ES439-15 Simulation of Operations

23/24

Department
School of Engineering
Level
Undergraduate Level 4
Module leader
Neil Davis
Credit value
15
Module duration
10 weeks
Assessment
60% coursework, 40% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Simulation of Operations

Module web page

Module aims

To introduce Discrete Event simulation in the context of business operations and planning in areas such as manufacturing plant, healthcare and large-scale construction activities. To develop understanding of how to apply the technique to help solve complex engineering systems design problems and basic skills in using commercial software used by major firms. To prepare the student so that they can engage with this in a meaningful way after they graduate, in identifying suitable problems, supporting the execution of simulation projects and managing them effectively.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1. Fundamental theory of discrete-event simulation.
2. Setting objectives for the simulation (formal planning, shop loading, optimisation).

3. Data collection and verification; data collection from existing plant operations;
4. Methods of estimating in the common case of incomplete data; synthetic data for a new simulation.
5. Choice of the system for simulation; criteria: technological aspects, simulation objectives.
6. Types of simulation software and their best areas of application.
7. Planning and executing a simulation; programming and cross-checking validity of the model; model running; sensitivity analysis; output format.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate an advanced ability to present the results of a simulation study in written form, and make evidence-based recommendations based on this.
- Analyse experimental results using appropriate structured and statistical methods to critically evaluate engineering proposals.
- Demonstrate in depth knowledge and skills to allow a new or existing facility and its operation to be simulated using discrete event simulation.
- Demonstrate an in-depth understanding of DES theory and make suitable simplifications of a problem to suit DES technologies.
- Make appropriate modelling simplifications (choice of variable, level of detail, degree of abstraction)
- Design and execute an appropriate set of experiments using a simulation model.

Indicative reading list

Simulation Modeling & Analysis, Law A., McGraw-Hill. 5th edition 2014
Computer Simulation in Management Science, Pidd M., Wiley. 5th edition, 2004.
Simulation: The practice of model development and use. Robinson S., Palgrave Macmillan. 2nd edition 2014.

View reading list on Talis Aspire

Subject specific skills

Ability to conceive, make and realise a component, product, system or process
Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality
Including these specific skills:
Ability to conceive, make and realise a simulation model using commercial software
Ability to design and conduct valid experiments within a time constraint
Ability to make pragmatic choices to develop useful models by oneself within a time constraint
Ability to consider the risks associated with building models with limited data

Transferable skills

Numeracy: apply mathematical and computational methods to communicate parameters, model

and optimize solutions
Apply problem solving skills, information retrieval, and the effective use of general IT facilities
Communicate with technical and non-technical audiences and work with others
Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
Exercise initiative and personal responsibility, including time management.
Overcome difficulties by employing skills, knowledge and understanding in a flexible manner

Including these specific transferable skills:
Computer literacy at an advanced level, including some programming skills
Experience in developing computer-based skills from within own resources by self-paced learning.
Managing time in an uncertain data environment
Presenting technical work to non-technical clients

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Practical classes	2 sessions of 1 hour (1%)
Other activity	2 hours (1%)
Private study	116 hours (77%)
Total	150 hours

Private study description

Guided Independent Learning 16 hours

Other activity description

Self-paced computer-based tutorials and exercises
2 x 1 hours revision examples classes

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group D2

	Weighting	Study time
Individual assignment	60%	

Individual assignment based on a modeling problem for system analysis, including the submission of a working simulation model. 10 pages/2,000 words

Online Examination	40%	

Online multiple choice examination of students ability to design and analyse simulation experiments to investigate multi-factor simulation problems by selecting the correct solutions f numeric problems and the correct or incorrect explanations of phenomena.

~Platforms - QMP

- Online examination: No Answerbook required

Feedback on assessment

Written comments on submitted assignments and written group feedback for the final examination Support through advice and feedback hours.

Past exam papers for ES439

Availability

Courses

This module is Core for:

- Year 4 of UESA-H311 MEng Mechanical Engineering

This module is Optional for:

- Year 4 of UESA-H116 MEng Engineering with Exchange Year
- Year 5 of UESA-H115 MEng Engineering with Intercalated Year

This module is Option list A for:

- Year 4 of UESA-H336 MEng Automotive Engineering
- Year 5 of UESA-H337 MEng Automotive Engineering with Intercalated Year
- Year 5 of UESA-H636 MEng Electronic Engineering with Intercalated Year
- Year 4 of UESA-H114 MEng Engineering
- Year 4 of UESA-HH76 MEng Manufacturing and Mechanical Engineering

- Year 5 of UESA-HH38 MEng Manufacturing and Mechanical Engineering with Intercalated Year
- Year 5 of UESA-HH77 MEng Manufacturing and Mechanical Engineering with Intercalated Year

This module is Option list B for:

- Year 4 of UESA-H336 MEng Automotive Engineering
- Year 5 of UESA-H337 MEng Automotive Engineering with Intercalated Year
- Year 5 of UESA-H636 MEng Electronic Engineering with Intercalated Year
- UESA-H311 MEng Mechanical Engineering
    - Year 4 of H30K Mechanical Engineering with Instrumentation
    - Year 4 of H30M Mechanical Engineering with Robotics
- Year 4 of UESA-HH31 MEng Systems Engineering
- Year 4 of UESA-HH33 MEng Systems Engineering with Exchange Year
- Year 5 of UESA-HH32 MEng Systems Engineering with Intercalated Year

This module is Option list C for:

- UESA-H311 MEng Mechanical Engineering
    - Year 4 of H311 Mechanical Engineering
    - Year 4 of H30J Mechanical Engineering with Appropriate Technology
    - Year 4 of H30L Mechanical Engineering with Automotive Engineering
    - Year 4 of H30P Mechanical Engineering with Fluid Dynamics
    - Year 4 of H30H Mechanical Engineering with Sustainability
    - Year 4 of H30N Mechanical Engineering with Systems Engineering
- Year 4 of UESA-H316 MEng Mechanical Engineering
- Year 4 of UESA-H318 MEng Mechanical Engineering with Exchange Year
- Year 5 of UESA-H317 MEng Mechanical Engineering with Intercalated Year