Module Specification

Stochastic Processes

Version: 2023-24, v3.0, 17 Mar 2023

Contents

Part 1: Information

Module title: Stochastic Processes

Module code: UFMFLH-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 Computer Sci & Creative Tech

Partner institutions: None

Delivery locations: Not in use for Modules

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: This module is designed to develop the student's knowledge and understanding of stochastic processes, including the mathematical foundations, computational aspects and applications. In particular, the underlying probability

theory will be discussed, as will the properties of important examples and classes of stochastic processes. A selection of stochastic process models in areas such as science, engineering, social science or finance will be studied. In addition, students will apply computational techniques, such simulation, to gain understanding of the behaviour of stochastic processes, including models of real world situations. Both discrete and continuous time processes will feature in the module.

Outline syllabus: The following syllabus is indicative:

Probability Theory:

Probability spaces, random variables and distributions; independence; conditional expectation; convergence of random variables.

Stochastic Processes:

Stochastic processes (definitions and fundamental ideas); introduction to stochastic calculus and stochastic differential equations; examples and classes of stochastic processes, both discrete time and continuous time (e.g., Markov chains, martingales, Poisson, Brownian motion, geometric Brownian motion); models (taken from a range of real-world applications, for example queuing).

Computational Aspects:

Simulation of distributions and of processes; analysis of time series data.

Part 3: Teaching and learning methods

Teaching and learning methods: The module syllabus will be delivered by means of lectures, which will introduce and develop new material and provide context. Problems classes/workshops will be used to go through solutions to homework exercises or to consolidate/contextualise material. 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 contact will also include some computer laboratory sessions.

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

MO1 To demonstrate an understanding of the mathematical foundations of stochastic processes

MO2 To demonstrate knowledge of the definition and properties of some important examples and classes of stochastic processes

MO3 To apply, in a critical fashion, appropriate mathematical techniques to analyse stochastic process models in areas such as science, engineering, social science and finance

MO4 To demonstrate how computational techniques, such as simulation, may be employed to gain understanding of the behaviour of stochastic processes, including models of real world situations

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 will consist of a single three hour examination that features a combination of partially seen and unseen questions. The unseen questions will assess primarily the first two learning outcomes, whilst the partially seen questions will assess primarily the third and fourth learning outcomes.

The problem classes and workshops are designed to provide regular feedback and together with the partially seen questions, encourage an active engagement and deeper understanding of the module material. 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 components:

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

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