Module Specification

Networks and Graphs

Version: 2023-24, v2.0, 27 Apr 2023

Contents

Part 1: Information

Module title: Networks and Graphs

Module code: UFMFKH-15-M

Level: Level 7

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See Learning Outcomes.

Outline syllabus: This module will introduce students to networks, graphs and their applications and will cover:

Advanced Graph Theory (theoretical results required for algorithms and applications)

Graph Theoretic Heuristics (e.g. TSP, local search, Lin-Kernighan heuristic)

Optimisation Algorithms (e.g. minimum spanning tree, shortest path algorithms: Dijkstra's, Floyd's)

Transportation Networks (e.g. maximum flow, transportation problems, Ford-Fulkerson theorem)

Traffic Network Design (e.g. equilibrium flow, traffic network design problem, Braess' paradox)

Electrical Networks (e.g. analysis of simple electrical networks, printed circuit design)

Application to Industrial Engineering (e.g. facilities layout)

Applications to Physics, Chemistry and Biology (e.g. evolutionary trees)

Further applications (e.g. Dynamic Programming, Markov Chains, Social Networks)

Part 3: Teaching and learning methods

Teaching and learning methods: The module syllabus is delivered by means of lectures, to introduce and develop new material and provide context. Problems Classes/Workshops will be used to develop model building and problem solving skills.

Tutorials will offer mathematical support, guidance and feedback. Students will have the opportunity to ask individual questions about problems they may be having with homework exercises, lecture material, assessment preparation, etc.

Scheduled learning includes lectures, problems classes and tutorials.

Independent learning includes hours engaged with essential reading. These sessions constitute an average time per level.
To prepare for assessment, students will be expected to undertake both directed and self-directed learning in addition to the directed learning which supports taught classes.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Show a detailed knowledge and understanding of the modelling process for various graph-theoretic approaches and network applications

MO2 Understand the strengths and limitations of graph-theoretic modelling and solution methods, including their use in practical situations

MO3 Demonstrate awareness of current advances and controversies in the field

MO4 Select and appraise appropriate graph-algorithmic and optimisation techniques to solve a variety of problems

MO5 Apply sound theoretical knowledge to the solution of real context of problems and appropriately interpret the solutions provided by the models

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/index.html

Part 4: Assessment

Assessment strategy: The assessment strategy consists of a 3-hour examination, which assesses students' understanding of underlying concepts and techniques, and

their ability to apply them to challenging problems. The examination consists of a combination of unseen and partially seen questions. The partially seen question(s) will be based on reading/resources identified by the lecturer during teaching delivery and students will have the opportunity to engage with this material well in advance of the examination.

The assessment method (wholly by examination) will prevent plagiarism and is aligned with the programme's assessment strategy to enable students to manage coursework workloads effectively.

Assessment tasks:

Examination (First Sit)
Description: Examination 3 hours
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Examination (Resit)
Description: Examination 3 hours
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mathematics [Sep][FT][Frenchay][4yrs] - Not Running MMath 2020-21

Mathematics [Sep][SW][Frenchay][5yrs] MMath 2019-20