WM9G5-15 Manufacturing Systems and Process Selection

22/23

Department
WMG
Level
Taught Postgraduate Level
Module leader
Greg Gibbons
Credit value
15
Module duration
3 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module provides the theoretical grounding for the domain of manufacturing systems and the current practices associated with manufacturing process selection. This requires matching processes to products and the materials that they are made from at different volumes (of sales). Students will examine models for this and consider the role of intelligent/expert systems in supporting such decision making.

Module aims

Prepare learners to engage with engineering professionals to evaluate the impact of process choices on manufacturing effectiveness and with managers to discuss implications at a manufacturing system level.

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.

Foundations of classical manufacturing systems practices;
Technology Readiness and factors that influence it;
Process Planning: The Design to Manufacturing interface;
Manufacturing processes and their selection;
Technology Showcases: additive manufacturing, advanced composites, laser processing, ultrasonic machining;
Expert Systems Support for Process Selection ;
Metrology technologies and their application;
Introduction to cyber-manufacturing.

Learning outcomes

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

- Identify foundational elements of classical manufacturing systems theory and practice.
- Critique the process selection made by existing models such as CES Edupack
- Organise competing arguments for matching product requirements to new and existing materials and processes
- Evaluate the requirements for achieving technological readiness across a dispersed collaborative network
- Explain the aims and approach of the phenomenon of cyber-manufacturing

Indicative reading list

Groover's principles of modern manufacturing : materials, processes, and systems / Mikell P. Groover, Global ed, Wiley, 2017;
Materials : engineering, science, processing and design / Mike Ashby, Hugh Shercliff, and David Cebon, Butterworth Heinmann, 4th ed, 2019.
Automation, production systems, and computer-integrated manufacturing. Groover, Mikell P, Pearson 2019.
Additive manufacturing technologies: 3D printing, rapid prototyping, and direct digital manufacturing. I. Gibson. 2ed, Springer 2016.

Subject specific skills

Use professional tools like CES Edupak to support process selection choices. Be able to classify manufacturing process maturity by Technology Readiness Level (TRL).

Transferable skills

Self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level.
Independent ability to advance their knowledge and understanding, and to develop new skills to a high level.
Independent learning ability required for continuing professional development.

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Demonstrations	5 sessions of 1 hour (3%)
Supervised practical classes	5 sessions of 2 hours (7%)
Online learning (independent)	20 sessions of 30 minutes (7%)
Other activity	12 hours (8%)
Assessment	98 hours (65%)
Total	150 hours

Private study description

No private study requirements defined for this module.

Other activity description

Industry exposure by way of physical or virtual factory visits and/or exhibition visits when available - the MACH shows at the NEC for example, or to firms like Mazak, both established already in WMG - and presentations from research teams. Also, self study tasks for transitioning between the phases of the 3 week engagement cycle: construction, application and consolidation. Peer-discussion, Wikis or similar.

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
Process Selection Task	5%	3 hours
A set of process selection tasks involving the use of CES Edupak to make manufacturing process selections for a range of products and market requirements.		
Manufacturing System Concept for 'X'	15%	15 hours

	Weighting	Study time
In small groups (2 or 3 students each) Design a simple manufacturing system for one of a number of business proposals ('X') and present the solution to the class at the end of the taught period.		
A Critical Evaluation of Technology Readiness	80%	80 hours
For a given problem involving advanced and cyber-manufacturing technologies students must analyse the requirements for manufacture and critically evaluate the technical readiness, identifying areas of weakness and prioritising actions needed to resolve these (without necessarily solving them).		

Feedback on assessment

Process Selection Task - check-box rubric with 'Likert-type' scales;
Presentation - verbal feedback and check-box sheet;
Post Module Assignment - written feedback.

Availability

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