

# WM9H1-15 Manufacturing Planning and Control for Cyber-Operations

**22/23**

**Department**

WMG

**Level**

Taught Postgraduate Level

**Module leader**

Neil Davis

**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

Starting with a review of the principles of operations management, the role of new and intelligent technologies in this will be introduced using a combination of self directed e-learning and formal lectures. The issues of decision making autonomy under distributed control, and system response, will be investigated using a series of hypothetical case studies explored by the students working in small teams. A final problem will be given that will require an open and balanced analysis of opportunities and threats.

### Module aims

This module will explore the way in which cyber-technologies modify the nature of planning and the subsequent control response of cyber-manufacturing systems within the firm and between collaborating partners. To make better-informed decisions for system design that reflect the operational needs of business partners and can respond effectively to these in both time and place.

### 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.

Principles of control theory;  
Enterprise Resource Planning Systems;  
Comparison of alternative control architectures (Centralised, hierarchical, distributed);  
Autonomous/Decentralised control;  
Agent-based control;  
Protection of intellectual property.

## **Learning outcomes**

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

- Compare alternative approaches to manufacturing planning and control with the capabilities proposed for cyber-manufacturing solutions
- Compare the advantages and disadvantages of open distributed and autonomous planning and control with conventional methods.
- Select reasonable countermeasures to protect against cyber-threats in the exchange of planning and ordering information.
- Compare and contrast the application of data-science methods to cyber-manufacturing systems with conventional techniques of demand forecasting and capacity planning

## **Indicative reading list**

Feedback Systems : An Introduction for Scientists and Engineers, Richard M. Murray, Karl Johan Aström, Princeton University Press, 2008;  
Reconfigurable Manufacturing Systems and Transformable Factories, Anatoli I. Dashchenko, Springer, 2006;  
Enterprise resource planning , Sumner, Mary, Pearson, 2014;  
The AI-powered workplace : How artificial intelligence, data, and messaging platforms are defining the future of work, Ashri, Ronald, APress, 2020;

## **Subject specific skills**

Predict the relative effectiveness of new and emerging cyber technologies on the control response and robustness of manufacturing operations.  
Lead a balanced debate on the pros and cons of autonomous embedded decision making in cyber-operations.

## **Transferable skills**

Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level ;  
making decisions in complex and unpredictable situations;  
independent learning ability required for continuing professional development.

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# Study

## Study time

Type	Required
Lectures	17 sessions of 1 hour (11%)
Seminars	8 sessions of 45 minutes (4%)
Practical classes	4 sessions of 3 hours (8%)
Online learning (independent)	20 sessions of 30 minutes (7%)
Assessment	105 hours (70%)
Total	150 hours

## Private study description

No private study requirements defined for this module.

## 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
Intelligent Agent, Friend or Foe? Working in a small team, identify three roles that machine intelligence can play in the planning and control of manufacturing operations and discuss the implications of these from a human management perspective. Present the outcomes in a 20 minute presentation.	10%	15 hours
Reflections on cyber security Based on the proposal made for cyber-operations in class, reflect on the implications of these on cyber-security and how these might be mitigated.	10%	10 hours
A cyber-operations design for 'X' For a given problem, 'X', identify a range of possible cyber technology enhancements that should in principle improve its effectiveness. Then develop a design for its planning and control that takes a prioritised subset of these to create competitive advantage and critically evaluate the risks and benefits of doing so.	80%	80 hours

## **Feedback on assessment**

In module group presentation will receive oral feedback accompanied by a check-box rubric. The reflective element based on the in-module substantive task will receive check-box feedback and a short paragraph of written comment. The post-module essay will receive written feedback.

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## **Availability**

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