UNIVERSITY OF EXETER

MODULE TITLE	Algorithms that Changed the World	CREDIT VALUE	15
MODULE CODE	ECM3428	MODULE CONVENER	Dr Chunbo Luo (Coordinator)

DURATION: TERM	1	2	3
DURATION: WEEKS	12	0	0

Number of Students Taking Module (anticipated)	98

DESCRIPTION - summary of the module content

Algorithms are precisely defined procedures designed to solve computational tasks: they are the life-blood of computing. This module is designed to highlight the importance of algorithms in Computer Science, providing you with an understanding of what algorithms are, how they can be specified and evaluated, and what they can be used for. These general ideas will be illustrated throughout by means of an in-depth study of a range of example algorithms which have played an important part in the development of Computer Science and underpin current computing practice. The prerequisite knowledge may be obtained from two first-year computer science and mathematics modules.â€¨â€¨

PRE-REQUISITE MODULES: ECM1400, ECM1414, ECM1416

AIMS - intentions of the module

In this module, you will build on the knowledge acquired in ECM1414 (Data Structures and Algorithms) with a more systematic exploration of a range of different types of algorithms and the principles of their design and analysis. A range of specific computational problems will be covered (e.g., operations on strings, graphs, and other data structures, numerical problems), and different algorithms for these problems analysed.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module *you should be able to*:â€¨â€¨

Module Specific Skills and Knowledgeâ€¨â€¨:
1. Appreciate the principles of algorithm design and implementation;
â€¨â€¨2. Analyse the time complexity of some important classes of algorithm;â€¨â€¨
3. Implement and analyse some fundamental algorithms.
â€¨â€¨**Discipline Specific Skills and Knowledge**â€¨â€¨:
4. Apply programming skills to convert abstract specifications into practical realisations;
â€¨â€¨5. Demonstrate an analytical approach to computational problems;
â€¨6. Appreciate the importance of complexity considerations in the practical deployment of programs at different scales.
Personal and Key Transferable / Employment Skills and Knowledge:
â€¨â€¨7. Approach problem-solving tasks in a systematic and disciplined way.

SYLLABUS PLAN - summary of the structure and academic content of the module

- Introduction: What is an algorithm?;
- Specification and pseudo-code;
- Recapitulation of: correctness; algorithms versus heuristics; space and time complexity; iteration and recursion; NP-completeness;
- A study of specific algorithms, problems, and techniques selected from:
Google: PageRank, Internet routing algorithm, Linear programming, Simplex algorithm for optimization, Data compression, Kalman filter, Algorithms on graphs,â€¨â€¨â€¨â€¨Fast Fourier transform,â€¨â€¨ Public-key encryption, Monte Carlo integration.
â€¨â€¨â€¨Other examples as appropriate.â€¨

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	33.00	Guided Independent Study	117.00	Placement / Study Abroad	0.00

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled learning and teaching	22	Lectures
Scheduled learning and teaching	11	Workshops to gain practical experience working with algorithms
Guided independent study	30	Coursework
Guided independent study	87	Reading, programming

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Class test	1 hour	1	In class

SUMMATIVE ASSESSMENT (% of credit)

Coursework	40	Written Exams	60	Practical Exams	0

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Coursework (programming)	40	30 hours	1, 2, 3, 4, 5, 6, 7	Individual feedback sheet
Examination	60	2 hours - Summer Exam Period	1, 2, 5, 6	Model answers supplied on request

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-assessment
Coursework (paper exercise and programming)	Coursework (paper exercise and programming)	1, 2, 3, 4, 5, 6, 7	To be completed over the summer and submitted in referred exam week

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-assessment
Examination	Examination	1, 2, 5, 6	Ref/Def Exam Period

RE-ASSESSMENT NOTES

Reassessment will be by coursework and/or written exam in the failed or deferred element only. For referred candidates, the module mark will be capped at 40%. For deferred candidates, the module mark will be uncapped.

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading:

ELE: http://vle.exeter.ac.uk/

Web based and Electronic Resources:

Other Resources:
Donald Knuth, *Fundamental Algorithms* (vols 1-3), Addison-Wesley

Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	MacCormick John	Nine Algorithms that Changed the Future: The Ingenious ideas that Drive Todays Computers		Princeton University Press	2012		[Library]
Set	Cormen T, Leiserson C, Rivest R, Stein C	Introduction to Algorithms	3rd Edition	MIT Press	2009		[Library]

CREDIT VALUE	15	ECTS VALUE	7.5

PRE-REQUISITE MODULES	ECM1414, ECM1400, ECM1416
CO-REQUISITE MODULES	

NQF LEVEL (FHEQ)	6	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Tuesday 10 July 2018	LAST REVISION DATE	Monday 11 April 2022

KEY WORDS SEARCH	Algorithms; Computational complexity.