



BSc Computer Science Programme Handbook 2019/20

The Faculty of Science and Technology

Programme Leader: Florian KammueLLer

Student Name: _____

Contents

Your Programme Handbook	4
Information in Alternative Formats.....	4
The Student Welcome Guide	4
MyUniHub	4
MDXapp.....	4
Welcome to Middlesex!.....	6
Welcome from the Executive Dean	6
Academic Calendar.....	7
Part One - Programme Details	8
Your Programme Team.....	8
Personal Tutor.....	10
Your Programme	11
Programme Specification	12
Your Module	12
Optional modules.....	12
Programme costs	12
Your Feedback Opportunities	12
How your Programme is Quality Assured	13
Part Two - Resources and Support Available to You	14
Programme Level Resources	14
Library Resources	14
IT Facilities	14
Student Support at Programme Level	14
Student Support Services.....	14
MDXworks Careers & Employability Service	15
Studying or Placement Abroad	15
Middlesex Student's Union (MDXSU)	16
Part Three - University Policies You Should Know	17
Programme Regulations	17
Research Ethics	17
Assessment.....	18
Submission and receipt of assessment.....	21
Exams	21
Marking, second marking and moderation.....	21

Return of coursework	22
External Examiners.....	22
Feedback on coursework	23
Feedback on examinations	23
Viewing scripts	23
Dissertations/projects.....	23
Progressing on your Programme	24
Results Confirmation	24
Academic Misconduct	24
Extenuating Circumstances	25
Attendance	25
Things you should know about attendance	25
Late arrival.....	26
Health and Safety.....	27
Appendix 1: Curriculum Map	28
Curriculum map for BSc (Hons) <i>Computer Science</i>	28
Appendix 2: Module Narratives.....	31

Introduction

Your Programme Handbook

The purpose of this Handbook is to introduce you to your programme of study and to direct you to other general information about studying at Middlesex University. The material in this document is as accurate as possible at the date of production; however, you will be informed of any major changes in a timely manner.

Your comments on any improvements to this handbook are welcome. Please put them in writing (an email will suffice) with the name of the Programme Handbook to the Programme Leader, Florian Kammuehler at f.kammuehler@mdx.ac.uk

Information in Alternative Formats

This handbook can be found online at: <https://myunihub.mdx.ac.uk/>

If you have a disability which makes navigating the website difficult and you would like to receive information in an alternative format, please contact Disability Support Service disability@mdx.ac.uk

We can supply sections from this publication as:

- a Word document with enlarged type — sent by email or supplied on a CD or memory stick
- printed copy with enlarged type
- printed copy on non-white paper
- as Braille

Other formats may be possible. We will do our best to respond promptly. To help us, please be as specific as you can about the information you require and include details of your disability.

The Student Welcome Guide

Before reading this Programme Handbook you should read the [Student Welcome Guide](#) this guide contains information on more general university services and facilities, such as UniHub, UniHelp and the Library. It is important that you familiarise yourself with this information to get the most from your handbook.

MyUniHub

All information that you require to support your learning at Middlesex is available on [MyUniHub](#). This document highlights key elements that you should be aware of and should be your first point of call, however all information in this document is available on MyUniHub.

MDXapp

MDXapp is Middlesex University's official and free student mobile application that allows you to manage your day-to-day student life on and off campus. The app was developed in

collaboration with your Students' Union (MDXSU) to make sure every student gets the most out of their time here.

Key features

- **Student timetable** – find out when your next lecture, seminar or practical session is in an instant
- **Library account** – search the University's extensive library catalogue and check on your loans, renewals and reservations
- **Campus map** – take the stress out of searching for a room with a detailed room-level campus map
- **Email** – your University e-mail inbox in one centralised and convenient place
- **PC availability** – save time by checking out where there are free computers on campus
- **Transport** – identify the most convenient local transport routes with live updates from TFL
- **MyLearning** – access your personal learning portal with information about your course, modules and upcoming assignments
- **News and events** – get the whole university experience with the latest updates and news from across campus

Getting MDXapp is easy

Go to your app store >> Search for 'MDXapp' >> Install (accept T&C's) >> Log in with your Middlesex University Student IT User ID and Password.

Web app users can download MDXapp here: <https://app.mdx.ac.uk/get>

Available on iPhone and Android software and as a Web App

Welcome to Middlesex!

Welcome from the Executive Dean

Welcome to Middlesex University and to The Faculty of Science and Technology. This programme handbook contains an overview of your programme and its modules – keep it safe so that you may refer to it throughout your time on the programme.

Your programme handbook along with other key documents, such as the Academic Regulations and the University Guide, sets out what you can expect from your experience at Middlesex University but also what is expected from you. From our side we will aim to deliver the best student experience we can so that you can build on your skills and knowledge and achieve your full potential. In return we expect you to engage actively in the learning process, to be fully committed to your studies and determined to succeed.

To read more about what your responsibilities may be you should refer to the full [University Regulations](#) and in particular 'University Membership' (mdx.ac.uk/regulations).

In your early weeks you are not expected to absorb everything in detail but to be aware of key documents and their content. If you have not already done so, have a look at the University Guide and explore [UniHub](http://unihub.mdx.ac.uk) (unihub.mdx.ac.uk) the student website which contains detailed advice and support to assist you further.

We know it takes time to settle in to University life. If you have questions to ask your first port of call should be <https://unihub.mdx.ac.uk/support> which offers face-to-face, email and telephone information and advice seven days a week. The UniHelp desk is located on the Ground Floor of the Sheppard Library and the advisors there will be pleased to help and direct you.

Here at Middlesex we are very proud of our academic programmes and students and we look forward to working with you.

Professor Sean Wellington
Pro Vice-Chancellor, Executive Dean - Faculty of Science and Technology
Town Hall - T114
020 8411 5344
s.wellington@mdx.ac.uk



Academic Calendar

Academic Calendars can be found at:

<https://unihub.mdx.ac.uk/your-middlesex/academic-calendars>

Part One - Programme Details

Your Programme Team

Staff Name	Contact Details
Florian KammueLLer	Programme Leader Town Hall, Room: TG03 Ext: 14930 Email: F.KammueLLer@mdx.ac.uk
Kelly Androutsopoulos	Senior Lecturer in Computer Science Room: TG02 Ext: 15131 Email: kelly12@mdx.ac.uk
Franco Raimondi	Professor of Computer Science Room: TG04 Ext: 16338 Email: F.Raimondi@mdx.ac.uk
Carl Evans	Associate Professor Room: TG10 Ext: 16201 Email: C.Evans@mdx.ac.uk
David Gamez	Lecturer in Computer Science Room: T112 Ext: 10935 Email: D.Gamez@mdx.ac.uk
Suiping Zhou	Professor in Distributed Systems & Networking Room: T113 Ext: 12902 Email: S.Zhou@mdx.ac.uk
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Aleksandar Zivanovic	Technical Tutor Room: R303 Ext: 15324 Email: A/Zivanovic@mdx.ac.uk
Xiaohong Gao	Professor of Vision Imaging Room: T125 Ext: 12252 Email: X.Gao@mdx.ac.uk
Clifford Sule	SL in Network Operating Systems & Network Programming Room: T116 Ext: 15185 Email: C.Sule@mdx.ac.uk
Catherine Walsh	Senior Lecturer in ICT Secondary PGCE & CPD Ext: 13716 Email: C.Walsh@mdx.ac.uk
Michael Heeney	Technical Tutor Engineering and Computer Science Ext: 14525 Email: michael69@mdx.ac.uk
Professor Sean Wellington	PVC, Executive Dean - Faculty of Science and Technology Town Hall - T114 020 8411 5344

Personal Tutor

You will be assigned a member of the programme team as your personal tutor. They will contact you via email and introduce themselves to you in person at the beginning of Term. Your personal tutor will normally meet you once each Term during your programme and you can make further appointments or contact them if you have any concerns about your course.

Graduate Academic Assistants (GAAs)

There are a number of GAAs who work with the BSc Computer Science programme. GAAs are recent Middlesex graduates who work with your tutors to assist in both teaching and supporting you. For example they may run drop in session to give advice on your assignments and revision as well as providing technical support during project work or tutorials. They do not mark your assessment or provide you with feedback on your progress.

Student Learning Assistants (SLAs)

You also have access to the BSc Computer Science SLAs who are experienced and capable second and third year students who have 'been there' and know the typical academic problems new students face. You will not be taught by an SLA but they will work with your lecturers to support you both in the classroom and outside and in small groups or one to one sessions. You can [find out who your SLAs are](https://unihub.mdx.ac.uk/study/student-to-student-support) and information on becoming one on UniHub: <https://unihub.mdx.ac.uk/study/student-to-student-support>

Subject Liaison Librarian

Vanessa Hill is your Liaison Librarian. They work closely with BSc Computer Science staff to ensure the resources and support that you need is available and provides information and research skills workshops relevant to Computing Science. You can contact them if you require individual support or if you would like to suggest a book, DVD etc for the library.

Vanessa Hill Liaison Librarian

Staff Workroom Ext 6866

Email: v.hill@mdx.ac.uk

Academic Writing and Language Co-Ordinator

Dr. Paula Bernaschina is your Academic Writing & Language Coordinator. They will provide academic support to you in areas such as writing essays and reports, giving presentations and participating in academic discussions. They will work with you in seminars; you can also contact them for individual support.

Dr. Paula Bernaschina Senior Lecturer

Sheppard Library Ext 5695

Email: p.bernaschina@medx.ac.uk

Progression and Support Advisors

Progression and Support Advisors work with Faculties to help students progress with their studies. You may be referred to a Progression and Support Advisor by a member of academic staff or other support service when appropriate, to support you through your studies. Progression and Support Advisors are able to assist with:

- A change of personal circumstance (for example a period of illness or bereavement)
- Understanding your progression through the programme, within University and programme regulations - [Progression Enquiry Form](#)
- Changing your programme - [Request changes to studies form](#)
- Withdrawing from studies (either temporarily or permanently) - [Request to Withdraw form](#)
- Changing your mode of study - [Request changes to studies form](#)
- Navigating and accessing other support services where students' have complex and/or severe and ongoing support needs.

Your Programme

There are a number of activities built into the first year of your University experience to enable you to focus upon and understand your own learning and development and help you to progress to the second year and achieve good results.

During week 4 you will participate in an activity we call '**Progress Review**'. This focuses on your initial few weeks at Middlesex and is an opportunity for all students on your Programme to share these experiences and raise any questions or issues with the programme team.

By week 9 you will have settled into your programme of study and received some assessment feedback. At this point you will have a '**Programme Progress Review**' which will be a one-to-one discussion with a member of the programme team, to talk about your progress and achievement to date, academic progress and future aims.

A further opportunity for such a one-to-one discussion will be provided around **week 18** when you will review your progression and achievement to date and identify and plan to meet any specific needs and enable fulfilment of your future aims.

It may be useful for you to familiarise yourself with the university's academic calendar to see where these activities fit in within the university year. The calendar can be accessed on the My Middlesex pages of UniHub: <http://unihub.mdx.ac.uk/mdx/calendar/index.aspx>

*Please refer to the **FIRST YEAR STUDENT HANDBOOK** on myLearning for detailed information on your first year of study.*

Programme Specification

Your Programme Specification can be found at
<https://www.mdx.ac.uk/courses/undergraduate/computer-science>

Your Module

Modules you are currently registered for are listed within the My Learning area on the [My Study](#) page of myUniHub; <https://myunihub.mdx.ac.uk/web/home-community/mystudy>.

You can access associated learning materials (e.g. lecture notes), reading lists, information on the learning aims and outcomes and assessment methods as well the schedule for assessment which will include submission deadlines.

Modules announcements will also appear in My Learning on myUniHub so log in and check each module regularly

Optional modules

Optional modules are usually available at levels 5 and 6, although optional modules are not offered on every course. Where optional modules are available, you will be asked to make your choice during the previous academic year. If we have insufficient numbers of students interested in an optional module, or there are staffing changes which affect the teaching, it may not be offered. If an optional module will not run, we will advise you after the module selection period when numbers are confirmed, or at the earliest time that the programme team make the decision not to run the module, and help you choose an alternative module.

Programme costs

The following course-related costs are included in the fees:

- A free electronic core textbook for every module,
- All printing and copying required for your study,
- Self-service laptops available for loan for a maximum of 24 hours,
- Audio-visual equipment available for loan, including digital stills cameras, digital video recorders, digital audio recorders.

Further details on specific additional equipment required which is not included in your fees can be requested from the Programme Leader.

Your Feedback Opportunities

Throughout your studies at Middlesex you will be given the opportunity to provide feedback on your programme. Details of all the opportunities available can be found on MyUniHub.

The main way to provide feedback is through participating in [surveys](#), and these can be at module and programme level. Your feedback in surveys will be acted upon to improve your experience and details of where student feedback has led to change can be found on the [Your Impact](#) page on MyUniHub.

Each year of every programme is represented by a [Student Voice Leader](#) – a student who is elected to work with students and academics to get feedback on what is good and what needs improving on your course. They represent you and make students' voices heard, collaborating with everyone at university to create the best possible student experience, and working with

MDXSU's President and Vice Presidents to create changes that will improve Middlesex for everyone.

[Programme Voice Groups](#) (PVG's) are one of the main formal channels of communication between staff and students. They are a forum in which students (through the Student Voice Leaders) and staff can constructively discuss areas of good practice as well as areas needing improvement, with the collective aim of enhancing the student experience. Students and Staff should both be given assurances they will not be penalised for raising issues at a PVG. Full details can be found on MyUniHub.

The dates of the Programme Voice Groups for 2019/20 are:

- The Programme Voice Group meets twice each year between teaching weeks 6 and 8 and again between weeks 17 and 19.

Minutes and actions from previous PVG's (formerly Boards of Study) should be made available to you through MyUniHub. Further guidance on the PVG's can be found here: <https://unihub.mdx.ac.uk/your-middlesex/student-feedback/>

How your Programme is Quality Assured

You may have not heard the terms 'quality assurance', 'academic quality', 'academic standards' before and now you have you may think they have nothing to do with you, however these terms are important to you and your programme. Full details on how we do this can be found [here](#).

The Student Protection Plan

One of the Middlesex University core values is 'We put students first'. We have a regulatory framework to support student continuation of study. The Student Protection Plan covers an assessment of the range of risks to the continuation of study for our students, and the measures put in place to mitigate those risks, arrangements for refund and compensation. Full details of the Student Protection Plan are available [here](#)

Part Two - Resources and Support Available to You

The university has extensive resources and support available to all students. This section briefly lists the different resources and support services available to you and full details can be found on [MyUniHub](#).

Programme Level Resources

Library Resources

The University provides a range of support and resources to help you with your studies and full details of the services can be found [here](#). As a Middlesex student you can access and expect the following from the Library;

- a free eTextbook for each module you study. This is chosen by your module leader and can be read online or downloaded to a computer or handheld device, and is accessed via MyLearning.
- Access to other learning materials with the most important gathered together on an online reading list created by your module leader and Liaison Librarian. Your reading list will be in your module area on MyLearning.
- a variety of ways that you can get help with your studies, including the Study Hub on the first floor of the Sheppard Library is a drop-in centre for all your queries.
- Access to Librarians, Academic Writing and Maths teachers as well as Student Learning Assistants and IT experts available to help you and provide advice. If your query is more in depth you can make an appointment with your Liaison librarian or AWL teacher, and they will also be coming into your seminars during the year to teach you skills which will help you succeed in your course.
- Finally, there are online resources which you can use in your own time to study where and when you choose:

IT Facilities

Most of the campus is covered by the wireless network so you can use your own devices, but there are also open access computers in the Sheppard library.

Student Support at Programme Level

Student Support Services

UniHelp is the University's central service through which you can access a range of support for the kinds of concerns that might arise throughout your study here, and details of all support available to you can be found [here](#). Some of the services include:

Counselling and Mental Health Team - providing mental wellbeing support and a confidential individual counselling service to help you manage any challenges affecting you emotionally or psychologically that you might face while you study with us. This service also provides a Monday to Friday drop-in session for which no appointment is needed;

Disability and Dyslexia Service – supporting an inclusive teaching and learning environment which caters for all students. North London Regional Access Centre - offering needs assessments, assistive technology training, advice and support for disabled students;

Student Welfare Advice Team – providing information and advice on money and funding matters, and housing;

International Student Advice Team – providing information and advice on visa and immigration concerns, for both international applicants and current international students;

Chinese Student Liaison Officer – providing assistance to Chinese-speaking students of our community;

Student Wellbeing Coordinator – providing information about and support with health matters.

MDXworks Careers & Employability Service

Middlesex University is committed to supporting you to develop your employability skills; we do this by designing your programme – BSc MComp/Computer Science - so that you have the opportunity to develop a key set of employability skills including team-working, self-management, business and customer awareness, communication, problem solving and the application of literacy, numeracy and information technology. We also offer extra-curricular opportunities including:

- access to our Service that will help you plan a route into employment, gain skills and experience for the workplace and secure highly skilled graduate level employment
- a range of services through our Enterprise Development Hub which is dedicated to nurturing innovative student ideas and supporting students into self-employment and entrepreneurship
- paid work at Middlesex via Unitemps while you study; part-time roles pay the London Living Wage and provide work experience opportunities through our Student Ambassador and Student Learning Assistant schemes as well as our Sport & Recreation Service (which also offers volunteering opportunities).

Full details of opportunities available to you can be found [here](#).

Studying or Placement Abroad

A study exchange or a work placement abroad is a great way to enhance your university experience and broaden your horizons. Additionally, taking part in such a programme or opportunity increases your employability and supplements the value of your degree by exposing you to a new culture, different thinking and a different way of doing things. A broad world view demonstrates to potential employers your ability to understand other perspectives, adapt to varying environments, work with diverse teams and bring an appreciation of insights and practices outside of your own.

Middlesex University offers one of the most comprehensive exchange programmes in the UK. We have over 100 different partners within the European Union and the rest of the world. Funding for some of these study and work placement opportunities may be available through the Erasmus+ programme. Erasmus grants are always subject to availability and to the UK's ongoing participation in the Erasmus programme.

What are my exchange options?

Currently there are both funded exchange options - through the Erasmus+ Programme (if available) - and unfunded exchange options. These can be study or work placement (or a combination of both). These are varied and depend on your programme and capacity. Discuss with your Programme Leader and with the Student Exchanges Office.

Don't hesitate - explore your options and details can be found [here](#).

Middlesex Student's Union (MDXSU)

Your Students' Union is here to support you throughout your studies and help you make the most of your time at university. Powered by students, we represent student views in university decisions and campaign on issues that students care about. We create lots of opportunities for you to meet new people at a huge range of social events, develop your skills throughout the year, campaign for change on campus and in the community - as well as even getting a job with us and earning the London Living Wage! Everything we do is for students.

Find out more about your students' union and get involved at www.mdxsu.com

Part Three - University Policies You Should Know

Programme Regulations

As a student of Middlesex University there are regulations and policies that you should make yourself aware of before you commence with your studies. These regulations detail the rules around assessment, how grades are awarded, and how assessment is conducted. This includes details on academic misconduct and what you should do if circumstances mean you cannot complete an assessment. Full details of the regulations can be found [here](#)

Research Ethics

The following information should be made available to students, if relevant:

An ethical approach to the undertaking of teaching, learning, assessments and research activities is of central importance to Middlesex University. Due consideration should be given to ethics in all aspects of your programme. Ethical process should be followed and/or ethical approval sought, before you carry out any work involving **human participants, human data, animals, materials or systems**. This applies to students at all levels of their degree.

Research ethics approval seek to ensure all work is designed and undertaken according to certain principles of ethical research. These include:

- 1. Primary concern must be given to the **safety, welfare and dignity** of participants, researchers, colleagues, the environment and the wider community*
- 2. Consideration of **risks** should be undertaken before research commences with the aim of minimising risks to those involved – i.e. human participants or animal subjects, colleagues, the environment and the wider community, as well as actual or potential risks to those directly or indirectly affected by the research.*
- 3. **Informed consent** should be freely given by participants, or by a trained person when collecting or analysing human tissue (details on accessing and completing online training for gaining informed consent for HTA purposes can be found below in Section 8).*
- 4. Respect for the **privacy, confidentiality and anonymity** of participants*
- 5. Consideration of the rights of **people who may be vulnerable** (by virtue of perceived or actual differences in their social status, ethnic origin, gender, mental capacities, or other such characteristics) who may be less competent or able to refuse to give consent to participate*
- 6. Researchers have a responsibility to the general public and to their profession; as such they should balance the anticipated benefits of their research against **potential harm, misuse or abuse** which must be avoided*
- 7. Researchers must demonstrate the highest standards of **ethical conduct and research integrity**. They must work within the limits of their skills, training and experience, and refrain from exploitation, dishonesty, plagiarism, infringement of intellectual property rights and the*

fabrication of research results. They should declare any actual or potential conflicts of interest, and where necessary take steps to resolve them.

8. When using human tissues for research, **Human Tissue Act and Human Tissue Authority (HTA) requirements** must be met. Please contact the relevant designated person (DP) in your department or the HTA Designated Individual (DI) (Dr Lucy Ghali - L.Ghali@mdx.ac.uk). Further information is provided below in the section: "Human Tissue Authority Information", see 'Governance Structure' document and SOPs etc.

9. Research should **not involve any illegal activity**, and researchers must comply with all relevant laws

Within taught degree programmes ethical approval **may** have been pre-sought for research activities that form part of specific modules. Please check with your module tutor/your module guide. Note however that **all students completing a dissertation or independent project** will be required to undertake an ethical review process.

Data **MUST** not be collected without first obtaining ethics approval for your research or ascertaining if data gathering has been pre-approved for a module. If you submit work that includes data gathered from or about people without ethical approval this may be treated as academic misconduct and could lead to a fail grade being awarded.

You can apply for research ethical approval using the Middlesex Online Research Ethics (MORE) system which has information and guidance to help you meet the highest standards of ethical research using this link: <https://MOREform.mdx.ac.uk>

Information and further guidance on how to complete a research ethics application form (e.g., video guides and templates) can be found on the MORE MyLearning site*: <http://mdx.mrooms.net/enrol/index.php?id=12277> (Log in required)

*Middlesex University Definition of Research document can be located on this site.

Assessment

Learning, Teaching and Assessment

The learning, teaching and assessment approaches used throughout your programme will encourage you to be actively involved in your learning and to co-operate with other students. We aim to give you prompt feedback on your learning as well as opportunities to reflect upon and learn from that feedback.

Learning and teaching methods

You will be actively involved in a range of learning, teaching and assessment approaches as part of programme. Such active approaches aim to put you at the centre of your learning so you are involved and engaged in all aspects of your assessment and learning. Your programme will require your active participation in learning activities and engagement with your fellow students both individually and collaboratively, working and learning with other students as part of a small group. Learning activities may also occur both within and outside the classroom.

Your learning will also be supported by technology. Increasingly your tutors will be using existing and emerging learning technologies to engage you in e-learning activities. Your programme will be facilitated using a variety of media and online tools (My Learning on UniHub, podcasts, wikis, etc.) which will allow you flexible access to a diverse range of online resources, quizzes and learning materials as well as collaborative tools with which you can engage and learn with your peers. Not confined by the time and space associated with traditional teaching methods you may take part in online discussions and learning activities from wherever you are studying.

Your tutors and the Web Helpdesk will provide any support you may need whilst learning online.

By engaging with e-learning you will also be developing skills which are essential for your learning and are also highly valued by employers. These include but are not limited to: working flexibly, communication, understanding of IT, team working and creating shared understandings based on quality resources and access to global expertise.

The aims and objectives of biochemistry modules relate to developing a core body of knowledge, the importance of using current research based information and the evolution of critical and analytical skills and management of individual personal growth.

In order to facilitate these aims a wide range of teaching and learning strategies will be employed to meet the needs of the students. The focus has been on encouraging students to be responsible for their own learning and progress.

Lectures will be used primarily to introduce key information, concepts and theories. Seminar presentations and discussions will increase knowledge and enable active participation in learning. Seminars will comprise a variety of formats including debates, case study and problem solving analysis, student led seminars, discussions of current topics, reviewing and consolidating learning and other appropriate student activities. Many sessions will include informal formative assessment. Interactive computer based sessions, laboratory practicals and workshops will be used to develop skills in hypothesis formation, data collection, analysis and interpretation. There is an emphasis on problem solving and case studies to develop analytical skills and to enhance integration and application of knowledge. Research skills are a thread running through the programme but taught formally in BIO2005 in year 2. Students are introduced to quantitative and qualitative research skills with an emphasis on data analysis so that they can critically evaluate different types of data presented in journals and be prepared for the dissertation in year 3. The dissertation module affords an opportunity to develop a particular area of interest or expertise in more depth.

Individuals learn in different ways by providing a range of teaching and learning strategies we hope to maximise student potential.

Autonomous learning means that students have responsibility for and the opportunity to manage and be more independent in their own learning. Modules are designed so that they provide a framework in the form of learning outcomes so that students are aware of what they need to learn and by what stage of their programme. Appropriate learning materials and resource based materials will also support independent learning. Students will be encouraged to complete a PDP (Personal Development Portfolio). This has been designed to assist students to take responsibility for their own learning and to act as a record of continuing

personal and professional development which will be a useful adjunct to the final award. It also provides the student with a convenient framework to record reflective observations.

Students will be allowed to develop as autonomous learners by the provision of self-directed learning from year 1. Self-directed learning will be introduced and overseen by programme tutors to facilitate skills in student self-management, information retrieval and self-reflection.

The use of e-learning will be prominent in many taught modules and will often enable students to carry out learning at a time which suits them. Online learning quizzes, data retrieval, use of government and other recognised websites are all examples of how the web is used as an electronic resource. Many text books are available online and students have access rights through Middlesex Learning Resources and there are also a wide range of electronic journals. UniHub is accessible from outside the University. Electronic discussion boards will enable students to support each other on modules.

Your tutors and UniHelp advisors will provide any support you may need whilst learning online.

By engaging with e-learning you will also be developing skills which are essential for your learning and are also highly valued by employers. These include but are not limited to: working flexibly, communication, understanding of IT, team working and creating shared understandings based on quality resources and access to global expertise.

Assessment methods

Assessment is an integral part of learning and you may hear it referred to as **formative** or **summative**.

Formative assessment is designed to give you feedback on your performance and how it can be improved. As a result you will get detailed feedback on formative assessment but not a grade. Formative assessment is an important part of the learning process and has been shown to help students improve both their grades and their learning style.

Summative assessment is designed to measure the extent to which you have achieved the learning outcomes of a module and therefore the grade you will be awarded. Learning outcomes are the specific skills and knowledge that you are expected to demonstrate as a result of taking a module. Summative assessment should assess achievement of all learning outcomes in a secure, fair and accurate manner.

Assessment may also involve self, peer or group approaches. For example, you may be asked to self-assess your own work, indicating where you feel you have clearly demonstrated your understanding and also identifying areas where you can see you have room to improve. Assessment may also be a peer process where students, individually or as groups, offer feedback on one another's work. Group assessment may also be part of your programme where part of the assessment requires you to demonstrate your ability to work as part of a group and possibly receive a group mark.

Individual modules set **assessment deadlines** different to all other modules as much as possible. This is to enable the assessment load to be spread evenly across the academic year. Where assessment is achieved through laboratory reports, reports are normally submitted two weeks after the completion of the laboratory and the grade and feedback returned to students within three weeks of submission. In all cases the assessment calendar

for each semester will be available at the start of the semester and can be found in the individual module handbooks and your yearly assessment map at the end of this programme handbook. An updated assessment map will be available on MyLearning.

It is up to each student to plan the management of their assessment to meet the deadlines. Failure to complete assessment at Level 5 and Level 6 by the given deadline will result in a penalty for that piece of work (a maximum of 40%, grade 16). If you have extenuating circumstances which have meant you cannot submit by the deadline, you can apply for an extension and there are details about how to do this in myUniHub.

Please note that assessment deadlines do occasionally change and while every effort has been made to ensure this is correct at the time of publishing you should check your email and My Learning on UniHub so you are aware of any changes.

Please see the module narratives at the end of this handbook or your module handbooks for more information about the specific learning arrangements for your modules.

Submission and receipt of assessment

You will find all the deadlines for your first year assessment (both formative and summative) in your assessment schedule given to you during induction week and online in myUniHub. Instructions on how to submit your assessment is given in each module handbook but this will either be electronically via myUniHub or, for work which must be submitted in hard copy, in person at UniHelp in the Sheppard Library.

Your module handbooks have the precise details of when and how to submit your coursework (but this will be either electronically via myUniHub or in person at the UniHelp desk in the Sheppard Library) and how you get a receipt confirming you have submitted it. Please refer to these and contact your module leader if you have any queries.

Exams

Information about exams, including the timetable and advice on preparing and revising is available on UniHub; unihub.mdx.ac.uk/study/exams

Past exam papers, if available, can be accessed via the My Study area of UniHub: <https://myunihub.mdx.ac.uk/web/home-community/mystudy>

If you are concerned about your exams then please book an appointment via UniHub to speak to a Student Achievement Officer: unihub.mdx.ac.uk/support/appointment or email your query to stachievement@mdx.ac.uk.

Marking, second marking and moderation

A sample of examination papers and coursework assignments are moderated internally by the module tutors with the programme leader and/or Director of Programmes (where the programme leader is part of the module team).

All coursework and examinations that do not meet the pass grade are moderated to ensure that there is agreement on the grade. After being marked all examination scripts are checked to ensure that marks' totals are correct and all sections have been marked.

A sample of coursework and examination scripts is available for moderation by the external examiner(s). This is usually 10% of the work for the module. In addition all failed assessments are seen by the external.

All dissertation projects are double marked. As a final check, the overall profile of marks for the module are examined internally and externally to ensure consistency of standards both within and between subjects or programmed, and against national higher education standards.

Return of coursework

You are expected to keep a copy of all your coursework and it should be kept somewhere safe (for example on a memory stick). As the marked copy of your work is not normally returned to you it is important you keep a copy so you can understand the feedback you get properly.

Exam scripts are not returned to any student however you can obtain feedback on exam performance by contacting your module leader.

External Examiners

External Examiners are one way we assure the academic quality of your programme. They are subject experts who help assure that your Middlesex award is comparable to that at other UK universities by reviewing the programme curriculum, the assessment and the learning resources. Among other things they approve all exam papers before they are taken, attend the assessment board and write a report at the end of the year. You can obtain a copy of this report by contacting programme leader.

IMPORTANT: It is inappropriate for you or any other student to make direct contact with an External Examiner. The appeal and complaints systems exist to allow you to express any concerns you have, including the marks you have been given for your performance.

You can read more about the role of External Examiners on UniHub:

<https://unihub.mdx.ac.uk/study/ensuring-quality/external-examiners>

Assessment Feedback

Feedback on your assessment (both formative and summative) provides the opportunity for you to reflect and to use the feedback as the basis for learning and to improve your work.

Feedback can take many forms and may be informal. For example it may be given and discussed orally in the classroom, or it may be more formal and delivered in written or audio form from academic staff or fellow students. Understanding your feedback is very important and to achieve this you are encouraged to discuss feedback with your peers and academic staff.

Receiving feedback on your work is an essential and important part of learning and so we provide regular opportunities for **formative assessment**, the purpose of which is to get

detailed feedback on your performance so you get a regular update on how you are developing and to prepare you for any summative assessment.

Feedback on summative assessment will be offered in a variety of forms and all your work will be marked and moderated in line with the Code of Assessment Practice which can be found in section M of the University Regulations: mdx.ac.uk/regulations

You will normally be provided with feedback within 15 working days of the published submission date.

Feedback on coursework

Arrangements for feedback are made at a modular level but all students can expect to receive effective and efficient feedback on work that is assessed formatively and summatively.

Once submitted and marked students receive feedback electronically via email or through their learning space. Feedback will normally consist of an assessment feedback sheet with written comments on it or comments associated with coursework submitted electronically via UniHub/Turnitin. This will also give an indication of how you performed in relation to the assessment criteria. Students are therefore, reminded to read their feedback in order to help them with further assessments. Tutors are available for support to help students clarify feedback.

Feedback on examinations

Arrangements are made at a module level. Once the examination is undertaken and marks published, students can collect their feedback form. This will in general be an individual feedback sheet or generic feedback for example the module team may provide an example written answer, tutorial or other information indicating expected answers for the examination.

Comments on examination scripts and marks can be made on the examination script to facilitate marking of the paper and to assist the external examiner.

Viewing scripts

If you want to see your scripts you must arrange this through your tutor within 14 days of the release of results. Please note that on occasion scripts are sent to the external examiner during this period. Alternative arrangements will be made in this instance.

Dissertations/projects

The dissertation/project supervisor is the first marker. The module leader for the dissertation/project module appoints a second marker usually but not always within the field of expertise for the project work.

Projects are marked “blind” and therefore marking is independent. The grades from the two markers are moderated to finalise the overall grade.

Progressing on your Programme

Re-assessment

Although no one anticipates failing a module, it is important that you are aware of what happens if you do. Normally you would be entitled to one re-assessment opportunity if you don't pass and there is no financial cost associated with this second attempt. You should however consult the Your Study area on UniHub for more information:

<http://unihub.mdx.ac.uk/study/assess/progression>.

Deferral of assessment

If there are exceptional circumstances which through no fault of your own are preventing you from completing all or some of your assessment (e.g. submitting coursework or taking an exam) you may seek permission to defer the relevant assessment to the next available opportunity. If you think this applies to you then you should first read the full Deferral Policy which is available in the Assessment and Regulations section of the Your Study area on UniHub: <http://unihub.mdx.ac.uk/study/assess/Deferral>.

Deferral requests should be submitted to UniHelp by completing the relevant form and attaching supporting documentation, e.g. medical certificates. **The final deadline for deferral applications is 2 weeks after the end of the exam period** (the dates of which are in the academic calendar at the start of this handbook). The deferral form is available from the Admin and Finances section of myUniHub:

<https://myunihub.mdx.ac.uk/web/home-community/myadminandfinances>.

If you have any questions about deferrals please contact UniHelp.

If you have difficulties accessing resources after deferral (e.g. accessing the University network and UniHub) then contact UniHelp: <http://unihub.mdx.ac.uk/unihelp> by phone (+44 208 411 6060), in person at the Sheppard Library or by email (unihelp@live.mdx.ac.uk).

Results Confirmation

At the end of each academic year, module grades are considered and confirmed by an Assessment Board. Following the Board, individual results and your progression status will be released after the point, and will be made available in the My Study area on MyUniHub.

If any of your results are provisional they will be labelled as such. Further information on your results and assessment can be found in the University Guide, under the Your Study area of MyUniHub, or by seeking advice from your Progression and Support Team Officer. Further details can also be found in the University regulations.

Academic Misconduct

You should be aware of the Universities academic misconduct policies and procedures. Taking unfair advantage over other students in assessment is considered a serious offence by the University. Action will be taken against any student who contravenes the regulations through negligence, foolishness or deliberate intent. Academic misconduct is a corrosive force

in the academic life of the University; it jeopardises the quality of education and devalues the degrees and qualifications of the University. Academic misconduct takes several forms, in particular:

- **Plagiarism** – using extensive unacknowledged quotations from, or direct copying of, another person's work and presenting it for assessment as if it were your own effort. This includes the use of 3rd party essay writing services.
- **Collusion** – working together with other students (without the tutors permission), and presenting similar or identical work for assessment.
- **Infringement of Exam Room Rules** – Communication with another candidate, taking notes to your table in the exam room and/or referring to notes during the examination.
- **Self-Plagiarism** – including any material which is identical or substantially similar to material that has already been submitted by you for another assessment in the University or elsewhere.

Full details on academic misconduct and the support available can be found [here](#).

Extenuating Circumstances

Extenuating Circumstances are personal circumstances which have affected your performance in assessment and are brought to the attention of the Assessment Board when considering your academic performance.

For information about how to apply for Extenuating Circumstances please see information available on [MyUniHub](#).

Attendance

Middlesex University is keen to support all students to help enhance their academic potential. One of the ways we can do this is by monitoring attendance which will allow us to work with you to resolve issues that may prevent you from attending.

Studies have shown that a good attendance record has a positive impact on performance and therefore is an important factor in helping you to fulfil your academic potential. If your attendance is unsatisfactory, we will review your complete record.

If you experience difficulties beyond your control, which prevent you attending, you should notify your tutor who may be able to offer support and guidance. The University Regulations (C2.1) state every student must attend those teaching sessions specified in the regulations governing the module/programme. In addition, Student Finance England and the Home Office (in the case of international students) require attendance to be monitored. Full details of attendance monitoring policies can be found [here](#).

Things you should know about attendance

Your punctuality and attendance are important, not just for you but for your cohort and peers. If you are frequently late or your attendance falls below the required amount specified in your module handbooks your record will be reviewed.

- It is your responsibility to ensure your attendance is recorded and as a professional courtesy you should let your lecturer know if you are going to be, or have been absent.
- If you consistently miss sessions you will be contacted by the Attendance Team or your tutor.
- Students should therefore make sure they have their student card when attending sessions.

You are expected to attend all timetabled teaching sessions and field trips. If you fail to meet the attendance requirements to meet the learning outcomes of the module, you may be excluded from the assessment and be graded X (ineligible for assessment due to unsatisfactory attendance/participation). You may be able to take the module again with permission from the Director of Programmes. This would require you to pay the module registration fee.

In some modules, especially those with seminars and laboratories, participation in the sessions is essential in order to achieve the learning for the module. Students who do not attend sufficiently may not be able to submit the relevant assessment for the module.

Where a practical session is not attended, students cannot submit a laboratory report applicable to this session. A register of all laboratory sessions will be kept.

You will find specific information about attendance in each module handbook.

The full regulations regarding attendance are in Section C of the University Regulations: www.mdx.ac.uk/regulations

For further guidance on attendance requirements please refer to the section on attendance which is available on UniHub: unihub.mdx.ac.uk/study/attend and in the University Guide.

Late arrival

Whilst it is recognised that there are valid reasons for late arrival to classes, arriving late is disadvantageous to yourself and other students:

- You may disrupt the learning experience of all students.
- You will miss the first part of the class when the learning outcomes of the class are outlined.
- In case of practical classes, you will miss the health and safety instructions, so you would endanger your health or other students if you were allowed into the class. Consequently, a five minute limit is applied in laboratory-based practicals. Thus, if you arrive later than five minutes late you will not be permitted to enter the laboratory or to join the class.

Therefore, you are expected to be punctual, arrive in advance of and settle before the scheduled start of the class. If you arrive late for whatever reason and the classroom door is shut or the lecturer has started the class, please do not enter the class. This policy has been introduced at the request of both staff and students, and to protect the interest of the majority of students who arrive on time. Please note if you try to enter the class, the tutor has the right to ask you to leave.

If you are late, you should go to library for private study and attend your next timetabled class. You cannot attend a different seminar/lab as it may be full.

Health and Safety

Information and advice regarding health, safety and welfare is available on Your Support Services page on UniHub: <http://unihub.mdx.ac.uk/support/wellbeing/index.aspx>
You are required to work safely in laboratories. Details of how to do so are given in the Module Handbooks. Assessments of risk are made for all scheduled laboratory practical sessions and are made prior to all research projects.

In practical classes, students must comply with laboratory rules and health and safety policies. These are normally outlined at the start of each module and students are required to sign an agreement, confirming that they understand rules and policies and will comply with these.

The Health and Safety Officer for the Faculty of Science and Technology is: Barry Harte, Email: B.Harte@mdx.ac.uk

Appendix 1: Curriculum Map

In this section you will find details of all the learning outcomes for the programme, and the modules where you will achieve them.

The curriculum map was correct at the time this handbook was published but details change over time and therefore you should always refer to the latest version available on the My Study area of MyUniHub.

Curriculum map for BSc (Hons) *Computer Science*

Programme learning outcomes

Knowledge and understanding	
A1	A range of underlying theories relevant to computer science.
A2	The process of systems development.
A3	The interaction between technology and society and the role of computer professionals within this.
A4	A range of specialized topics within Computer Science.
Skills	
B1	Apply sound principles to the construction and maintenance of computer-related artifacts.
B2	Verify and validate computer-related systems.
B3	Apply appropriate theories to the design and evaluation of systems.
B4	Adapt and critically apply their knowledge and skills to mastering new technical areas.

BSc MComp/Computer Science 2019/20														
Programme outcomes														
A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	B8
Highest level achieved by all graduates														
6	6	6	6	-	-	-	6	6	6	6	-	-	-	-

[illegible]

BSc MComp/Computer Science 2019/20

Teaching Computing in the Secondary School	CST3120			✓								✓				
Advanced Web Development with Big Data	CST3130	✓	✓	✓	✓				✓	✓	✓	✓				
Novel Interaction Technologies	CST3140	✓		✓	✓				✓		✓	✓				
Computer Graphics	CST3150	✓			✓				✓		✓	✓				
Designing Secure Systems	CST3160	✓	✓	✓	✓				✓			✓				
Artificial Intelligence	CST3170	✓			✓				✓	✓		✓				
UX Design	CST3180	✓	✓	✓	✓				✓		✓	✓				
Open Source Software	CST3185	✓		✓	✓				✓			✓				
Systems Engineering for Robotics	PDE3413	✓			✓				✓	✓		✓				
Industrial Network Design and Management	CST3555	✓			✓				✓	✓		✓				
Web-Based Mobile App Development	CST3145	✓	✓	✓	✓				✓	✓	✓	✓				
UG Individual Project	CST3990		✓	✓					✓	✓	✓	✓				

Appendix 2: Module Narratives

In this section you will find details of all the modules associated with your programme so that you can see what is involved in your programme and make any choices over option modules (if applicable).

The narratives were correct at the time this handbook went to print but details change over time and therefore you should always refer to the latest version available on the My Study area of myUniHub:

<https://myunihub.mdx.ac.uk/web/home-community/mystudy>

Your online reading lists can be accessed from the My Study area of myUniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	SAT0100(<i>Published</i>)
Module Title	SMART (Students Mastering Academic writing, Research and Technology)
Credit	30

Aims

This module provides students with fundamental written and oral communication skills required to continue studying at degree level. Students will develop analytical skills through a problem solving approach; build their confidence working individually and as a member of a team, and gain appreciation of research techniques by using libraries and a range of e-learning resources.

Learning Outcomes

Knowledge

On completion of this module the successful student will be able to:

1. Identify and select appropriate materials for written work
2. Write for different purposes
3. Prepare and deliver effective verbal presentations
4. Work effectively as part of a team
5. Demonstrate good organisational and time management skills

Skills

This module will call for the successful students to demonstrate the ability to:

6. Use libraries and e-learning resources effectively
7. Conduct small scale research
8. Debate effectively with peers

9. Evaluate and provide feedback on work produced by peers
10. Reflect on their learning and practice

Syllabus

- Writing for different audiences
- Structuring reports, essays and other assignments
- Referencing
- Presentation and team working skills
- Conducting research; literature searches
- Strategies for studying and assessment

Learning, Teaching and Assessment Strategies

Weekly lectures will be used to provide core knowledge and skills. Students are expected to participate by working individually or in pairs in lectures to solve problems and apply theory in practical activities. Weekly lab/workshop sessions will provide opportunities to work in small self-organised groups to search, gather and analyse data by using e-learning resources and presenting findings to peers.

Assessment Scheme

Formative assessment consists of reflective writing exercises and presentations. Students receive electronic and/ or verbal feedback from the tutor.

Summative assessment consist of:

- Presentation (30%) in groups (3,4,5,7)
- Written report (40%) individual (1,2,6)
- Written exercises (30%) individual (9,10)

Assessment Weighting

Coursework: 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Total Notional Learning Hours

300

Module Code	SAT0300(<i>Published</i>)
Module Title	Foundation Project
Credit	30

Aims

To provide students with experience of a range of projects that reinforce understanding of materials taught and provide opportunities to apply the knowledge gained in other Foundation Year modules.

Learning Outcomes

Knowledge

On completion of this module the successful student will be able to:

1. Apply subject related concepts to projects
2. Evaluate the overall outcomes of the project

Skills

This module will call for the successful students to demonstrate the ability to:

3. Demonstrate how to plan and manage a project
4. Communicate effectively in writing and verbally the project development
5. Reflect on the process of the project

Syllabus

- Project management in student projects
- Effective project team work
- Presentation and documentation skills

- Requirements for subject specific projects
- Professional and ethical issues in projects

Learning, Teaching and Assessment Strategies

Weekly lab sessions provide opportunities to work in pairs or small self-organised groups to search, gather and analyse data by using e-learning resources. Students are expected to consolidate learning from all Foundation Year modules and their previous learning towards the project outcome and documentation.

Formative assessment consists of demonstrations in labs. Feedback is provided verbally to students in labs.

Assessment Weighting

Coursework 100% Assessment comprises a series of tasks demonstrating skills and knowledge gained in a particular subject area. Assessment details will be provided in the Module Handbook

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Total Notional Learning Hours

300

Module Code	SAT0400(<i>Published</i>)
Module Title	Computing and Digital Technology
Credit	30

Aims

The module provides an introduction to some of the fundamental concepts in computing, engineering and networks. Students will learn about the latest developments within computing, both software and hardware, and gain basic understanding of the characteristics and operational behaviour of computer systems and computer communications. The module will assist students in making their degree choice for future careers.

Learning Outcomes

Knowledge

On completion of this module the successful student will be able to:

1. Discuss the basic hardware and structure of modern computer systems and data transmission
2. Demonstrate understanding of the basics of programmed systems such as languages
3. Discuss some simple systems in terms of the basic concepts in engineering and electronics, including ethical and professional issues

Skills

This module will call for the successful students to demonstrate the ability to:

4. Connect computers to communicate at both the hardware and software levels
5. Design and code simple programs
6. Develop skills in selecting and applying knowledge and techniques to given problems
7. Design simple databases using packages

Syllabus

Indicative topics to be covered:

- Computer Architecture
- Networks and the Internet
- Network Addressing and Services and wireless Technologies
- Introduction to programming
- Basic data types, debug code, input and output
- Control structures, arrays
- Design code web pages
- Data management modelling
- Design and implement a database
- Ethical and Professional issues
- Electrical signals, measurement and simple digital systems

Learning, Teaching and Assessment Strategies

Weekly lab/workshop sessions will provide opportunities to work individually, in pairs and in small self-organised groups to discuss and analyse case studies and use online materials.

Formative assessment consists of demonstrations in labs.

Students are encouraged to actively contribute to discussions and will receive written and /or verbal formative feedback in labs.

Assessment Scheme

Summative assessment consists of three components. Students must demonstrate all of the learning outcomes to pass.

The module is pass/fail only.

- Practical demonstrations (2, 3, 5)
- Logbook tasks with reflection on learning; (6, 7)
- Class Tests and Lab reports (1, 4)

Assessment Weighting

Coursework (no examination): 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Total Notional Learning Hours

300

Module Code	MSO0200
Module Title	Foundation Mathematics (Science and Technology)
Level	3
Credit	30
Owning Subject	Mathematics, Statistics and Operational Research
Level Restrictions	

Aims

This module introduces fundamental mathematical and statistical topics and concepts that are required in a range of subjects studied at degree level. Students will begin to develop an appreciation of the importance of mathematics as an aid to understand and describe abstract ideas. The module covers introductory areas of mathematics including numbers, algebra, data collection and statistics in a structured and supportive environment. Software will be used to demonstrate and elucidate material and to motivate its use in real world situations.

Learning Outcomes

Knowledge

On completion of this module the successful student will be able to:

1. demonstrate familiarity with the basics of numbers and algebra;
2. demonstrate an understanding of common algebraic operations;
3. identify and solve problems involving different types of functions;
4. understand the importance of good methodology when collecting data;
5. identify appropriate descriptive statistics for a simple data set.

Skills

This module will call for the successful student to:

6. work with numbers and algebraic expressions;
7. use algebra to solve problems in familiar settings;
8. use computer software to solve mathematical problems;
9. show efficient and correct use of Excel, including the production of graphs;
10. present mathematical results using appropriate typesetting.

Syllabus

The content of the module will include types of numbers, algebra and equations, and the use of simple functions. It will also include aspects of data collection and basic statistics.

Learning, Teaching and Assessment Strategy

The nature of mathematics learning is that it is cumulative, and so in order to complete this module successfully, students are expected to be actively and continuously involved in all the learning, teaching and assessment methods employed, to develop their appreciation of, and skills in, the application of mathematics.

Each week a one-hour lecture will introduce key concepts. These will be developed in a two-hour workshop / lab session where practical examples will be used to introduce and clarify subjects and software used to expand and analyse topics. Students will work individually or in groups on given problems to develop a deep understanding of areas and their use in practice.

The lab time will introduce students to Excel and other suitable software to help them make practical use of the subjects covered in the module, and also to enhance their computing skills.

Assessment Scheme

Formative assessment will be given in the form of problems at the end of the lectures which students will work on in preparation for the workshop and laboratory session; students will be given immediate formative feedback on their work.

The summative assessment of this module is task based. The learning outcomes have been decomposed into numerous milestones which are demonstrable during the lifetime of the module.

Student progress on demonstrating these milestones will be continually assessed during all student contact opportunities. Full details of the milestones and how they can be demonstrated will be given at the start of the module. Students and staff will be able to monitor progress of the achievement of these throughout the year.

Summative assessment requires students to demonstrate that they have met all learning outcomes, and is entirely assessed by a series of tasks completed during the taught sessions. The tasks are selected in order to ensure students demonstrate an overall understanding of relevant concepts and techniques, and the ability to apply them.

Assessment Weighting

Coursework: 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	CST1110(<i>Published</i>)
Module Title	Programming
Credit	30

Aims

To provide students with an understanding of the foundations of programming.

Learning Outcomes

Learning outcomes:

Knowledge

On completion of this module, the successful student will be able to:

1. Explain the key foundational concepts used to construct, analyse and debug programs.

Skills

This module will call for the successful student to demonstrate

2. Construct, analyse and debug small-to medium sized programs for a variety of computing applications

Syllabus

- Definitions, names, variables, interfaces.
- Data structures, lists, functions.
- Syntax, value, denotation.
- Recursive definitions, processing recursive data structures, control structures.
- Debugging, step-by-step execution

Learning, Teaching and Assessment Strategies

Learning and teaching strategy:

This module is taught in an integrated fashion concurrently with all other first-year modules. Each first-year module contributes individual learning outcomes that are demonstrated by students typically through practical sessions throughout the first-year. The opportunities for students to demonstrate their learning for assessment purposes are continuous and integrated with all other first-year modules. There will be multiple opportunities for students to demonstrate each learning outcome. Each new module cohort will be provided with an assessment handbook detailing the specific requirements for that year.

Total Notional Learning Hours

300

Module Code	CST1120(<i>Published</i>)
Module Title	First Year Project
Credit	30

Aims

To provide students with experience of a range of Computer Science projects that reinforce First Year teaching and learning and provide opportunities to apply this learning in a supported and structured environment.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Explain how Computer Science concepts provide a framework for understanding real-world systems.

Skills

On completion of this module, the successful student will be able to:

2. Successfully undertake simple development projects.
3. Successfully demonstrate appropriate information searching, critical evaluation, writing and communication skills necessary to enable effective documentation and communication.

Syllabus

- Individual and group project management.
- Presentation and documentation skills.
- Professional and ethical responsibilities.
- Requirements, specification and verification.
- Design and computational thinking

Learning, Teaching and Assessment Strategies

This module is taught in an integrated fashion concurrently with all other first-year modules. Each first-year module contributes individual learning outcomes that are demonstrated by students typically through practical sessions throughout the first-year. The opportunities for students to demonstrate their learning for assessment purposes are continuous and integrated with all other first-year modules. There will be multiple opportunities for students to demonstrate each learning outcome. In this demonstration students should show an awareness of the ethical/legal/professional issues that might be raised by the techniques or the context of the project.

Each new module cohort will be provided with an assessment handbook detailing the specific requirements for that year.

Total Notional Learning Hours

300

Module Code	CST1130(<i>Published</i>)
Module Title	Foundations of Computer Science
Credit	30

Aims

To provide students with an understanding of the foundations of Computer Science.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Explain the key concepts underpinning the discipline of Computer Science.

Skills

On completion of this module, the successful student will be able to:

2. Apply key concepts to computer systems development.

Syllabus

- Execution: state transitions; sequencing; recursion; concurrency.
- Algebraic structures: sets; graphs; sequences; trees; functions; relations.
- Logic: predicate logic; propositional logic; reasoning and proof.
- Languages: regular expressions; automata; syntax; semantics.
- Specification: ADT; invariants; pre-post conditions.

Learning, Teaching and Assessment Strategies

This module is taught in an integrated fashion concurrently with all other first-year modules. Each first-year module contributes individual learning outcomes that are demonstrated by students typically through practical sessions throughout the first-year. The opportunities for students to demonstrate

their learning for assessment purposes are continuous and integrated with all other first-year modules. There will be multiple opportunities for students to demonstrate each learning outcome.

Each new module cohort will be provided with an assessment handbook detailing the specific requirements for that year.

Total Notional Learning Hours

300

Module Code	CST1140(<i>Published</i>)
Module Title	Systems and Architecture
Credit	30

Aims

To provide students with an understanding of the organization of computer-based systems from the small-scale (for example gates, processors and memory), through the medium-scale (for example personal computer organization), to the large-scale (for example the Internet).

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Describe a range of typical computer based systems in terms of their internal organization of components and their system interfaces.

Skills

On completion of this module, the successful student will be able to:

2. Construct, test and analyse systems involving both hardware and software.

Syllabus

- Data representation: binary; structures.
- Circuits: logic gates; arithmetic.
- Machine organization: memory; registers.
- Programming: instructions; interrupts; low-level vs. high-level. I
- Input-output: devices; interfaces.
- Distributed Systems: networking; communication; concurrency.

- Operating Systems.

Learning, Teaching and Assessment Strategies

This module is taught in an integrated fashion concurrently with all other first-year modules. Each first-year module contributes individual learning outcomes that are demonstrated by students typically through practical sessions throughout the first-year. The opportunities for students to demonstrate their learning for assessment purposes are continuous and integrated with all other first-year modules. There will be multiple opportunities for students to demonstrate each learning outcome.

Each new module cohort will be provided with an assessment handbook detailing the specific requirements for that year.

Total Notional Learning Hours

300

Module Code	CST2110(<i>Published</i>)
Module Title	Object-Oriented Programming
Credit	30

Aims

This module aims to provide the student with an understanding of the concepts involved with object-oriented programming. To this end, the student will cover the fundamentals of objects, classes, inheritance, composition, encapsulation and polymorphism. In addition, the module will expose the student to GUI frameworks, introduce some basic software engineering design principles and patterns, and provide a more abstracted view of system design in terms of layered software architectures. It is expected that on completion of this module students will be able to design, implement and test non-trivial object-oriented programs.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Demonstrate an understanding of the fundamental concepts of object-orientation.
2. Apply object-oriented solutions to the analysis and design of software systems.
3. Know how to employ testing strategies to verify an object-oriented software system.

Skills

This module will call for the successful student to demonstrate:

4. How to design an object-oriented system that is underpinned by good practise and object-oriented principles.
5. The production of relevant documentation using appropriate documentation tools.
6. Implementation of an object-oriented system using an industry standard programming language and API.

Syllabus

Review of procedural programming

Introduction to objects and classes

Object principles and encapsulation

Object relationships: inheritance, composition, association

Abstraction and polymorphism

Working with a GUI framework

Introductory design patterns (Façade, Observer)

Core architectural patterns (MVC, Layering)

Introduction to testing strategies

Learning, Teaching and Assessment Strategies

Theoretical and practical examples will be presented in a weekly lecture. Practical skills and experience will be built up through weekly laboratories. These will comprise a series of software design and development exercises that will both support the lecture material and serve as milestones for self-evaluation. A number of scheduled sessions in the computing laboratory will also be employed for formative assessment via online tests. The laboratory sessions will also be used to support students in completion of their summative assessment (individual programming assignments).

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST2120(<i>Published</i>)
Module Title	Web Applications and Databases
Credit	30

Aims

This module will give students practical experience with the development of dynamic websites using HTML, CSS, PHP and JavaScript. They will learn how to store client-side data and get first-hand experience with the server-side storage of data using databases. Students will also obtain a deeper understanding of the operation of large-scale websites, such as Facebook and Google, and the security, privacy and legal issues that affect web applications.

Learning Outcomes

Knowledge

On completion of this module, the successful student will have knowledge of:

1. Client and server technologies.
2. Commercial website development.
3. Data storage and retrieval.
4. Website testing and deployment.
5. Security, privacy and legal issues.

Skills

On successful completion of this module, students will be able to:

6. Design and develop a website.
7. Construct the front end of a website using HTML, CSS and JavaScript.
8. Develop the back end of a website using PHP and MongoDB.
9. Develop the back end of a website using Node.js and MySQL.
10. Test the front and back end of a website.

Syllabus

Website design

HTTP

HTML

CSS

JavaScript

JSON

PHP

AJAX

Node.js

Data storage and retrieval

Testing

Commercial website

Security, privacy and legal issues

Learning, Teaching and Assessment Strategies

Contact hours during teaching weeks:

Lecture: 1 hrs

Laboratory: 2 hrs

The course is taught using the flipped classroom approach. The recorded lectures will provide the knowledge component of the course. The live lectures will give students opportunities to ask questions and there will be live coding and technology demonstrations. The laboratory sessions will consolidate students' understanding of the lecture material and support their development of the technology skills.

BSc MComp/Computer Science 2019/20

Assessment Weighting

Coursework 1: Game Website (50%) Coursework 2: E-commerce Website (30%) Coursework 3: Single Page Web Application (20%)

Total Notional Learning Hours

300

Module Code	CST2400(<i>Published</i>)
Module Title	Industrial Placement
Credit	120

Aims

The module aims to develop the students' employability skills by achieving the set of agreed learning outcomes using a Three Way Negotiated Learning Agreement. The module develops a range of skills specific to the individual workplace. This practical experience module provides the means for students to link academic work with the 'real world' situation. The module facilitates the embedding of transferable and graduate skills necessary for future career paths and employment. It is envisaged the student will reflect upon areas of knowledge relevant to the placement learning experience and develop personal knowledge through a review of their learning. The placement learning experience provides students with the opportunity to enhance their skills of self-expression, communication, self-reliance and co-operation.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Explore how your subject theoretical breadth and knowledge may be integrated with the placement environment and applied to the workplace.
2. Develop a plan of learning outcomes and personal development goals to be achieved in the placement organisation.
3. Critically examine the organisational structures, policies and operational aspects of the placement organisation including risk management.

Skills

This module will call for the successful student to demonstrate:

4. Develop and apply practical skills and competencies required for professional or other employment requirements. This may include the requirements of professional bodies associated with your programme.

5. Critically reflect upon your personal growth, development and learning during the placement experience and relate them to your possible future employment
6. Evaluate the acquisition and development of your transferable and graduate skills during the placement experience illustrating how these will enhance your employability

Syllabus

No formal syllabus is specified but the module does foster integration of subject knowledge into the placement situation.

Learning, Teaching and Assessment Strategies

Learning and teaching strategy:

In the year prior to the industrial placement year, students will be introduced to the aims of the module and given guidance on appropriate placement opportunities. If a student decides to take a placement year, s/he must register with the designated placement officer and inform them the type of organisation they are interested in. The registered student will also be introduced to the health and safety aspects of placements.

Students will book themselves for a CV workshop with the student development unit service, a preparation week prior to the placement starting. Students will also meet with the module leader for preparation prior to the placement commencing.

Students are expected to apply reflective learning to their placement activities throughout the placement.

The student will undertake 1200 study hours over 32 weeks. This translates as 128 days within the placement organisation and 32 days for self-directed research and writing up time.

Visiting placement tutor:

The visiting tutor will visit the workplace twice to check the student's progress; one at the start and one towards the end of the placement.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

1200

Module Code	CST2550(<i>Published</i>)
Module Title	Software Engineering Management and Development
Credit	30

Aims

This module builds on the programming fundamentals developed in the first year through the study of algorithm design and the properties of several data structures; concurrent programming; networked programming and database design and implementation. This will enable writing efficient concurrent and/or networked programs which store data efficiently and reliably in a well-designed database. Throughout the course software engineering tools and techniques will be introduced and utilized in the design, management and testing of software being developed

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Have knowledge of a variety of algorithms and data structures and the impact of algorithm and data structure selection on software performance
2. Understand of the importance of correct database design
3. Have an understanding of the principles of concurrent and network programming

Skills

This module will call for the successful student to demonstrate

4. A sophisticated application of information searching
5. Implement and analyse algorithms
6. Design and implement databases and interact with them through software
7. Develop concurrent and networked programs
8. Effectively present and communicate design concepts both orally and in writing

Syllabus

- Algorithms and data structures: Analysis of algorithms; order of growth; asymptotic notation; implementation of algorithms and data structures; selection of data structures
- Databases: The relational model; ER-modeling; SQL (DDL and DML); Normalization; interacting with database using a programming language
- Concurrent programming: Threads; race conditions; locks; deadlocks; threadpools
- Network programming: Client/server computing; data transmission over TCP and/or UDP

Learning, Teaching and Assessment Strategies

Learning and teaching strategy:

Support for achieving the module outcomes is provided by lectures and labs typically involving a focussed practical task.

Formal materials are introduced in weekly one-hour lectures; these outline key principles, concepts and considerations. The weekly two-hour lab sessions consolidate the lecture material and provide an opportunity to apply the material to practical problem solving tasks.

Assessment

Several in-class tests scheduled throughout the year.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST2555(<i>Published</i>)
Module Title	Operating Systems and Computer Networks
Credit	30

Aims

Computer systems have become pervasive and increasingly more powerful enabling users to run many different kinds of applications. The power available on modern day computing devices and the ever increasing usage being found for them has led to the redefinition of the roles, responsibilities and design of Operating Systems. The aim of this introductory course is to review the design principles, performance, security and system management issues in Operating Systems design. It provides an understanding of the operation of the underlying hardware and software and gives practical systems-level experience of client-server based applications. It lays the groundwork needed for more advanced engineering applications in the area. The module will provide students with an opportunity to gain practical level experience of Operating System management techniques in a realistic and flexible environment. Access is provided to a 64-bit Linux Enterprise system to promote active learning and reinforce lecture material. This module lays the groundwork needed for more advanced engineering applications in the area.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Describe, select and use appropriate Linux operating system commands to perform a range of tasks including those commonly required during software installation
2. Explain and justify the way in which server applications need to be customised
3. Describe the architecture of major state-of-the-art applications

Skills

This module will call for the successful student to:

4. Successfully demonstrate a sophisticated application of information searching,
5. Classify and analyse the main security weaknesses in current operating systems and network architectures
6. Download, install and customise typical Internet client/server applications on different operating systems
7. Design, implement and evaluate programs to probe networks to which they are attached.

8. Deploy mathematical skills and understanding to system and problem analysis, and problem solutions

Syllabus

Types of O/S, functions of operating systems and computer networks, system interfaces, process management, concurrency, low level IPC, high level IPC, deadlock detection and recovery, security threats and provision, and distributed operating systems.

Networking models of communication (ISO reference model), LANs, Wireless networks, client-server systems, socket programming, and network management issues (FCAPS).

Learning, Teaching and Assessment Strategies

In-depth theoretical overview of Operating Systems and networking concepts will be delivered in the form of lectures. Students will gain significant hands-on interaction with networking equipment in our CISCO specialist labs. Hands-on labs and case studies will help students apply what they learn and to develop critical thinking and complex problem-solving skills.

Exam Duration

Examination, 2 hours

Learning Materials

Unseen examination 40%

Coursework 60%

Total Notional Learning Hours

300

Module Code	CST3110(<i>Published</i>)
Module Title	Testing and Verification
Credit	30

Aims

Computer systems are almost never perfect, exhibiting errors, crashes and hangs whose implications range from benign to fatal. This module will examine the different notions of correctness relevant to computer systems, and how these are applied to the different parts of a computer system. Automatic and user-guided methods that attempt to find possible problems within systems will be covered and demonstrated on practical examples. Also, methods for ensuring that no problems can possibly exist within a system design will be examined and applied.

Learning outcomes

Knowledge

On completion of this module, the successful student will:

1. Appraise different correctness conceptualisations including safety/liveness, functional correctness and temporal properties.
2. Be able to use different ways of specifying correctness including pre- and post-conditions, temporal logic properties, code contracts and unit tests.
3. Appraise the role of correctness in industry: safety-critical industries and certification/validation processes.

Skills

On completion of this module, the successful student will be able to:

4. Apply appropriately and evaluate open source industry-standard tools for finding bugs in software.
5. Abstract and model complex systems so as to make them amenable to analysis with tools such as model checkers.
6. Design unit test suites manually and automatically, using test generation tools.
7. Develop advanced debugging techniques and apply them to software systems.
8. Apply advanced code writing techniques aiming to reduce the incidence of bugs including defensive coding and coding-by-contract.

Syllabus

- Logic as specification language: propositional, first-order, Hoare, temporal logics.
- States and traces as models of computations.
- Safety vs liveness, reachability vs termination and other correctness concepts.
- Absence of bugs vs presence, and techniques for proving those.
- Tests, code coverage and other code metrics.
- Code contracts.

Learning, Teaching and Assessment Strategies

The course will support a collaborative mode of learning combined with assessment of individual critical capacities. To this aim, students will be required to show both individual work and group activities. The learning process will be based on a combination of theoretical knowledge and practical skills. The student will be required to show knowledge of basic principles of Computation, Algorithms and Complexity

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3120(<i>Published</i>)
Module Title	Teaching Computing in the Secondary School
Credit	30

Aims

The module will focus on the teaching of computer science within the secondary school (age 11-16) setting. You will observe, analyse and prepare materials for teaching practice. You will start to apply your knowledge of computing to teaching practice. You will develop an understanding of the Teachers' standards, thus supporting your preparation for application of initial teacher training courses. You will complete reading on education pedagogy to critically analyse practice. The module will also support your development of public speaking.

Learning Outcomes

Knowledge

On successful completion of this module, the student will be able to:

1. Reflect upon school experience to prepare you for initial teaching training.
2. Analyse relevant computing pedagogy theory to support critical action research.
3. Analyse the teaching requirements of computer science in the national curriculum and awarding body syllabus.

Skills

On completion of this module, the successful student will be able to:

4. Create engaging teaching activities to support pupil progress.
5. Develop an understanding of the Teachers' standard requirements and how you will start to meet them.
6. Develop professional relations with colleagues within school.
7. Gain confidence in public speaking.

Syllabus

This module is designed to support the professional development of undergraduate students in understanding the requirements of teaching computer science within a secondary school setting. Therefore, the module incorporates school experience with directed tasks to support students' application for teaching training courses.

Areas covered will include:

1. You will complete school experience within partnership secondary school
2. Critically analyse up to date theory in teaching computer science
3. Plan and teach engaging teaching materials
4. Keep a reflective diary to support your understanding

Learning, Teaching and Assessment Strategies

Learning and teaching strategy

This module is mainly delivered through workshops and school experience. These focus on good practice of teaching computer science, professionalism and meeting of the Teacher's Standards.

Student engaging in school experience are analysed to ensure that support is given to strengthen areas for development and consolidate and share good and outstanding practice. Tutors will visit students to discuss their progress.

The module is supported through the VLE (Moodle) The Moodle area is listed on Unihub under MyLearning. All of these developments support the aim of developing a reflective practitioner.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3130(<i>Published</i>)
Module Title	Advanced Web Development with Big Data
Credit	30

Aims

Many modern websites store and process large amounts of data. Typical examples are property search websites, price comparison websites and financial websites. This module aims to give students the ability to download, store and process large quantities of data and build websites based on this data using advanced JavaScript frameworks. At the end of the module successful students will have gained advanced skills with Java, JavaScript, web development and big data, which are highly sought after in industry.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Choose a technology architecture for a website built around a large quantity of data.
2. Evaluate a design for a SQL database.
3. Critically assess and compare machine learning techniques and deploy in sentiment analysis.
4. Articulate website performance measurement and the role of caching.

Skills

On completion of this module, the successful student will be able to:

5. Construct professional quality websites displaying data from large databases using Node.js and advanced JavaScript frameworks.
6. Design complex multi-threaded Java programs using Spring, Hibernate and Maven.
7. Plan and implement a real-time web application using WebSockets
8. Process data locally and in the cloud.

9. Measure and optimize the performance of the websites that they have built.

Syllabus

- Advanced Java (threads, Spring, Hibernate, Ant, Maven).
- Unit testing of Java and JavaScript.
- Downloading data from third party websites and web services.
- SQL databases.
- Advanced JavaScript (Node.js, ECMAScript 6, React.js, Vue.js).
- Cloud data storage.
- Data processing pipelines.
- WebSockets.
- Data visualization with JavaScript.
- Machine learning.
- Sentiment analysis
- Performance measurement and caching.

Learning, Teaching and Assessment Strategies

Learning and Teaching Strategy

Contact hours during teaching weeks:

Lecture: 1 hrs

Laboratory: 2 hrs

The course will be taught using the flipped classroom approach. The recorded lectures will provide the knowledge component of the course (1-4). The live lectures will give students opportunities to ask questions and there will be live coding and technology demonstrations (1-9). The laboratory sessions will consolidate students' understanding of the lecture material and support their development of the technology skills (5-9).

Assessment Scheme

Formative Assessment Scheme

Students will be encouraged to submit drafts of summative assessments tasks for formative feedback. Formative feedback will also be given to students as they work on their coursework in the labs.

Summative Assessment Scheme

Coursework 1: Price Comparison Website, Property Search Website, or Similar.

Students build a price comparison or property search website (other options are possible).

Coursework 2: Recommendation Website based on Machine Learning and Sentiment Analysis.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3140(<i>Published</i>)
Module Title	Novel Interaction Technologies
Credit	30

Aims

Interactive technologies are developing continually, and new devices that offer novel ways of interacting with computer-based systems are constantly finding their way into our homes, workplaces and lives. Students on this module will encounter and study a range of innovative and emerging interaction technologies. The module affords an opportunity to become familiar with the technologies and devices themselves as well as ways of analysing their applicability for particular uses and situations, and approaches evaluating their use. By understanding how computing devices and products are used and studying the ways that usage changes over time, students will gain a critical awareness of the processes by which interactive products gain in popularity and become successful. After completing the module, students will therefore be better equipped to anticipate and select the successful interaction technologies of the future, analyse situations of use and potential users, design using the latest interaction technology, and evaluate novel and innovative designs.

Learning Outcomes

Learning outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Describe the underpinning concepts and key features of a range of novel and emerging interaction technologies
2. Critically assess and compare such technologies
3. Provide arguments for how such technologies challenge concepts of HCI

Skills

On completion of this module, the successful student will be able to:

4. Analyse problem situations with regard to task, context and user needs

5. Design and prototype solutions that harness the potential of novel interaction devices and technologies to address specific problems
6. Plan and conduct appropriate evaluations of designed artefacts, that can be used in the iterative improvement of designs

Syllabus

- Fundamentals of HCI: Usability, User Experience, and the Evaluation of Interactive systems
- Theory: Reality-based interaction
- Tangible User Interfaces
- Augmented Reality & Virtual Reality
- Haptic Perception and Interaction
- Proxemic interaction
- Novel Assistive Technologies
- Pervasive and Ubiquitous Computing

Learning, Teaching and Assessment Strategies

Learning and Teaching Strategy

A combination of weekly lectures and practical sessions will be used to deliver conceptual material and to allow students to develop practical skills.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3145(<i>Published</i>)
Module Title	Web-Based Mobile App Development
Credit	30

Aims

This module aims to develop a deep understanding of the latest web-based app programming techniques, frameworks, and methodologies used by the industry to develop the next generation software that can be deployed on any mobile devices (both Android and iOS). The module will investigate, develop, and deploy latest programming language standards that are fundamental to app development and currently being widely employed in industry. Modern programming frameworks will be introduced to provide the essential software architecture for large-scale software development and the ability to target either the Android or iOS platform. The module will cover the three most important components of a complete mobile app: front end, back end, and system administration.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Understand the latest programming standard required for advanced app development;
2. Utilise the latest software architecture frameworks and understand their strength and weakness;
3. Utilise of the latest serverless backend that provide app hosting and data storage;
4. Utilise essential tools required such as version control, dependency management, transpiling, and behaviour-driven development.
5. Understand the methodology of developing platform-independent mobile app and the strength and weakness of existing libraries.

Skills

This module will call for the successful student to demonstrate:

6. Ability to develop efficient and robust app following the latest programming standard.
7. Ability to design and implement industry-scale app utilising the latest software frameworks.
8. Ability to host app online and design/manage serverless data storage;

9. Ability to efficiently deploy, config, and administrate essential tools required for advanced web app development workflow such as version control, dependency management, transpiling, and behaviour-driven development.
10. Ability to develop platform-independent mobile apps using Web-based technologies.
11. Ability to design and evaluate cross-platform mobile apps based on customer specifications.

Syllabus

- Object-oriented programming in functional language such as JavaScript;
- Advanced features in the latest programming language standard such as ECMAScript 6;
- Version control and issue tracking with Git and Github.com;
- Software testing library such as Jest;
- Project dependency and compile tools such as NPM and Webpack.
- Full-stack software framework such as Vue.js:
 - UI Component;
 - User registration and authentication;
 - Serverless data storage and sharing (such as Firebase);
 - Messaging;
 - Web APIs (such as Facebook and Google Maps);
 - Hardware APIs (such as camera, gps, and other sensors);
- Platform-independent mobile app development with framework such as NativeScript;

Learning, Teaching and Assessment Strategies

Learning and Teaching Strategy

Contact hours:

- Lecture: 1.5 hrs
- Laboratory: 1.5 hrs

The focus of teaching will be a mixture of lectures and lab-based practical work and discussions. Skills and experience are built up through weekly lab sessions that progressively build up the knowledge and skills to complete a full-fledged web application. Various tools, such as Git, NPM, and VSCode will be introduced throughout the module as they become necessary. The student will be expected to pursue the latest progress in the Web app development through group discussions and self-study.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3150(<i>Published</i>)
Module Title	Computer Graphics
Credit	30

Aims

The aim of this module is to examine in depth the concepts and techniques needed in the construction of interactive graphics systems covering advanced graphics programming techniques. It will cover theory and mathematics as required. It aims to provide students with practical experience via significant individual project work developing computer graphics programs using an industry standard environment.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Demonstrate understanding of a wide range of techniques and algorithms used in implementation of graphics systems.
2. Demonstrate in depth knowledge of an industry standard development environment including the appropriate use of libraries.
3. Demonstrate understanding of mathematical methods used in the domain of graphics and visualisation including the use of vectors, matrices and transformations.

Skills

On completion of this module, the successful student will be able to:

4. Use an industry standard graphics and visualisation development library and tools to develop an individually researched and designed graphics and visualisation application.
5. Manage resources and time in the design and development of a substantial individual coding project.
6. Document the design and implementation of a significant software development project.

Syllabus

- graphics primitives
- transformations, vectors and matrices
- viewing systems
- animation techniques
- object modelling
- lighting and texturing
- virtual and augmented reality

Learning, Teaching and Assessment Strategies

Learning and Teaching Strategy

A weekly lecture will be used to deliver theoretical material, cover the necessary mathematical background, to introduce the programming environment and to discuss example programs. The laboratory time will be used for the development of course works and as an opportunity for students to get continual formative feedback on their work. Due to the development focus of the course it is assessed by 100% coursework, over one formative and two summative coursework assessments.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3160(<i>Published</i>)
Module Title	Designing Secure Systems
Credit	30

Aims

Designing secure computer systems is a cross cutting discipline: from organisational policies, via programming languages and network protocols all the way down to physical layers, security controls need to be installed at all levels of a computer system. This course aims at giving students an overall appreciation of the meaning of security and privacy, teaching them standard techniques of designing, developing and assessing secure computer systems. At the end of the module, participants will have acquired skills and knowledge in basic cryptology, security protocol design, threat analysis, security models and security engineering techniques.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Explain the notions of security, privacy and socio-technical security problems, like insider threat
2. Apply basic concepts of cryptography and use them in secure communications,
3. Identify protection goals and quantify the attacker to build appropriate security models,
4. Understand policies addressing socio-technical security.

Skills

On completion of this module, the successful student will be able to:

5. Identify security and privacy goals in application scenarios.
6. Apply and implement standard cryptographic algorithms like RSA and Diffie-Hellman,
7. Assess and design simple secure communication protocols following given examples using standard software (Modelcheckers),

8. Model security policies for infrastructures with human actors.

Syllabus

Introduction to cryptography and cryptanalysis,

Principles of cryptography,

Security engineering principles, security perimeter, physical security

Security models: multi-level and multi-lateral security

Protection goals,

Misuse cases and attack trees: quantifying the attacker

Access control,

Authentication protocols,

Model checking security protocols,

Secure programming with information flow control,

Socio-technical aspects of security (insider threats),

Blockchain

Case studies:

Privacy and the GDPR,

Security and Privacy in the Internet of Things (EU project [SUCCESS iot-success.eu](http://SUCCESS.iot-success.eu)),

Cloud Security.

Learning, Teaching and Assessment Strategies

Learning and teaching strategy:

Contact hours during teaching weeks:

Lecture: 1 hrs

Laboratory: 2 hrs

The course will be taught using the flipped classroom approach. Lectures will give students opportunities to ask questions and there will be live demonstrations. The seminar and laboratory sessions will consolidate students' understanding of the lecture material and support their development of application, design and verification skills.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3170(<i>Published</i>)
Module Title	Artificial Intelligence
Credit	30
Other Restrictions and Requirements	None

Aims

The aim of the module is to introduce students to a range of AI theories and techniques, including the most commonly used. This will extend to the ability to implement these techniques, and the students will extend their own development skills.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Show understanding of common knowledge representation mechanisms.
2. Demonstrate an understanding of common machine learning mechanisms

Skills

This module will call for the successful student to:

3. Successfully demonstrate a sophisticated application of information searching,
4. Ability to implement knowledge bases in common knowledge representation formats.
5. Ability to implement machine learning algorithms for particular applications.
6. Ability to use common AI development techniques and languages.

Syllabus:

- First Order Predicate Logic
- Semantic Nets
- XML

- Statistical techniques including linear approximation.
- Multi-layer perceptrons
- Self-organising maps
- Genetic algorithms
- Rule based systems
- Case base reasoning
- Search mechanisms
- Algorithms for large data sets

AI areas including language, vision and robotics

Learning, Teaching and Assessment Strategies

Learning and teaching strategy:

In-depth theoretical overview of machine learning concepts will be delivered in the form of lectures. Students will gain significant hands-on interaction with particular algorithms and representation techniques. Hands-on labs and case studies will help students apply what they learn and to develop critical thinking and complex problem-solving skills.

Assessment scheme:
(a) Formative assessment scheme The workshops will be used as platforms to discuss various aspects of machine learning and algorithms and representation techniques. Feedback will be given by workshop tutors.
(b) Summative assessment scheme - The module is assessed by coursework and examination. - 50% coursework will be based on hands-on lab exercises. (<i>Learning outcome 1 to 3</i>). A Lab book will be submitted with completed labs and a coursework that is based on “Skills-Based Assessments”. (<i>Learning outcome 4 to 5</i>)

Assessment Weighting

- The module is assessed by coursework and examination. - 50% coursework will be based on hands-on lab exercises.

Exam Duration

Examination, 3 hours

Total Notional Learning Hours

300

Module Code	CST3180(<i>Published</i>)
Module Title	User Experience (UX) Design
Credit	30

Aims

Students of this module will gain understanding of underpinning concepts and practical techniques relevant when considering humans, both in the organisation of design and design processes, and as a way of incorporating a user perspective in the design of products and services. The module also includes analysis of user experience, the characteristics of users and their tasks, and the technical, organisational and physical environment in which products or systems may operate.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Explain key theories and concepts that underpin our understanding of human roles in the design process, both as design participants, and as other stakeholders (e.g. users of designed artefacts).
2. Select and use appropriate tools and methods to analyse all aspects of interaction between users and deployed technology.
3. Advise on usability (including safety and accessibility) for products and services.
- 4.. Plan and perform appropriate evaluation methods and, interpret and present the results of evaluation.

Skills

On completion of this module, the successful student will be able to:

5. Select and apply appropriate techniques, methods, and tools to research and understand human stakeholders in design, and deploy the knowledge gained to achieve positive user experiences and construct prototypes.

Syllabus

- Understanding the user in design
- User research
- Design and prototyping
- User experience analysis
- User experience evaluation
- Human behaviour, perception and cognition
- Refine the design solutions in response to evaluation
- Communicate design solutions for implementation

Learning, Teaching and Assessment Strategies

A combination of weekly lectures and practical sessions will be used to deliver conceptual material and to allow students to develop practical skills.

(a) Formative Assessment Scheme

Students' knowledge and skills will be assessed across a range of team and individual work and, written work based on practical work undertaken. To achieve this, a formative assessment strategy will be utilised to provide continuous feedback to students on their individual learning and progress. The process of formative assessment will lead to summative assessment, which will have two components.

(b) Summative Assessment Scheme

For this module, there is a single summative coursework with three phases. CW Phase 1: User Research (LO 1, 2 and 4) CW Phase 2: Design & prototyping (LO 2,3 and 5) CW Phase 3: Evaluation (LO 3 and 4) Each phase is assessed by a group presentation AND an individually written report. In each written report, the student should identify their group members with an estimate of each contribution. This may be considered in the marking process. Note that each phase builds on the one before, so students who do not complete earlier phases will find it difficult to complete later ones. Formative assessment will be by tutor feedback on assessed components and by tracking progress in class.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3185(<i>Published</i>)
Module Title	Open Source Software
Credit	30

Aims

The module aims to give students an introduction into the Open Source software ecosystem. A range of issues involving Open Source will be discussed, both technical (the Open Source development model) and non-technical (legal, ethical and political issues). In order to gain hands-on experience, students will also participate in an existing Open Source project.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Demonstrate a sound understanding of the Open Source paradigm, its difference from traditional software development practices and its strengths and weaknesses.
2. Demonstrate an understanding of concepts important in Open Source concepts such as licensing, community management and collaborative work.
3. Understand and discuss the ethical, political and economical issues involving Open Source software.

Skills

On completion of this module, the successful student will be able to:

4. Actively participate in or set up an Open Source project and use the Open Source development model.

Syllabus

- History of Open Source
- Definitions of Open Source
- Collaborative development model (source code management, bug tracking, communication methods)
- Licensing and legal issues
- Open Source business models
- Ethical considerations
- Open Source and politics
- Active Development

Learning, Teaching and Assessment Strategies

The topics enumerated above will be discussed in a weekly lecture.

Students will be required to participate in an existing project. Since the focus is not specifically on the quality of the end product, but on the interaction with the project community, this does not necessarily involve programming, but can also take the form of advocacy, adding to documentation, translation, etc. Creativity is encouraged.

In order to encourage students to work on the project participation during the entire module run, they will be required to submit a blog about their progress each week.

Knowledge of the Open Source background will be assessed using quizzes.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	CST3555(<i>Published</i>)
Module Title	Industrial Network Design and Management
Credit	30

Aims

An important criterion for the implementation of Industry 4.0 is the amalgamation of machines and industrial components in a network infrastructure, to support operational communication amongst machines and other applicable IT systems in an automated network. This will enable the optimization of conventional industrial processes in many facets. The central theme of this module is to equip students with the skills necessary to design and implement network infrastructures to support industrial communication and to integrate Industry 4.0 enabled machines to facilitate a Cyber-Physical Factory. In doing so, students will embrace the practice of setting up TCP/IP communication between modules, IP-address design and allocation, secure wireless LAN communication, switching and routing services to support communication, deploy VPN for remote services, and to explore the integration of the CP Factory with the Internet of Things.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

1. Understand the importance of integrating factory floor industrial networks and process plant floor networks with company enterprise networks.
2. Familiarise with the basics of Ethernet networks.
3. Develop a clear understanding of the technology required for interconnecting LAN segments.

Skills

This module will call for the successful student to:

4. Successfully demonstrate a sophisticated application of information searching,
5. Design, Implement and maintain Ethernet networks
6. Configure and secure, suitable LAN/WLANs for factory environments.
7. Embrace Ethernet and networking technologies applicable to industrial network environments.

Syllabus:

- Layer 1: Physical Layer & Communications Media
- Layer 2: Data Link Layer & Switches
- Layer 3: Network Layer & Routers

- Layer 2/3 Plus: Advanced Networking
- Layer 4: The Transport Layer
- Layer 5 – 7: Applications Layer

Learning, Teaching and Assessment Strategies

In-depth theoretical overview of networking concepts will be delivered in the form of lectures. Students will gain significant hands-on interaction with networking equipment in our CISCO specialist labs. Hands-on labs and case studies will help students apply what they learn and to develop critical thinking and complex problem-solving skills.

Assessment Weighting

Coursework 100%

Total Notional Learning Hours

300

Module Code	PDE3413
Module Title	Systems Engineering for Robotics
Level	6
Credit	30
Owning Subject	Product Design & Engineering
Level Restrictions	

Aims

This module aims to develop understanding of the integration of modular robotic and sensor systems. It will enable students to acquire practical skills of robotic software/hardware integration and validation. In addition it aims to develop understanding of human robot interaction.

Learning Outcomes

Knowledge

On completion of this module the successful student will be able to demonstrate:

1. Knowledge of multisensory signal processing and fusion techniques.
2. In depth knowledge and understanding of human robot interaction in a social context
3. Advanced knowledge of robot architectures

Skills

This module will call for the successful student to:

4. Select, apply and justify the appropriate use of signal processing and fusion techniques to solve specific challenges in robotics
5. Develop suitable robot control techniques in response to human input
6. Devise a systems architecture for complex robot operations

Syllabus

Indicative topics that may be covered:

- Robotic systems architectures and programming
- Appropriate signal processing techniques e.g. Kalman filtering
- Multi-sensor data fusion techniques, e.g. occupancy grids
- Mobile robot locomotion and navigation systems. Mapping and localisation techniques e.g. SLAM
- Interactive robotics in social contexts (interfacing, interaction and ethics)
- Physical human robot interaction (haptics and appropriate control techniques e.g. force, admittance, hybrid, impedance)
- Teleoperation/telepresence, master/slave manipulators
- Distributed and swarm robotics
- Artificial Intelligence reasoning methods for robotics

Learning, Teaching and Assessment Strategy

The module will be taught in a laboratory environment with hands-on activities, supported by lab demonstration, tutorial input and guided study.

Assessment will be entirely by coursework assessing all learning outcomes in the form undertaken as part of a team project, undertaken in ways that support the development of good practice and employability skills.

Formative assessment will be embedded in this approach. For example, students will present, discuss and critique design ideas, and staff will contribute to this process. Formal and informal code reviews will provide feedback to students, but also require them to reflect on their systems in ways that are both deep and useful. Students will be required to justify design decisions prior to implementation, illustrating, for example, that systems are safe, live and fair in their behaviour. This embedding of professional methods of systems review into the learning process will also serve to ensure that each individual contributes to the development, and potential problems (such as plagiarism or poor participation) are identified and discussed with individuals as the projects develop.

Summative assessment consists of a number of tasks and projects. The projects are designed so that students are required to demonstrate all 6 learning outcomes for successful completion. The precise details of the project will vary from year to year taking into account factors such as the students' interests, the research specialisms of the staff involved and possible industrial involvement. Consequently the deliverables used as the basis for assessment will also change, but will be made explicit to students prior to the start of the module. For

example, a large, complex system-of-systems project undertaken by the whole cohort as one group would not be assessed in the same way as a challenge to propose a solution to a specific problem undertaken by small groups who “pitch” to a company.

Typical elements of the assessment would include:

- A presentation of the working system either in person or as a recorded artefact.
- A presentation of the system design, including discussion of the key decisions taken and the rationale behind these.
- A record of the details of the implementation, including code, plans, data sheets etc.
- A personal submission by each student that is designed to enable individual grades to be decided. This might take the form of a reflective log, incorporating aspects of the design process monitoring above. It might also include a viva voce examination based upon other submitted items, to ensure that individual students understand, and contributed to, the work done.

Assessment Weighting

Coursework (No examination) 100%

Learning Materials

Your online reading lists can be accessed from the My Study area of UniHub. They highlight essential and recommended reading for all modules you are registered on.

Module Code	CST3990
Module Title	Undergraduate Individual Project
Level	6
Credit	30
Owning Subject	Computer Science Technology
Level Restrictions	

Aims

This module provides you with the opportunity of choosing and working on a project that reflects your interests and aims and outcomes of your programme. It should constitute a practical problem-solving project relevant to your programme of study. The primary aim of the module is to consolidate and deepen your understanding of material taught on your programme, to exercise professional judgement, to undertake individual research and to conduct an investigation and/or develop a product, process or application relevant to the focus of your programme. It provides you with the opportunity of engaging in significant system development, the typical output of which represents the solution of a problem akin to those that you as a fledgling professional practitioner are likely to encounter in future employment. The module intends that your choice of individual project will provide you with a significant opportunity to reflect on your learning progress and to develop your learning for life-long and career development.

Learning Outcomes

Knowledge

On completion of this module, the successful student will be able to:

- Apply and integrate a range of computer science and engineering, technologies, information systems, theories, research, design and evaluation techniques to the solution of a specific and substantial problem and recognise the professional, legal and ethical issues involved.
- Demonstrate a comprehensive and detailed understanding of professional standards and the life-cycle of the object of your work (product, process or application), and show a critical appreciation of the selection of the tools used in its development.

Skills

This module will call for the successful student to demonstrate that they can:

- Address a complex problem with a spirit of critical enquiry, successfully demonstrating a sophisticated application of information searching, analytical competency, critical evaluation, writing and communication skills to enable effective documentation and communication for the final year project, as well as life-long personal and career development.
- Reflect on the process of learning and personal development.
- Demonstrate creative thinking competencies – the ability to be original or inventive and to apply lateral thinking.

Syllabus

There is no taught syllabus and students are expected to work autonomously. Some timetabled support workshops on the various stages of the project will be provided as necessary throughout the year, on topics such as plagiarism, evaluation and testing, literature review, referencing and citations, dissertation structure and research methodologies.

Students will:

Develop a project proposal

Liaise with your supervisor regularly throughout the year

Prepare and submit a system analysis or literature review as appropriate to the proposed project

Complete an ethics approval application if appropriate

Design and develop an artefact

Design and implement a test plan and evaluation

Submit a final report

Give a demonstration of the finished software artefact

Learning, Teaching and Assessment Strategy

Supervisors will confirm the following:

Agreed project proposal

Student attended supervisory meetings

Project delivery plan

Suitability for BCS accreditation

Guidelines, including submission deadlines, for each of these components of assessment will be detailed in the module handbook.

Coursework 100%, with the following four deliverable components:

Project proposal - 10%

Review/analysis/agreed work chapter - 20%

Final report - 45%

Oral exam/demonstration - 25%

Guidelines, including submission deadlines, for each of these components of assessment will be detailed in the module handbook.

Students are expected to produce an artefact. The nature of this artefact will be determined by the programme of study and the supervisor with moderation from the module leader. For example, in programmes where software development plays a significant role, the artefact might be expected to be a piece of software. It might be the evaluation and modelling of a network or a novel visualisation of data. Extended literature reviews are not acceptable as student projects, however, they might form a significant part of some projects where analysis of literature leads to a set of heuristics or new ways of modelling data. The project work should not be an extension of student's existing or previous coursework.

Attendance at the viva presentation is compulsory.

Assessment scheme

Formative assessment scheme

Formative feedback is given in meetings with the supervisor. Students should receive an average of 20 minutes a week supervision. It is the responsibility of the student to send details of any work completed to the supervisor prior to meetings, in order to use the time constructively.

Summative assessment scheme Indicate tasks and weightings and which tasks assess which learning outcomes

Assessment Weighting

Coursework 100%

Learning Materials

All reading lists should now be available online via the My Study area of MyUniHub. Please discuss with your liaison librarian if you require assistance with your reading list or advice on supported referencing styles for your Faculty.