

WM3G4-15 Robotized Production Systems

27/28

Department

WMG

Level

Undergraduate Level 3

Module leader

Adriana Smith Ortiz

Credit value

15

Module duration

14 weeks

Assessment

100% coursework

Study locations

University of Warwick main campus, Coventry Primary

Distance or Online Delivery

Description

Introductory description

This module aims to provide the students with an understanding of key concepts and methodologies of modelling automated production systems, with particular emphasis on robotized manufacturing plants. Building on several Y2 and Y3 modules, it equips students with knowledge and skills to model a complex production system and study its properties, therefore preparing the ground for its control.

Examples and case studies span a number of dynamic systems based on discrete events, such as manufacturing, communications, traffic control, etc.

Students will furthermore be able to apply a simulation industrial tool to create simple simulation models that would allow them to generate experimental results that provide useful information for decision making.

This modules is linked with C2, C3, C4, C6 and C17 of the AHEP 4.

LO1 - C2, C4, C17

LO2 - C2, C3, C6, C17

LO3 - C2, C3, C6

LO4 - C6, C17

[Module web page](#)

Module aims

This module aims to provide the students with concepts and tools for understanding the dynamic modelling and control of complex robotized production systems . Students will also develop skills in applying simulation of production systems to identify deficiencies in a production system and assess solutions that consider other important constraints such as the use of new technologies in production systems.

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.

- Introduction to Discrete Event Systems
- Automata
- Petri nets
- Data collection from production systems and data verification
- Basics of kinematic simulation for robotics and ergonomics modelling.
- Design experiments for simulation.
- Systematic analysis of simulation data.

Learning outcomes

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

- Demonstrate knowledge of the different modelling tools for a discrete-event system. [AHEP:4-C2, C4, C17]
- Apply mathematical and analytical skills to model and study discrete-event systems, with emphasis on manufacturing plants. [AHEP:4-C2, C3, C6, C17]
- Utilise simulation problem-solving methodologies and techniques to model complex problems of production systems. [AHEP:4-C2, C3, C6]
- Analyse the simulation results of several scenarios in order to design a future state that optimises aspects of the production system which may include the addition of new technologies. [AHEP:4-C6, C17]

Indicative reading list

[Reading lists can be found in Talis](#)

[Specific reading list for the module](#)

Subject specific skills

Skills from the ST0023 DA Standard:

- S3: Select the best method for collating and conveying complex information using a range of data sources and supporting documentation.
- S4: Interpret and produce technical documentation such as schematic diagrams, project plans, fault reports or data analytics using company documentation systems and guidelines.
- S5: Observe, record and draw accurate and auditable conclusions from data and/or developmental or test evidence.
- S9: Create a project or work programme plan and develop activities in a logical process embedding mechanisms for adapting to changing circumstances or requirements.
- S12: Identify areas for improvement and lead continuous improvement activities such as improving safety, quality, technology solutions, operational processes, training and development, equipment performance or cost key performance indicators (KPIs).

Transferable skills

- Problem Solving- Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions. Retain an open mind, optimistic of finding solutions, thinking laterally and creatively to look beyond the obvious. Knows how to learn from failure.
 - Critical Thinking- Recognise patterns, themes and key messages from sometimes confused and incomplete data. Make informed decisions on the value of a range of sources allowing an evidence based conclusion based on this analysis.
 - Teamwork- Operate within, and contribute to, a respectful, supportive and cooperative group climate. Sensitive to the impact of actions on others.
 - Information Literacy- Critical awareness of how information is gathered, used, managed and synthesised. Understanding of the relative value of different sources and the importance of provenance. The systematic collection, analysis and evaluation of information in the investigation of a topic.
 - Communication - Written: Present arguments, knowledge and ideas, in a range of formats.
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Study

Study time

Type	Required
Lectures	9 sessions of 1 hour (6%)
Seminars	9 sessions of 1 hour (6%)
Practical classes	3 sessions of 1 hour (2%)
Work-based learning	15 sessions of 1 hour (10%)
Total	150 hours

Type	Required
Online learning (scheduled sessions)	9 sessions of 1 hour (6%)
Online learning (independent)	5 sessions of 1 hour (3%)
Other activity	5 hours (3%)
Private study	35 hours (23%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

- Self-guided study: revision on module contents, solution of additional seminar-type questions, video tutorials and supplementary materials.
- Study and use of simulation software.
- Online forum and discussion (asynchronous).

Other activity description

Other activity:

- online consulting / support sessions during assignment work.

Additional explanation of 5 hours in "Online learning - Independent" category above:

- pre-module reading list given on Moodle and
- online quizzes available to encourage active learning in teaching blocks.

Additional explanation of 15 hours of "Work based learning" category above

- students to observe and analyse the current or potential collaboration between operators, robots and production line operations. This information would be documented in the assignments.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assignment 1	40%	24 hours	Yes (extension)
Apprenticeships to select a part of the manufacturing area at their working place to create a discrete event model of a manufacturing system. The individual written report should cover explanation of simplifications, assumptions and data gathering to create the model.			

Reassessment component

Assignment 1			No
Apprenticeships to select a part of the manufacturing area at their working place to create a discrete event model of a manufacturing system. The individual written report should cover explanation of simplifications, assumptions and data gathering to create the model.			

Assessment component

Assignment 2 - Individual portfolio	60%	36 hours	No
Apprentices work in small groups to create a simulation model of a given case study and to produce an individual portfolio consisting of two main parts with a single point individual submission in Tabula.			
The first part of the portfolio focus on explaining the modelling stages and the results interpretation of the "As is" scenario.			
The second part of the portfolio presents the "What if" scenarios analysis and proposals to improve the current system.			

Reassessment component is the same

Feedback on assessment

Formative feedback:

- Verbal feedback on submitted drafts of portfolio modelling stages and scenario analysis.
- Automated Individual feedback on Online Moodle quiz.

Summative feedback:

- Individual written feedback on Assignment 1.

- Individual written feedback on Assignment 2.
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Availability

Courses

This module is Core for:

- Year 4 of UWMS-H7C3 Undergraduate Applied Professional Engineering (Control/Technical Support Engineer)