New College of the Humanities

Algorithms Course Descriptor

Course Title	Algorithms	Faculty	Philosophy
Course code	NCHCS761	Course Leader	Dr Alexandros Koliousis
Credit points	15	Teaching Period	Any
FHEQ level	Level 7	Date approved	September 2020
Compulsory/ Optional	Compulsory		
Pre-requisites	None		
Co-requisites	None		

COURSE SUMMARY

Efficient algorithms are the centrepiece in software development: How much time does a computer program take to output a solution? How much memory space does it occupy? This course presents the mathematical techniques used for the design and complexity analysis of computer algorithms. It covers fundamental concepts, data structures and algorithms (including recursion, dynamic programming, hash tables, sorting, graph algorithms) that students will encounter throughout the duration of this Master's programme as well as in their subsequent careers.

COURSE AIMS

The aims of this course are:

- Critical understanding on techniques for analysing the correctness, time, and space complexity of algorithms.
- The ability to recognise which algorithms are best-suited to solve a computing problem.

LEARNING OUTCOMES

On successful completion of the course, students will be able to:

KNOWLEDGE AND UNDERSTANDING

K2d Understand advanced aspects of algorithmic problems (e.g. sorting), algorithms and techniques that solve those problems (e.g. dynamic programming) and

rigorous mathematical techniques to analyse the complexity of algorithms (e.g. asymptotic notation and NP-completeness).

K1d Master techniques to rigorously analyse the time and space complexity of algorithms.

K3d Evaluate the technical, social, and management dimensions of algorithms used in industry applications.

SUBJECT SPECIFIC SKILLS

S1d Critically assess and review algorithms used in existing software in terms of their complexity, identify limitations and propose alternatives for improvement.

S2d Communicate with mathematical rigor the complexity of algorithms.

S3d Identify and implement algorithms to solve problems that arise in a software application efficiently.

TRANSFERABLE AND PROFESSIONAL SKILLS

T2d Articulate algorithmic solutions and their complexity to both technical and non-technical audiences.

T2d Critically review and analyse the complexity of proposed software and propose directions for improvement.

T2d Consistently apply an excellent level of technical proficiency in written English, using an advanced application of scholarly terminology, that demonstrates the ability to deal with complex issues both systematically and with sophistication.

T3d Lead or participate in the design and implementation of high efficient, well-proven software.

TEACHING AND LEARNING

Teaching and learning strategies for this course will include:

- 30 hours of full-cohort lectures
- 20 hours of lab-based tutorials
- 1 office hour per teaching week

There will be three 1-hour lectures per teaching week. Two 1-hour lab sessions will give students the opportunity to work on their assignments with the help of the course leader and teaching assistants.

Course information and supplementary materials are available on the College’s Virtual Learning Environment (VLE).

Student’s will also attend the formal meeting, Collections, iin which they will receive constructive and developmental feedback on their performance.

Students are required to attend and participate in all the formal and timetabled sessions for this course. Students are also expected to manage their directed learning and independent study in support of the course.

EMPLOYABILITY SKILLS

- Communication Skills
- Mathematical skills

ASSESSMENT

FORMATIVE

Students will be formatively assessed during the course by means of set assignments. These do not count towards the end of year results but will provide students with developmental feedback. Set assignments will also amplify problem-solving skills useful for the set exercises and written examination.

SUMMATIVE

Assessment will be in two forms:

AE:	Assessment Activity	Weighting (%)	Online submission	Duration	Length
1	Set exercises	40	Yes	N/A	Code and up to 2500-word explanation
2	Written examination	60	N/A	2 hours	N/A

The examination will consist of a number of questions from which the student will have the choice of answering a specified number. Both the set exercises and the examination will be assessed in accordance with the assessment aims set out in the Programme Specification.

FEEDBACK

Students will receive formal feedback in a variety of ways: written (including via email correspondence); oral (within one-to-one tutorials or on an *ad hoc* basis) and indirectly through discussion during group tutorials.

Feedback is provided on written assignments (including essays, briefings and reports) and through generic internal examiners' reports, both of which are posted on the College's VLE.

INDICATIVE READING

Note: Comprehensive and current reading lists for courses are produced annually in the Course Syllabus or other documentation provided to students; the indicative reading list provided below is used as part of the approval/modification process only.

BOOKS

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. 2009. Introduction to Algorithms, 3rd Edition (3rd. ed.). The MIT Press

Sanjoy Dasgupta, Christos H. Papadimitriou, and Umesh Vazirani. 2006. Algorithms (1st. ed.). McGraw-Hill, Inc., USA

INDICATIVE TOPICS

Students will study the following topics:

- Algorithmic design and implementation
- Techniques for algorithm analysis
- Graph algorithms
- Sorting algorithms
- Dynamic programming
- Data structures and complexity of operations on them

Title: NCHCS761 Algorithms Course Descriptor

Approved by: Academic Board

Location: Academic Handbook/Programme specifications and Handbooks/ Postgraduate Programme Specifications/MSc Computer Science Programme Specification/Course Descriptors

Version number	Date approved	Date published	Owner	Proposed next review date	Modification (As per AQF4) & category number
2.0	January 2022	April 2022	Dr Alexandros Koliousis	April 2025	Category 3: Changes to Course Learning Outcomes
1.0	September 2020	September 2020	Dr Alexandros Koliousis	April 2025	