming I [CM1005]

+

Seven compulsory modules:

- Introduction to programming II [CM1010]
- Computational mathematics [CM1015]
- Discrete mathematics [CM1020]
- Fundamentals of computer science [CM1025]
- How computers work [CM1030]
- Algorithms and data structures I [CM1035]
- Web development [CM1040]

Level 5

Eight compulsory modules:

- Object oriented programming [CM2005]
- Software design and development [CM2010]
- Programming with data [CM2015]
- Agile software projects [CM2020]
- Computer security [CM2025]
- Graphics programming [CM2030]
- Algorithms and data structures II [CM2035]
- Databases, networks and the web [CM2040]

Level 6

Five specialist core modules:

- Virtual reality [CM3025]
- Games development [CM3030]
- 3D graphics and animation [CM3045]
- Mobile development [CM3050]
- Interaction design [CM3055]

+

One optional module chosen from the list:

- Data science [CM3005]
- Databases and advanced data techniques [CM3010]
- Machine learning and neural networks [CM3015]
- Artificial intelligence [CM3020]
- Advanced web development [CM3035]
- Physical computing and internet of things [CM3040]
- Natural language processing [CM3060]
- Intelligent signal processing [CM3065]

+

One 30 credit project:

- Final project [CM3070]

Graduate Diploma in Data Science

Three core modules:

- Programming with Data [CM2015]
- Data Science [CM3005]

- Machine Learning and Neural Networks [CM3015]

+

Three compulsory modules:

- Databases and Advanced Data Techniques [CM3010]
- Advanced Web Development [CM3035]
- Natural Language Processing [CM3060]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in Machine Learning and Artificial Intelligence

Three core modules:

- Programming with Data [CM2015]
- Machine Learning and Neural Networks [CM3015]
- Artificial Intelligence [CM3020]

+

Three compulsory modules:

- Data Bases and Advanced Data Techniques [CM3010]
- Natural Language Processing [CM3060]
- Intelligent Signal Processing [CM3065]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in User Experience

Three core modules:

- Agile Software Projects [CM2020]
- Mobile Development [CM3050]
- Interaction Design [CM3055]

+

Three compulsory modules:

- Advanced Web Development [CM3035]
- Virtual Reality [CM3025]
- Physical Computing and internet of things [CM3040]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in Web Development

Three core modules:

- Databases, Networks and the Web [CM2040]
- Databases and Advanced Techniques [CM3010]
- Advanced Web Development [CM3035]

+

Three compulsory modules:

- Interaction Design [CM3055]
- Agile Software Projects [CM2020]
- Mobile Development [CM3050]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in Mobile Development

Three core modules:

- Object-Oriented Programming (Level 5) [CM2005]
- Databases and Advanced Data Techniques [CM3010]
- Mobile Development [CM3050]

+

Three compulsory modules:

- Advanced Web Development [CM3035]
- 3D Graphics and Animation [CM3045]
- Interaction Design [CM3055]

+

- A Final Project [CM3070]

Graduate Diploma in Physical Computing and the Internet of Things

Three core modules:

- Databases, Networks and the Web [CM2040]

- Physical Computing and internet of things [CM3040]
- Intelligent Signal Processing [CM3065]

+

Three compulsory modules:

- Advanced Web Development [CM3035]
- Databases and Advanced Data Techniques [CM3010]
- Interaction Design [CM3055]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in Games Development

Three core modules:

- Object Oriented Programming [CM2005]
- Games Development [CM3030]
- 3D Graphics and Animation [CM3045]

+

Three compulsory modules:

- Artificial Intelligence [CM3020]
- Virtual Reality [CM3025]
- Interaction Design [CM3055]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Diploma in Virtual Reality

Three core modules:

- Graphics Programming [CM2030]
- Virtual Reality [CM3025]
- 3D Graphics and Animation [CM3045]

+

Three compulsory modules:

- Interaction Design [CM3055]
- Games Development [CM3030]

- Mobile Development [CM3050]

+

One 30 credit project:

- Final Project [CM3070]

Graduate Certificate in Data Science

Three core modules:

- Programming with Data [CM2015]
- Data Science [CM3005]
- Machine Learning and Neural Networks [CM3015]

+

One compulsory module:

- Databases and Advanced Data Techniques [CM3010]

Graduate Certificate in Machine Learning and Artificial Intelligence

Three core modules:

- Programming with Data [CM2015]
- Machine Learning and Neural Networks [CM3015]
- Artificial Intelligence [CM3020]

+

One compulsory module:

- Data Bases and Advanced Data Techniques [CM3010]

Graduate Certificate in User Experience

Three core modules:

- Agile Software Projects [CM2020]
- Mobile Development [CM3050]
- Interaction Design [CM3055]

+

One compulsory module:

- Advanced Web Development [CM3035]

Graduate Certificate in Web Development

Three core modules:

- Databases, Networks and the Web (Level 5) [CM2040]

- Databases and Advanced Techniques [CM3010]
- Advanced Web Development [CM3035]

+

One compulsory module:

- Interaction Design [CM3055]

Graduate Certificate in Mobile Development

Three core modules:

- Object-Oriented Programming [CM2005]
- Databases and Advanced Data Techniques [CM3010]
- Mobile Development [CM3050]

+

One compulsory module:

- Advanced Web Development [CM3035]

Graduate Certificate in Physical Computing and the Internet of Things

Three core modules:

- Databases, Networks and the Web [CM2040]
- Physical Computing and internet of things [CM3040]
- Intelligent Signal Processing [CM3065]

+

One compulsory module:

- Advanced Web Development [CM3035]

Graduate Certificate in Games Development

Three core modules:

- Object Oriented Programming [CM2005]
- Games Development [CM3030]
- 3D Graphics and Animation [CM3045]

+

One compulsory module:

- Artificial Intelligence [CM3020]

Graduate Certificate in Virtual Reality

Three core modules:

- Graphics Programming [CM2030]
- Virtual Reality [CM3025]
- 3D Graphics and Animation [CM3045]

+

One compulsory module:

- Interaction Design [CM3055]

Appendix B – Module Outlines

Topics covered in each module may be revised to ensure currency and relevance. Students will be advised of any changes in advance of their study. See module descriptors under the Structure tab on the website for further information and any updates.

The BSc Computer Science suite is a new programme. In these regulations, some modules yet to be taught for the first time, do not contain a list of topics covered. As those modules are launched, future iterations of these regulations will include those topic lists.

Level 4

Introduction to programming I [CM1005]

This module is focused on basic programming techniques. By taking this module, you will learn how to use the basic elements of computer programming such as variables, conditionals, functions and loops. You will also learn how to create interactive, graphical computer programs. You will also be introduced to basic object-oriented programming techniques.

Topics covered:

- Your development environment
- Drawing in 2D
- Variables, objects and interaction
- Conditional and variable types
- For loops and arrays
- Advanced arrays and iteration
- User defined functions and scope
- Data structures and searches
- Extending objects
- Constructor functions

Assessment: Coursework only (Type II)

Introduction to programming II [CM1010]

This module is focused on adding to the basic programming skill set you developed in Introduction to Programming I and giving you experience working with existing code and third-party libraries. By taking this module, you will learn how to customise existing code, to implement basic object orientation and to work with a range of third-party libraries.

Topics covered:

- Object orientation in practice
- Introducing case study – drawing App
- Introducing case study – music Visualizer
- Introducing case study – data Visualisation

- Extending the case studies – part 1
- Extending the case studies – part 2
- Extending the case studies – part 3
- Asynchronous programming
- Testing for stability and performance
- Completing your project

Assessment: Coursework only (Type III)

Computational mathematics [CM1015]

This module helps you hone your skills in thinking abstractly. It also introduces you to many of the standard continuous models used to help understand and design computational systems. Through this module, you will develop the fundamental computational mathematical tools that will support you throughout the BSc programme. Particular attention is paid to notions of experimentation, reasoning, and generalisation. By taking this module, you will learn a wide range of the computational mathematical concepts and techniques that underpin Computer Science. In particular, you will study number systems, special functions, graphing and linear algebra.

Topics covered:

- Number bases
- Sequences and series
- Modular arithmetic
- Angles, triangles and trigonometry
- Graph sketching and kinematics
- Trigonometric functions
- Exponential and logarithmic functions
- Calculus: limits and differentiation
- Algebra: vectors, matrices and linear transformations
- Combinatorics and probability

Assessment: One two hour unseen written examination and coursework (Type I)

Discrete mathematics [CM1020]

This module helps you to hone your skills in thinking abstractly. It also introduces you to many of the standard discrete models used to help understand and design computational systems. Through this module, you will develop the fundamental discrete mathematical tools that will support you throughout the BSc programme. Particular attention is paid to notions of experimentation, reasoning, and generalisation.

Topics covered:

- Sets
- Functions

- Propositional logic
- Predicate logic
- Boolean algebra
- Induction and recursion
- Graphs
- Trees
- Relations
- Combinatronics

Assessment: One two hour unseen written examination and coursework (Type I)

Fundamentals of computer science [CM1025]

By taking this module, you will gain a broad understanding of many of the key topic areas in computer science and the fundamental concepts that underpin them. In the area of fundamental concepts, you will study binary representations and logic, complexity theory and theories of computation, finite state machines and Turing machines. Building on this, you will then study key areas of interest in computer science including databases, artificial intelligence, and machine learning. These will be presented in the light of practical examples to illustrate how they are implemented in modern computer systems.

Topics covered:

- Logic
- Proof techniques
- Basic combinatorial principles
- Automata theory
- Regular languages
- Context-free languages
- Turing machines
- Algorithms 1
- Algorithms 2
- Complexity theory

Assessment: One two hour unseen written examination and coursework (Type I)

How computers work [CM1030]

This module aims to help you understand, and to interact with, computer systems. You will learn how to use knowledge about computational processes to analyse and explain the behaviour of computer systems. The module will use the concept of a Notional Machine, an abstract representation of the functioning of a computer system, to help you to reason about computer systems and to predict their behaviour. You will also learn about typical computer system architectures, basic networking and network services such as databases.

Topics covered:

- How a computer works
- How the web works
- Data representation
- Computer architecture
- Operating systems
- Operating system processes
- Networks
- The internet
- Machine learning
- Data science

Assessment: One two hour unseen written examination and coursework (Type I)

Algorithms and data structures I [CM1035]

This module aims to help you to develop your analytical and problem-solving skills, particularly concerning thinking algorithmically. The module will encourage you to start thinking about how to use computers to solve problems. You will develop skills in thinking algorithmically and learn the central concepts of algorithms and data structures. You will learn about linear data structures such as arrays, vectors and lists, and a unifying framework for considering such data structures as collections. You will learn how algorithms can be expressed as flowcharts and pseudocode, and how to convert these expressions into running programs. You will learn specific algorithms used for sorting and searching, and how to express repetition as iteration and recursion. You will learn a simple model for execution of computation, and how to describe computational problems and their solutions. The model will allow you to compare algorithms regarding their correctness and regarding their efficiency.

Topics covered:

- Problems, algorithms and flowcharts
- Pseudocode
- Vectors, stacks and queues
- Data structures and searching
- Sorting data 1
- What makes a good algorithm?
- Searching data 2
- Recursion
- Sorting data 2
- Computational complexity

Assessment: One two hour unseen written examination and coursework (Type I)

Web development [CM1040]

This module aims to provide you with a foundational web development skill set. You will learn the critical languages of the web: HTML, CSS and JavaScript. Using HTML and CSS, you will learn how to markup, layout and style web content. You will learn about the document object model and how you can dynamically manipulate it with JavaScript to create interactive web pages. You will consider accessibility and usability issues, and how you can overcome them. You will learn about website deployment and how you can use it to make your websites accessible to other people. The module will also enable you to present your work online in the form of a website.

Topics covered:

- Introduction to the web
- Designing web sites
- Introduction to HTML
- Introduction to CSS
- Positioning in CSS
- Responsive web sites
- Introduction to JavaScript for the web
- React to the user
- JavaScript libraries
- Web hosting & professional practices

Assessment: Coursework only (Type III)

Level 5

Object oriented programming [CM2005]

This module aims to provide you with an object-oriented programming skill set. You will learn what objects and classes are and how to write your classes. You will see how objects can interact with each other, including defining and implementing interfaces to control the interaction. You will learn how to use inheritance to inherit and extend functionality from parent classes. You will learn how to write code according to style guidelines and how to write formal code documentation..

Topics covered:

- Text I/O and functions
- Using classes and variables to model data
- File I/O, exception handling and algorithms
- Writing and testing an algorithm
- Object interactions
- Libraries, toolkits, frameworks and widgets
- Event driven programming and inheritance
- Refactoring and class design

- Initialiser lists, constructors and threads
- Advanced class and user interfaces

Assessment: Coursework only (Type II)

Software design and development [CM2010]

This module aims to advance your software development skills so that you can write more robust and complicated programs. You will learn how to use a range of programming techniques that will allow you to deal with unwanted or unexpected events that might happen when your application is running. You will use defensive coding to check data before processing it, and exception handling to gracefully manage unforeseen or unwanted occurrences. You will learn how to discuss program structure concerning cohesion (how to meaningfully organise code into modules) and coupling (how to define the interactions between different parts of the program). You will learn about test-driven development, where you write tests for your code, and write the code itself, in parallel. You will also learn how to use software versioning tools to manage a software project as it develops.

Assessment: One two hour unseen written examination and coursework (Type I)

Programming with data [CM2015]

This module will show you how to work with data: getting data from a variety of sources, visualising data in compelling, informative ways, processing data to make it useful and shareable, and reasoning with data to test hypotheses and make parameterised predictions. The module will also introduce you to a new language and programming environment that is well-adapted to languages for these applications.

Assessment: One two hour unseen written examination and coursework (Type I)

Agile software projects [CM2020]

This module aims to provide insights and practice in software development using contemporary methods to produce software that meets the needs of users and supports an organisation's business function. The module will enable you to gain competence in the conceptualisation of a technology-based solution to a real-world problem, fulfilling the requirements of users and taking constraints imposed by the prevailing and foreseen market conditions and lessons learned from prototypes into account. You will then be given the opportunity to present a proposal for a technical project including a structured plan for implementing the solution using the agile development methodology and test driven development practices. During the whole process from concept to solution presentation, you will be required to work in a distributed team using online collaboration, project tracking and version control tools.

Assessment: Coursework only (Type III)

Computer security [CM2025]

This module aims to provide you with an understanding of the need for computer security and the technologies that support it. It has both a theoretical component that will teach you mathematical underpinnings of security systems and a practical element that will help you discover the pitfalls of security design and to comprehend the mathematics underlying the protocols by programming small examples.

Assessment: One two hour unseen written examination and coursework (Type I)

Graphics programming [CM2030]

This module aims to show you how to work with images in a variety of ways. You will learn how to synthesise graphics and how to process visual signals. You will learn about the mathematical ideas that underpin digital representations of graphics; how digital media files represent graphics, and how to handle and manipulate them; and the basics of working with simulated physics and 3D graphics.

Topics covered:

- 2D graphics
- Physics part 1
- Physics part 2
- Generative art part 1
- Generative art part 2
- Procedural content generation for games
- 3D graphics
- Colours and images
- Image processing
- Computer vision

Assessment: Coursework only (Type II)

Algorithms and data structures II [CM2035]

This module aims to provide you with detailed knowledge of several common algorithms and data structures. You will improve your understanding of searching and sorting and learn new algorithms to solve new problems. You will learn about a range of data structures such as trees, heaps, sets, maps, stacks, queues and graphs. You will learn how to evaluate and describe the performance of algorithms using big-O notation. You will learn: how to choose appropriate data structures for representing problems, how to define and implement algorithms for manipulating them, and how to analyse the correctness and efficiency of algorithms.

You will be expected to have mastered the material in Algorithms and Data Structures I before attempting this module.

Topics covered:

- Analysis of algorithms
- Recursive algorithms
- Comparison sorting algorithms
- Non-comparison sorting algorithms
- Hashing
- Linked lists, stacks and queues
- Linear data structures
- Trees
- Heaps

- Graphs

Assessment: One two hour unseen written examination and coursework (Type I)

Databases, networks and the web [CM2040]

In this module, you will learn theory and practical skills focused on the modern web, internet and client-server applications. You will learn about relational database systems, mainly from a development perspective, emphasising issues related to data modelling and database implementation in SQL. You will learn how to model data in a database, retrieve data from the database and provide access to data through dynamic websites. In particular, you will learn about the Relational Model, Query processing, and socket architectures to enable communication.

Topics covered:

- Three-tier web application
- Building simple web servers
- Generating web pages from data using templates
- Handling forms to input data
- Representing data in databases, relational databases
- Basic database operations, providing access to databases from middleware
- Building a dynamic web application
- Database schema, ERD
- Querying a database (advanced)
- Networking concepts

Assessment: One two hour unseen written examination and coursework (Type I)

Level 6

Data science [CM3005]

By taking this module, you will gain a data science skillset. With these skills, you will be able to write computer programs that can read, process and analyse textual and numerical data. You will be able to generate plots and interactive visualisations of data. You will understand how to apply statistical methods to the interpretation of results. You will be able to use data analysis in the decision-making process. You will also learn about a range of application domains for data science.

Assessment: One two hour unseen written examination and coursework (Type I)

Databases and advanced data techniques [CM3010]

This module aims to show you how to work with data in your computer programs. You will learn how to use SQL and NoSQL databases to store tabular data and documents. You will learn about the ethics of gathering and processing data and why it is important to consider issues around data security. You will learn about open data resources, and how you can access them from your computer programs. You will learn about audio and video data, and the challenges of working with this kind of data.

Assessment: One two hour unseen written examination and coursework (Type I)

Machine learning and neural networks [CM3015]

This module provides a broad view of machine learning and neural networks. You will learn how to solve common machine learning problems such as regression, classification, clustering, matrix completion and pattern recognition. You will learn about neural networks and how they can be trained and optimised, including an exploration of deep neural networks. You will learn about machine learning and neural network software libraries that allow you to develop machine learning systems rapidly, and you will learn how to verify and evaluate the results.

Assessment: Coursework only (Type II)

Artificial intelligence [CM3020]

This module is focused on Artificial Intelligence techniques. You will understand the historical development of Artificial Intelligence including search, vision and planning. You will become familiar with the foundations of agent-based approaches to software design, decision making and problem solving including under uncertainty. You will have an opportunity to apply Artificial Intelligence techniques to particular problems such as game playing and decision making.

Assessment: One two hour unseen written examination and coursework (Type I)

Virtual reality [CM3025]

The module will combine the theory and psychology of VR with practical development skills. You will learn the skills needed to design compelling VR environments and the skills that apply to creative practice, science and industry.

This module aims to give you the skills needed to develop VR. These skills include understanding the basic theory of presence in VR, which underlies the basic design principles. You will also learn practical development skills, using an appropriate 3D engine to create interactive virtual environments. These skills will include creating 3D environments, designing and implementing 3D interaction for VR and building social VR experiences with interactive virtual characters.

Assessment: Coursework only (Type III)

Games development [CM3030]

This module will introduce you to i) industry standard tools for game development, such as game engines, and ii) the process of game development, including prototyping and playtesting. You will undertake a short series of game development projects, each lasting a set number of weeks and with a specific brief. For each project, you will propose a game that fits the brief, and then you will implement it. You are expected to deliver the proposed game and document it thoroughly. Through this process, you will develop an awareness of intended audience and the use of media for documentation.

Contemporary video game production draws on a range of techniques from artificial intelligence (AI) to perform tasks such as controlling virtual agents and generating novel game content. This module will also introduce crucial game AI concepts. Compared to mainstream AI, the emphasis is less on optimal problem solving and more on entertaining the player with limited computational resources. This module gives students practical experience of programming game AI systems and an understanding of the relevant theory.

Assessment: Coursework only (Type III)

Advanced web development [CM3035]

Through this module, you will learn how to build dynamic, data-driven websites using databases, front-end frameworks and server-side programming. This module provides the skill set required to do full stack web development work. By studying this module, you will develop a web developer skill set that enables you to understand how to build and deploy complete, data-driven websites. You will consider several different technologies for client side-web development such as HTML, CSS, JavaScript and templates. You will explore methods for developing server-side web applications, by building web-accessible wrappers around databases. You will consider issues of scalability, and learn about web application configuration and deployment.

Assessment: Coursework only (Type II)

Physical computing and the internet of things [CM3040]

This course provides an introduction to the development and programming of hardware devices that can sense and act in the environment. The course will explain and demonstrate how the environment, which is inherently continuous, can be monitored by analogue electrical and mechanical sensors, then captured and analysed using a computer, which is a discrete system. A focus of this course is the interface between the digital and the analogue.

This study encompasses basic physics, electronics, programming and software engineering. The practical objective of this course is the development of the skills needed for designing and building interactive physical devices.

Assessment: Coursework only (Type III)

3D graphics and animation [CM3045]

This module will cover advanced methods used in current state-of-the-art graphics and animation systems. It will include the mathematical foundations, computational techniques and their use in creative practice. By taking this module, you will learn how to write programs that generate animated 3D graphics. There are several distinct study areas: 3D modelling and animation, the graphics pipeline, simulation of physics and shader programming. You will study a range of examples, and through these learn how you can program computer graphics in contemporary graphical software for different applications.

Assessment: One two hour unseen written examination and coursework (Type I)

Mobile development [CM3050]

This module aims to give you the fundamental understanding and skills needed to develop mobile applications. By studying this module, you will learn the principles of effective mobile user interface design and how to design and build user interfaces. You will learn about data-driven mobile applications, and how you can integrate a mobile application to a data source. You will learn about the mobile development ecosystem and how you can develop, run and test your applications. You will learn how to work with various sensors available on mobile devices using built-in APIs. The style of the modules will be practical, with a focus on developing functioning applications.

Assessment: Coursework only (Type III)

Interaction design [CM3055]

When taking this module, you will examine the notion of 'interaction with technology'. You will focus on the concepts behind modern user experience design and production. You will gain a solid grasp and practical experience of the process which allows the creation of interactive systems. This process involves specification, design, prototyping and evaluation. You will examine several design approaches and techniques, and consider how they enable usability engineering. You will learn how

to evaluate interactive systems against criteria such as efficiency and usability. You will examine issues of accessibility from the perspective of different populations.

Assessment: One two hour unseen written examination and coursework (Type I)

Natural language processing [CM3060]

This module will provide you with a grounding in both rule-based and statistical approaches to NLP, and it combines theoretical study with hands-on work employing widely used software packages. The module focuses on text processing, and by taking this module, you will learn about how you can work with text-based natural language in your computer programs. You will learn about grammars and how they can be used to analyse text. You will learn how statistical analysis can be used to extract information from and classify text. You will work in an appropriate programming environment for NLP, using libraries to implement NLP workflows.

Assessment: One two hour unseen written examination and coursework (Type I)

Intelligent signal processing [CM3065]

This module aims to provide you with a broad experience of digital signal processing techniques and applications. You will study how audio and video signals can be captured and processed by a computer program. You will learn about time domain and frequency domain representations and processing. You will learn how you can extract information from audio signals. You will implement movement and face detection systems that work with live camera input.

Assessment: Coursework only (Type II)

Final project [CM3070]

In this module, you will undertake a substantial independent project that will allow you to demonstrate a wide range of skills such as project planning, management, research, software implementation, and written presentation. If you are enrolled on a specialist pathway, either as part of the BSc or a graduate diploma, you will be expected to undertake a project in your specialist area. You will integrate the knowledge gained throughout the programme and use skills acquired in other modules in the implementation of your final project which will be in computer science or your specialist area. The work will consist of a combination of research and software development in various proportions. You will be expected to make use of methodologies from various components of computer science, including your specialist pathway if appropriate.

Assessment: One two hour unseen written examination and coursework

Appendix C – Assessment Criteria

Mark	Descriptor	Specific Marking Criteria
80-100%	I: First (Exceptional)	• Represents an exceptional achievement beyond the standard requirements of a first class degree. • Students' work should demonstrate considerable creative thought and be based on a critical evaluation of prior work. Work is likely to achieve some outcomes that would be expected at a higher level degree.
70-79%	I: First (Excellent)	• Demonstration of a thorough grasp of relevant concepts, methodology and content appropriate to the subject discipline; indication of originality in application of ideas, in synthesis of material or in implementation; insight reflects depth and confidence of understanding of the material. • Students should be able to design and create computer systems that demonstrate original design considerable independent thought and are based on independent learning of prior work and existing technologies. • Students should be able to critically evaluate their own work.
60-69%	IIi: Upper Second (Very good)	• Demonstration of a sound level of understanding based on a competent grasp of relevant concepts, methodology and content; display of skill in interpreting complex material; organisation of material at a high level of competence. • Students should be able to demonstrate the ability to independently design, implement and evaluate a high quality and complex computer systems using knowledge from across the programme. • Students should be able to effectively evaluate their work using standard methodologies.
50-59%	IIii: Lower Second (Good)	• Demonstration of an adequate level of understanding of relevant concepts, methodology and content; display of sufficient skill to tackle some complex problems; appropriate organisation of material. • Students should demonstrate the ability to create moderately complex computer software, making use of prior knowledge and material taught within the program. • Students should be able to, at least partially, test their work using standard methods.
40-49%	III: Third (Pass)	• Represents the overall achievement of the appropriate learning outcomes to a threshold level (honours). • Demonstration of a limited level of understanding of relevant concepts, methodology and content; clear if limited attempt to tackle problems; display of some skill in organisation of material. • Students should demonstrate creation of a basic, complete and working computing system/ program.

Mark	Descriptor	Specific Marking Criteria
25-39%	Fail	• Represents an overall failure to achieve the appropriate learning outcomes.
10-24%	Bad fail	• Represents a significant overall failure to achieve the appropriate learning outcomes.
1-9%	Very bad fail	• A submission that does not even attempt to address the specified learning outcomes.
0%	Non submission or plagiarised	• Work was not submitted or it was plagiarised.

Appendix D – Transfers from other University of London and Goldsmiths Programmes

Students registered to either the Computing and Information Systems or Creative Computing programmes are permitted to transfer to BSc Computer Science. If you wish to transfer, you must be within their registration period, and if your registration period has ended, the transfer will not be available to you.

Module transfers will include marks, and those marks will be listed on the BSc Computer Science transcript.

If you apply to transfer credit from the Computing and Information Systems or Creative Computing programmes, you will have the following options, depending on which stage of your studies you are in.

Level 4

Students at any stage of Level 4 can transfer onto the BSc Computer Science programme.

If you have finished all 120 credits at Level 4, you can transfer straight to Level 5.

If you have been awarded fewer than 120 credits, you are required to complete the number of credits of Level 4 on BSc Computer Science to make up to 120 credits altogether. This choice is subject to the following constraints:

- If you have done any of the modules in the first two columns of the Level 4 equivalents table below, you cannot do the modules in the right-hand column of the same row.
- You need to complete either Mathematics for computing [CO1102] (30 credits) or both of Computational mathematics [CM1015] (15 credits) and Discrete mathematics [CM1020] (15 credits).
- You need to complete either Introduction to Java and object-oriented programming [CO1109] or both of Introduction to programming I [CM1005] (15 credits) and Introduction to programming II [CM1010] (15 credits).

Level 4 Module Equivalents		
Computing and Information Systems	**Creative Computing**	**Computer Science**
Mathematics for computing [CO1102] (30 credits)	Mathematics for computing [CO1102] (30 credits)	Computational mathematics [CM1015] (15 credits) Discrete mathematics [CM1020] (15 credits)
Introduction to Java and object-oriented programming [CO1109] (30 credits)	Introduction to Java and object-oriented programming [CO1109] (30 credits)	Introduction to programming I [CM1005] (15 credits) Introduction to programming II [CM1010] (15 credits)

Level 4 Module Equivalents		
Computing and Information Systems	**Creative Computing**	**Computer Science**
Introduction to computing and the internet [CO1110] (30 credits)	Introduction to computing and the internet [CO1110] (30 credits)	How computers work [CM1030] (15 credits) Fundamentals of computer science [CM1025] (15 credits)
Information systems: foundations of e-business [CO1108] (30 credits)		
	Creative computing I: image, sound and motion [CO1112] (30 credits)	
		Algorithms and data structures I [CM1035] (15 credits)
		Web development [CM1040] (15 credits)

Level 5

Students studying Level 5 modules are permitted to transfer all of their Level 4 modules, plus, a maximum of two Level 5 modules (60 credits total).

For the remaining Level 5 Computer Science modules, if you have studied any of the modules in the first two columns of the Level 5 equivalents table below, you cannot do the modules in the right-hand column of the same row.

Level 5 Module Equivalents		
Computing and Information Systems	**Creative Computing**	**Computer Science**
Database systems [CO2209] [30 credits]	Database systems [CO2209] [30 credits]	Databases, networks and the web [CM2040] [15 credits] Computer security [CM2025] [15 credits]
Graphical object-oriented and internet programming in Java [CO2220] [30 credits]	Graphical object-oriented and internet programming in Java [CO2220] [30 credits]	Object oriented programming [CM2005] [15 credits] Software design and development [CM2010] [15 credits]

Level 5 Module Equivalents		
Computing and Information Systems	**Creative Computing**	**Computer Science**
Software engineering, algorithm design and analysis [CO2226] [30 credits]	Software engineering, algorithm design and analysis [CO2226] [30 credits]	Agile software projects [CM2020] [15 credits] Algorithms and data structures II [CM2035] [15 credits]
Data communications and enterprise networking [CO2222] [30 credits]		
	Creative computing II: interactive multimedia [CO2227] [30 credits]	
		Programming with data [CM2015] [15 credits]
		Graphics programming [CM2030] [15 credits]