Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 2(FHEQ LEVEL 5)

COMPUTER SCIENCE

DEGREE PROGRAMMES

SUBJECT SPECIFIC
PART TWO OF TWO
MODULE AND COURSE STRUCTURE
2022-23

DISCLAIMER

The Faculty of Science and Engineering has made all reasonable efforts to ensure that the information contained within this publication is accurate and up-to-date when published but can accept no responsibility for any errors or omissions.

The Faculty of Science and Engineering reserves the right to revise, alter or discontinue degree programmes or modules and to amend regulations and procedures at any time, but every effort will be made to notify interested parties.

It should be noted that not every module listed in this handbook may be available every year, and changes may be made to the details of the modules. You are advised to contact the Faculty of Science and Engineering directly if you require further information.

The 22-23 academic year begins on 26 September 2022

Full term dates can be found here

DATES OF 22-23 TERMS

26 September 2022 – 16 December 2022

9 January 2023 – 31 March 2023

24 April 2023 – 09 June 2023

SEMESTER 1

26 September 2022 – 27 January 2023

SEMESTER 2

30 January 2023 – 09 June 2023

SUMMER

12 June 2023 – 22 September 2023

IMPORTANT

Swansea University and the Faculty of Science of Engineering takes any form of **academic misconduct** very seriously. In order to maintain academic integrity and ensure that the quality of an Award from Swansea University is not diminished, it is important to ensure that all students are judged on their ability. No student should have an unfair advantage over another as a result of academic misconduct - whether this is in the form of **Plagiarism**, **Collusion** or **Commissioning**.

It is important that you are aware of the **guidelines** governing Academic Misconduct within the University/Faculty of Science and Engineering and the possible implications. The Faculty of Science and Engineering will not take intent into consideration and in relation to an allegation of academic misconduct - there can be no defence that the offence was committed unintentionally or accidentally.

Please ensure that you read the University webpages covering the topic – procedural guidance here and further information here. You should also read the Faculty Part One handbook fully, in particular the pages that concern Academic Misconduct/Academic Integrity. You should also refer to the Faculty of Science and Engineering proof-reading policy and this can be found on the Community HUB on Canvas, under Course Documents.

Welcome to the Faculty of Science and Engineering!

Whether you are a new or a returning student, we could not be happier to be on this journey with you.

This has been a challenging period for everyone. The COVID-19 pandemic has prompted a huge change in society as well as how we deliver our programmes at Swansea University and the way in which you study, research, learn and collaborate. We have been working hard to make sure you will have or continue to having an excellent experience with us.

We have further developed some exciting new approaches that I know you will enjoy, both on campus and online, and we cannot wait to share these with you.

At Swansea University and in the Faculty of Science & Engineering, we believe in working in partnership with students. We work hard to break down barriers and value the contribution of everyone. Our goal is an inclusive community where everyone is respected, and everyone's contributions are valued. Always feel free to talk to academic staff, administrators, and your fellow students - I'm sure you will find many friendly helping hands ready to assist you.

We all know this period of change will continue and we will need to adapt and innovate to continue to be supportive and successful. At Swansea we are committed to making sure our students are fully involved in and informed about our response to challenges.

In the meantime, learn, create, collaborate, and most of all – enjoy yourself!

Professor Johann (Hans) Sienz
Interim Pro-Vice Chancellor/Interim Executive Dean
Faculty of Science and Engineering

Faculty of Science and Engineering	
Interim Pro-Vice Chancellor/Interim Executive Dean	Professor Johann Sienz
Head of Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Professor Paul Holland
School of Mathematics and Computer Science **Head of School: Professor Elaine Crooks**	
School Education Lead	Dr Neal Harman
Head of Computer Science	Professor Xianghua Xie
Computer Science Programme Director	Undergraduate: Dr Liam O'Reilly MSc: Dr Bertie Müller
Year Coordinators	Year 0 – Dr Deepak Sahoo Year 1 – Dr Mike Edwards Year 2 – Dr Giedre Sabaliauskaite and Dr Trang Doan Year 3 – Dr Jens Blanck Year 4 – Dr Tom Owen

STUDENT SUPPORT

The Faculty of Science and Engineering has two **Reception** areas - Engineering Central (Bay Campus) and Wallace 223c (Singleton Park Campus).

Standard Reception opening hours are Monday-Friday 9am-5pm.

The **Student Support Team** provides dedicated and professional support to all studentsin the Faculty of Science and Engineering. Should you require assistance, have any questions, be unsure what to do or are experiencing difficulties with your studies or in your personal life, our team can offer direct help and advice, plus signpost you to further sources of support within the University. There are lots of ways to get information and contact the team:

Email: studentsupport-scienceengineering@swansea.ac.uk (Monday–Friday, 9am–5pm)

Call: +44 (0) 1792 295514 and 01792 6062522 (Monday-Friday, 10am–12pm, 2–4pm).

Zoom: By appointment. Students can email, and if appropriate we will share a link to our Zoom calendar for students to select a date/time to meet.

The current student **webpages** also contain useful information and links to otherresources:

https://myuni.swansea.ac.uk/fse/coe-student-info/

READING LISTS

Reading lists for each module are available on the course Canvas page and are also accessible via http://ifindreading.swan.ac.uk/. We've removed reading lists from the 22-23 handbooks to ensure that you have access to the most up-to-date versions. Access to print material in the library may be limited due to CV-19; your reading lists will link to on-line material whenever possible. We do not expect you to purchase textbooks, unless it is a specified key text for the course.

THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

Compulsory modules must be **pursued** by a student.

Core modules must not only be **pursued**, but also **passed** before a student can proceed to the next level of study or qualify for an award. Failures in core modules must be redeemed.

Further information can be found under "Modular Terminology" on the following link - https://myuni.swansea.ac.uk/academic-life/academic-regulations/taught-guidance/essential-info-taught-students/your-programme-explained/

Year 2 (FHEQ Level 5) 2022/23
Computer Science

BSc Computer Science[G400,G401]
BSc Computer Science with a Year Abroad[G40C,G40C]
MSci Computer Science[G4G4]
MSci Computer Science with a Year Abroad[G4G2]

Coordinator: Dr G Sabaliauskaite

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
CS-205 **Declarative Programming** **15 Credits** **Dr M Seisenberger/Dr PRA Pradic**	**CS-200** **Introduction to Human-Computer Interaction** **15 Credits** **Dr JS Pearson/Dr SNW Robinson**
CS-230 **Software Engineering** **15 Credits** **Dr LP O'Reilly/Mr SW Powell**	**CS-210** **Concurrency** **15 Credits** **Dr F Caraffini/Mr SW Powell**
CS-250 **Database Systems** **15 Credits** **Dr KL Tam**	**CS-255** **Computer Graphics** **15 Credits** **Prof MW Jones**
CS-270 **Algorithms** **15 Credits** **Dr O Kullmann/Dr JE Blanck**	**CS-275** **Automata and Formal Language Theory** **15 Credits** **Dr AM Pauly**
Total 120 Credits	

Optional Modules

Choose exactly 0 credits
Students may choose to select this additional zero credit module.

CS-203	Professional Development and Career Planning	Miss VV Wislocka/Mr N Clarke	TB1	0

Year 2 (FHEQ Level 5) 2022/23
Computer Science
BSc Computer Science with a Year in Industry[G40A]
MSci Computer Science with a Year in Industry[G847]

Coordinator: Dr G Sabaliauskaite

Semester 1 Modules	Semester 2 Modules
CS-205 **Declarative Programming** **15 Credits** **Dr M Seisenberger/Dr PRA Pradic**	**CS-200** **Introduction to Human-Computer Interaction** **15 Credits** **Dr JS Pearson/Dr SNW Robinson**
CS-230 **Software Engineering** **15 Credits** **Dr LP O'Reilly/Mr SW Powell**	**CS-210** **Concurrency** **15 Credits** **Dr F Caraffini/Mr SW Powell**
CS-250 **Database Systems** **15 Credits** **Dr KL Tam**	**CS-255** **Computer Graphics** **15 Credits** **Prof MW Jones**
CS-270 **Algorithms** **15 Credits** **Dr O Kullmann/Dr JE Blanck**	**CS-275** **Automata and Formal Language Theory** **15 Credits** **Dr AM Pauly**
CS-201 **Placement Preparation: Science Industrial Year** **0 Credits** **Mr N Clarke/Miss VV Wislocka**	
Total 120 Credits	

CS-200 Introduction to Human-Computer Interaction

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JS Pearson, Dr SNW Robinson

Format: 30 Lectures

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module introduces the key principles and practices of human-computer interaction (HCI). It describes in detail the basic concepts, methods and issues surrounding interaction design, explores the properties which make good and poor interfaces and presents the major design principles in the discipline. Students will learn how to gather and analyse requirement data, how to prototype designs, how to construct more usable user interfaces and how to design and run user evaluations.

Module Content: - Introduction to human-computer interaction - what is HCI and why is it important?: provides examples of good and bad design and the process involved in the interaction design process.
- Key concepts: describes major design principles associated with HCI (e.g., visibility, flow, affordance, metaphors, feedback, consistency etc.)
- Understanding users; data gathering: an overview of how to plan and run successful data gathering sessions including how to plan interviews, design questionnaires and run observations.
- Establishing requirements: describes how to interpret results from data gathering sessions into requirements for design, explains the process and purpose of literature reviews and goes through how to develop scenarios and use-cases.
- Interfaces and modalities: introduction to the many different types of user interface and how they are used (e.g., command-based, GUIs, speech, haptics, robotic, etc.)
- Design, prototyping and construction: explains why to prototype, how to construct prototypes (low and high fidelity), and how to begin construction based on designs.
- Evaluation: describes the process of evaluation including, determining goals, selecting participants, obtaining ethical approval and analysing, interpreting and presenting the data. We also go through the different types of evaluation (e.g., usability lab testing and field studies) and touch on statistical analysis and heuristic evaluation.
- Data analysis: discusses the differences between qualitative and quantitative data and describes how best to analyse the results from data gathering sessions.
- Future directions: what is next for HCI and interaction design?

Intended Learning Outcomes: Students will:
- Understand the basic principles of human-computer interaction, including what makes a good or a poor user interface
- Be able to establish usability requirements via data gathering techniques
- Have an understanding of different types of user interface
- Get experience of both prototyping and basic interface design
- Gain an understanding of how to evaluate and analyse interactive systems

Assessment: Examination 1 (60%)
Coursework 1 (5%)
Coursework 2 (5%)
Coursework 3 (30%)

Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: The coursework is group-based and will require students to collect user requirements, design and prototype (to a basic level) and evaluate a design to a specification given at the start of the module. Two milestones will be video-based, screened in a lecture (Labelled as Coursework 1 and Coursework 2); the final submission is a written report (Labelled as Coursework 3).

The examination will take the standard format for Computer Science and will test the range of learning outcomes stated above.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Grades, group and collective written feedback for coursework. Written collective feedback for examinations.

Failure Redemption: Resit exam and/or resubmit coursework as appropriate.

Additional Notes:

Updated July 2019. Available to visiting and exchange students.

CS-201 Placement Preparation: Science Industrial Year

Credits: 0 Session: 2022/23 Academic Year

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Mr N Clarke, Miss VV Wislocka

Format: 6 hours consisting of a mix of podcasts, recorded lectures and Zoom sessions and optional 1-2-1 meetings and weekly drop-in sessions. Prior to the change it was 6 hours of face to face delivery via PC labs, and a 1-2-1 meeting where applicable / requested.

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This generic cross-disciplinary module is a mandatory module for all students who have enrolled (or transferred) onto the Science Industrial Placement Year. The module focuses on the underpinning and fundamental requisites required to gain, enter and progress effectively through an industrial placement. Learners will be introduced to (a) sourcing placements, CV writing, and application techniques; (b) Interview techniques, how to pitch yourself and be successful; (c) workplace fundamentals and IP awareness, behaviors and expectations; and, (d) Key employability skills; getting the most from your Industrial Placement. This module is only mandatory for students who have enrolled on a Science Industrial Year programme of study or who transfer up to the end of level 5.

Module Content: The module will focus on the key requirements to gain and be successful whilst on a placement. Directed and self -directed activity will address the following topics:

1) Science Industrial Placements - What they are, how to search and how to apply.

2) CV writing, cover letters and application processes.

3) Assessment centres, interview techniques and a mock interview.

4) Recognizing and developing employability skills.

5) reflecting and maximising your placement experience.

6) one to one meeting with careers and employability officers.

Intended Learning Outcomes: By the end of this module, students will be able to:

1) Be aware of and possess the essential skills needed to secure placement opportunities; alongside having the skills to apply for relevant placements.

2) Have a general understanding of an interview process and what tools and attributes make a good interview.

3) Discuss and share what is expected within the workplace including behavioral and professional conduct.

4) Identify personal employability skills and how these will be used in a workplace setting.

5) Understand the need to reflect and maximise the placement experience in future career decisions.

Assessment: Participation Exercise (100%)

Assessment Description: Students are required to attend all taught sessions and the one to one meeting (if required). The module has no credit attached. However to ensure engagement a compulsory quiz will be undertaken in session 6. Students who do not attend and have no valid reason will not be permitted to continue on a Science Industrial Placement Year programme of study.

Moderation approach to main assessment: Not applicable

Assessment Feedback: N/A

However feedback on progress and the progression through the module will be provided in the one to one mandatory meeting and MCQ quiz.

Failure Redemption: Successful completion of this module depends upon satisfactory attendance at, and engagement with, all sessions. Therefore there will normally be no opportunity to redeem failure. However, special provision will be made for students with extenuating or special circumstances.

Additional Notes:

Module code reserved by s.j.toomey on 10/02/2015 09:40:10

This module is being piloted in 2015. This module is only available for students enrolled on the Science Industrial Year, specifically:
CS-E00
BI-E00
GE-E00
MA-E00
PH-E00

CS-203 Professional Development and Career Planning

Credits: 0 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Miss VV Wislocka, Mr N Clarke

Format: 6 hours consisting of a mix of podcasts, recorded lectures and Zoom sessions and optional 1-2-1 meetings and weekly drop-in sessions. Prior to the change it was 6 hours of face to face delivery via PC labs, and a 1-2-1 meeting where applicable / requested.

Delivery Method: These modules are delivered through online resources, scheduled Zoom sessions and 1-2-1 meetings. There is self-directed learning required using online resources provided.

Module Aims: This generic cross-disciplinary module is an additional module for all students who are not enrolled on (or transferred to) the Science Industrial Placement Year. The module focuses on the underpinning and fundamental requisites required to gain, enter and progress effectively through a successful career. Learners will be introduced to (a) sourcing placements, CV writing, and application techniques; (b) Interview techniques, how to pitch yourself and be successful; (c) workplace fundamentals and IP awareness, behaviors and expectations; and, (d) Key employability skills; getting the most from your Job or an Industrial Placement. .

Module Content: The module will focus on the key requirements to gain and be successful whilst on a placement or in work. Directed and self -directed activity will address the following topics:

1) Science Industrial Placements - What they are, how to search and how to apply.

2) CV writing, cover letters and application processes.

3) Assessment centres, interview techniques and a mock interview.

4) Recognizing and developing employability skills.

5) reflecting and maximising your placement experience.

6) A meeting with careers and employability officers.

Intended Learning Outcomes: By the end of this module, students will be able to:

1) Be aware of and possess the essential skills needed to secure placement opportunities; alongside having the skills to apply for relevant placements or jobs.

2) Have a general understanding of an interview process and what tools and attributes make a good interview.

3) Discuss and share what is expected within the workplace including behavioral and professional conduct.

4) Identify personal employability skills and how these will be used in a workplace setting.

5) Understand the need to reflect and maximise the placement experience in future career decisions.

Assessment: Participation Exercise (100%)

Assessment Description: Students are required to attend all taught sessions and the one to one meeting (if required). This module has no credit attached. However to ensure engagement with the content a compulsory quiz will be added in session 5. are required to attend all taught sessions and the one to one meeting. Students who do not attend and have no valid reason will not be permitted to continue on a Science Industrial Placement Year programme of study.

Moderation approach to main assessment: Not applicable

Assessment Feedback: N/A

However feedback on progress and the progression through the module will be provided in the one to one meeting and MCQ quiz.

Failure Redemption: Successful completion of this module depends upon satisfactory attendance at, and engagement with, all sessions. Therefore there will normally be no opportunity to redeem failure. However, special provision will be made for students with extenuating or special circumstances.

Additional Notes:

Module code reserved by N.A.Harman on 01/05/2019 :12:03

This module is being piloted in 2019.

CS-205 Declarative Programming

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules: CS-110; CS-115

Co-requisite Modules:

Lecturer(s): Dr M Seisenberger, Dr PRA Pradic

Format: 20 hours lectures and 20 hours practicals

Delivery Method: Lectures and laboratory sessions

Module Aims: This module provides an introduction to the functional and logic programming paradigms and gives students the opportunity to gain practical experience in using both.

Module Content: Functional Programming in Haskell:
The functional programming paradigm and its relation to other programming paradigms.
Functions, definitions and types.
Solving simple algorithmic problems using iteration and recursion.
Polymorphism and higher-order functions.
Programming with lists.
Verification of programs in Haskell.

Logic Programming in Prolog:
The essence of logic programming.
Pattern matching, recursion, backtracking and resolution.
Database programming
Extralogical aspects of Prolog.
Data structure terms and lists.

Intended Learning Outcomes: Students will be able to specify and write programs in functional and logic programming languages. They will be able to develop solutions to simple algorithmic problems using declarative rather than procedural concepts.

Assessment: Examination 1 (70%)
Coursework 1 (15%)
Laboratory work (15%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Guided and Supported Laboratory Sessions.
Coursework - functional programming exercise.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Exam resit instrument.

Additional Notes:

Updated July 2021. Available to visiting and exchange students

CS-210 Concurrency

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules: CS-110; CS-115; CS-170; CS-175; CS-205

Co-requisite Modules:

Lecturer(s): Dr F Caraffini, Mr SW Powell

Format: Lectures (including Problem Sessions) and Lab Sessions

Delivery Method: On Campus Lectures

Module Aims: This module provides an introduction to the issues raised in developing and using concurrent and distributed systems. Consideration of practical and formal solutions to example problems from operating systems and networking.

Module Content: Background and motivation: concurrent programs and modelling.
Processes and Threads: modelling and implementing processes.
Concurrent execution: modelling concurrency and multi-threaded programs.
Shared objects and mutual exclusion: interference, mutual exclusion in Java.
Monitors and condition synchronization: semaphores, bounded buffers.
Deadlock and livelock: analysis, dining philosophers.
Safety and liveness properties.
Model-based design: from requirements to models to implementations.
Java memory model. Amdahl's law.
Deterministic and non-deterministic parallelism.
Software Transactional Memory (STM).

Intended Learning Outcomes: Students will have an appreciation of the subtle and complex problems in concurrent systems. They will be aware of strategies to reliably solve these problems. They will be aware of the core algorithms used in concurrent/distributed systems in practice (operating systems, networks - including web applications - and hardware), and will appreciate the link between models of concurrency and their practical application.

Assessment: Examination 1 (70%)
Coursework 1 (20%)
Laboratory work (10%)

Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Guided and Supported Laboratory Sessions.
Coursework 1 is a practical programming.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Resit exam and/or resubmit assignments as appropriate.

Additional Notes:

Updated July 2019. Available to visiting and exchange students

CS-230 Software Engineering

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules: CS-110; CS-115; CS-130; CS-135

Co-requisite Modules:

Lecturer(s): Dr LP O'Reilly, Mr SW Powell

Format: 30

Delivery Method: On Campus Lectures

Module Aims: This module exposes the student to the major components of a practical software lifecycle through team-based practical software engineering. This module introduces students to prototyping, software design and implementation, and testing. Students are introduced to the issues and techniques of working in teams.

Module Content: General software engineering and project management:
• Conventional software process and software life-cycle models
• Software project management and team organisation
• Risk assessment and management
• Prototyping
• GUI programming,
• Requirements analysis,
• System design,
• System implementation,
• Version Control Systems

Intended Learning Outcomes: Knowledge and application of software engineering methodologies.
Application of software prototyping methods.
Practical experience in designing and building non-trivial software.
Experience with basic testing strategies for software.
Ability to work in a team for the development of software.

Assessment: Group Work - Coursework (30%)
Group Work - Coursework (45%)
Examination 1 (25%)

Resit Assessment: Coursework reassessment instrument (100%)

Assessment Description: Group work - Object Oriented Software Design.
Group work - System Implementation.
Examination - Multiple Choice.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Group and individual analytical feedback for courseworks. Examination feedback summarising strengths and weaknesses of the class.

Failure Redemption: Resit examination and/or resubmit coursework(s) as appropriate.

Additional Notes:

Updated July 2017. Not suitable as an elective or optional module

CS-250 Database Systems

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules: CS-110; CS-115

Co-requisite Modules:

Lecturer(s): Dr KL Tam

Format: 30 hours (20 lectures, 10 problem classes)

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module will discuss the theory, design and implementation of databases.

Module Content: What is a database? What is data? Database software and benefits. ANSI/SPARC model, database structure.

Relational databases - properties, designing, problems. Normalisation - normal forms, functional dependence, primary keys, integrity constraints and rules, validation.

Real world examples - SQL and practical sessions using a relational database. Client/server technology, web and database programming (eg. PHP/MySQL), including examples and applications.

ER Model - entities, relationships, modelling, attributes, converting to relational model.

Relational calculus, relational algebra - select, project, join, union, intersection, difference, cartesian product, query optimisation, and its application to databases

Recovery and concurrency - transaction processing, locking, detecting deadlocks. Multi-user databases - client/server, distributed, commit protocols.

Security - managing users and passwords, SQL injection, data security in a database environment, e.g. cryptography (RSA/SSL), preventive measures and responses to security breach.

Intended Learning Outcomes: Students will be aware of relational databases and the need for the normalisation of data. Students will have been exposed to transaction processing and how to detect and avoid problems that can arise in a multi-user and/or distributed environment. Students will have designed a database using the ER model, and have practical experience of a relational database.

Assessment: Examination 1 (70%)
Coursework 1 (10%)
Coursework 2 (10%)
Coursework 3 (10%)

Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs (70%).
Database Coursework 1 10%
Database Coursework 2 (PartA) 10%
Database Coursework 2 (PartB) 10%

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.

Failure Redemption: Resit exam and/or resubmit assignments as appropriate.

Additional Notes:

Updated July 2014. Available to visiting and exchange students.

CS-255 Computer Graphics

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules: CS-110; CS-115

Co-requisite Modules:

Lecturer(s): Prof MW Jones

Format: 30 hours lectures and problem classes

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module will provide an introduction to the use of computer graphics and its applications particularly for image processing and the production of realistic representations.

Module Content: Fundamentals: Image sampling and quantization. Digital images. Storage and pixels. Perception, human visual system. Gamma correction. Mathematical background.

Image Processing: Representation — sizing, re-scaling, rotation, colour components, brightness and colour models, histograms, histogram equalization, nearest neighbour, bilinear and tricubic interpolation. Processing techniques — JPEG compression, quantization, antialiasing, filtering, convolution, dithering, edge detection and denoising.

Image Synthesis: Ray tracing — modelling scenes, accelerating ray tracing using bounding volumes and octrees, fundamental primitives, lighting and illumination, shadows, reflections and transparency.

Applications: Volume data and rendering — isosurfacing, volume rendering, Maximum Intensity Projection.

Intended Learning Outcomes: Students will be aware of different forms of computer imagery; methods for synthesizing images from data; and the post-processing of images. Students will have experienced programming a graphical application and carrying out operations on a digital image.

Assessment: Examination 1 (80%)
Coursework 1 (20%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Coursework - graphics programming assignment.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.

Failure Redemption: Resit exam and/or resubmit assignments as appropriate.

Additional Notes:

Updated July 2014. Available to visiting and exchange students.

CS-270 Algorithms

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr O Kullmann, Dr JE Blanck

Format: lectures, tutorials, and laboratory sessions

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module introduces students to the formal concepts of algorithms and data structures and will enable them to understand how the selection of different algorithms and data types affects the performance and efficiency of a program. Particular attention will be paid to the fundamental problems of searching, sorting, and graph traversal.

Module Content: Introduction to the concept of algorithm and program efficiency.
Mathematical foundations: asymptotic notation, summations, recurrence relations.
Introduction to various abstract data types: stacks, queues, lists, heaps and tables.
Searching algorithms: binary search trees, balanced search trees, hash tables.
Sorting algorithms: merge sort, quick sort, heap sort.
Graph representations and algorithms: adjacency lists and matrices, depth-first and breadth-first search.

Intended Learning Outcomes:
Students will appreciate the idea of analysing an algorithm to determine its efficiency.
Students will be familiar with, and be able to manipulate, basic abstract specifications of some standard data types.
Students will know and understand various standard sorting and searching algorithms and be able to comment on their relative performance.
Students will be familiar with directed and undirected graphs, in particular their various representations, and be able to solve algorithmic problems based on depth- and/or breadth-first search.

Assessment: Examination 1 (70%)
Coursework 1 (10%)
Coursework 2 (10%)
Laboratory work (10%)

Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Coursework 1.
Coursework 2.
Guided and Supported Laboratory Sessions. Online quizzes.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Resit exam.

Additional Notes:

Updated July 2019. Available to visiting and exchange students.

CS-275 Automata and Formal Language Theory

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AM Pauly

Format: 30 (20 hours lectures, 10 hours problem classes)

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module introduces the notion of grammars for defining the syntax of formal languages, especially programming languages. It introduces the limits of computation using Turing Machines and other models of computation.

Module Content: • Use of Grammars for defining syntax. The Chomsky hierarchy and the language recognition (parsing) problem.

• Finite-state automata, regular languages and regular expression: equivalences between formalisms, methods for determining when a language is or is not regular.

• Context-free languages and context-free grammars: methods for determining when a language is or is not context-free.

• Turing analysis of computation. Turing machines. Algorithmically decidable languages. Equivalences between formalisms. Methods for determining when a language is or is not computable. Register machines. Hierarchy and compilation.

Intended Learning Outcomes: Students will know the key steps in the historical development of programming languages and the basic techniques for defining the syntax of languages. They will be familiar with the standard hierarchy of formal languages and their various characterisations. They will be aware of the limits of description and computation.

Assessment: Examination 1 (65%)
Coursework 1 (20%)
In class test (non-invigilated) (15%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Coursework 1: theoretical questions about the module content.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.

Failure Redemption: Resit exam and/or resubmit assignments as appropriate.

Additional Notes:

Updated July 2017. Available to visiting and exchange students.