Module Specification

Networks

Version: 2024-25, v4.0, 08 Jul 2024

Contents

Part 1: Information

Module title: Networks

Module code: UFMFXV-15-3

Level: Level 6

For implementation from: 2024-25

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Arts, Technology and Environment

School: CATE School of Computing and Creative Technologies

Partner institutions: None

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: Graphs, Algebra and Algorithms 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The application of network theory to solve a diverse range of problems has been a exciting and expanding field. Applications include: business, resource planning, marketing, social networks, transport, biological and physical sciences. A theoretical understanding of networks is an area where professional mathematicians can make a real impact on the world.

This module will develop the student's knowledge of the mathematics of networks, building on the material in the level five module Graphs, Algebra and Algorithms.

Features: Not applicable

Educational aims: This module aims to develop the student's theoretical understanding of graph theory and its application to real-world networks. It will introduce advanced techniques that the students will be able to apply to solve practical problems.

Outline syllabus: Further concepts in graph Theory that are required for algorithms and applications, including dynamic programming and game theory using graphs.

Applications in Operational Research. Graph theoretic heuristics (e.g., Travelling Salesperson Problem, local search, Lin-Kernighan heuristic).

Transportation networks (e.g., maximum flow, transportation problems, Ford-Fulkerson theorem). Traffic network design (e.g., equilibrium flow, traffic network design problem, Braess' paradox).

A selection of further applications, e.g., facilities layout in industrial engineering, evolutionary trees in biology, applications in physics and in chemistry.

Part 3: Teaching and learning methods

Teaching and learning methods: The module syllabus is delivered by means of lectures, tutorials and practical exercises, all interleaved within a single weekly class in a computer lab in order to develop theoretical understanding of graphs, building of network models, and problem-solving skills

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

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

MO1 Select and appraise appropriate graph-algorithmic and optimisation techniques to solve problems involving networks and network applications.

MO2 Implement and evaluate the modelling process for various graph-theoretic approaches and network applications.

MO3 Communicate the strengths, limitations, and interpretation of graph-theoretic modelling and solution methods, including their use in practical situations.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 0

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/6663EF44-0D04-2B98-AA98-5DC26F5C13FC.html?lang=en-GB&login=1

Part 4: Assessment

Assessment strategy: The assessment strategy consists of a 24-hour examination, which assesses the student's understanding of underlying concepts and techniques, and their ability to apply these concepts and techniques to challenging problems.

The examination consists of unseen questions, for some of which the student will have prepared by carrying out pre-work, which they will bring to the examination.

The resit assessment will have the same format as the first sit assessment.

Assessment tasks:

Examination (Online) (First Sit)

Description: 2 hour scenario based exam (24 hour window)

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Examination (Online) (Resit)

Description: 2 hour scenario based exam (24 hour window)

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mathematics {Foundation}[Sep][SW][Frenchay][5yrs] BSc (Hons) 2020-21

Mathematics [Frenchay] BSc (Hons) 2022-23

Mathematics [Sep][SW][Frenchay][4yrs] BSc (Hons) 2021-22

Mathematics {Foundation}[Sep][FT][Frenchay][4yrs] BSc (Hons) 2021-22

Mathematics {Foundation} [Sep][SW][Frenchay][5yrs] BSc (Hons) 2020-21