

# WM9G7-15 Research and Development in Automation Systems

**22/23**

**Department**

WMG

**Level**

Taught Postgraduate Level

**Module leader**

Daniel Vera

**Credit value**

15

**Module duration**

3 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

This is a specialist module that provides a focus on an area of research relevant to the subject of Intelligent Manufacturing Systems. Students will have an opportunity to engage more deeply than elsewhere and share their observations and ideas with leading researchers.

### Module aims

To engage the student with the latest research in intelligent manufacturing systems from the perspective of one of WMG's research teams in the area. This will enhance their understanding of the relationships that form between research institutions and industry and how these serve both sides' needs in introducing advanced technologies. For those interested in pursuing an academic career it will provide a closer look at the nature of the work in this field.

### 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.

Digitalisation and Industry 4.0;

Automation and robotic systems lifecycle engineering (including specification, design, integration, implementation, support and reconfiguration);

Virtual process planning;

Virtual commissioning;

Industrial IoT and distributed controls systems;

Digital twin / digital shadow creation and integration;

IT/OT Integration strategies and manufacturing data models;

Production data analytics and information visualisation;

Application of ML technologies to manufacturing;

## **Learning outcomes**

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

- Appraise the methods and practices of current research in this area.
- Engage with and defend the process of creating a proposal for industrially funded or supported research
- Critically evaluate the strengths and weaknesses of the latest cyber-manufacturing and related concepts and the progress of research in this area.

## **Indicative reading list**

Introduction to robotics: analysis, control, applications, Saeed B. Niku, Wiley, 2019 ;

Implementation of Robot Systems: An Introduction to Robotics, Automation and Successful Systems Integration in Manufacturing, Wilson M., Butterworth Heinemann 2013;

Programmable logic controllers, Bolton W. Newnes, 2015;

Automation, production systems, and computer-integrated manufacturing , Groover M.P., Pearson 2019.

Smart Sensors and Systems : Technology Advancement and Application Demonstrations, Liu Y. Springer 2020.

## **Research element**

The module will be owned by one of WMG's research teams. They will decide the most appropriate means of delivering the module learning outcomes, setting this within the context of their research. This may involve practical work alongside researchers or research technicians, evaluating new technologies, or reviewing and reporting on pre-publication research papers.

## **Subject specific skills**

At least one subject specific skill will be developed. The nature of this will depend on the focus of the research team, but could range from designing a test regime, to setting up equipment, to logging and analysing data.

- Setting up automation controls backbones (general PLCs, specific systems' controllers)
- Creating communication bridges between industrial and IT networks (IT/OT integration)
- Interfacing to DBMS systems for manufacturing using specific APIs

- Raw structured manufacturing data manipulation and preparation methods
- Designing manufacturing system integration architectures
- Identifying relevant KPIs and creating data-driven reports/monitoring dashboards

## Transferable skills

Knowledge elicitation; communicating with new people; grant/proposal writing and presentation skills.

dealing with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences;

advancing their knowledge and understanding, and to develop new skills to a high level; and making decisions in complex and unpredictable situations.

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## Study

### Study time

Type	Required
Lectures	6 sessions of 1 hour (4%)
Tutorials	6 sessions of 1 hour (4%)
Demonstrations	4 sessions of 1 hour (3%)
Practical classes	3 sessions of 1 hour (2%)
Supervised practical classes	1 session of 3 hours (2%)
Online learning (independent)	14 sessions of 30 minutes (5%)
Other activity	8 hours (5%)
Private study	23 hours (15%)
Assessment	90 hours (60%)
Total	150 hours

### Private study description

Become familiar with the research team's activities by reviewing their external online communications (website, for example) and carrying out background reading of their publications and common sources used in the area (journals and conferences, for example)

### Other activity description

Visits from and/or visits to a research partner's site, where practical; working alongside research technicians; analysing data; attending project meetings.

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group A

	Weighting	Study time
An evaluation on current research in the area.	20%	10 hours
A 20 minute presentation on one of the following related to an aspect of the research team's current activities: SWOT analysis, requirements analysis; Technology Road Map; stakeholder analysis, taking a cyber-manufacturing perspective.		
Opportunities and applications of cyber-manufacturing in 'X' (where 'x' is a current area of research.)	80%	80 hours
Develop a work-plan proposal for applying cyber-manufacturing principles to an aspect of the research team's ongoing or future research. In principle this could form support for a grant proposal.		

### Feedback on assessment

Oral feedback for in-module presentation by members of the research team audience.  
Written feedback for the essay component

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## Availability

There is currently no information about the courses for which this module is core or optional.