

MODULE DESCRIPTOR

Module Title

Digital Manufacturing

Reference	EN4505	Version	5
Created	March 2024	SCQF Level	SCQF 10
Approved	March 2021	SCQF Points	30
Amended	April 2024	ECTS Points	15

Aims of Module

To provide the student with knowledge of the skills required to use a variety of commercial software packages in the design and manufacture of products, and the rapid prototyping techniques which can be used to reduce time to market for new products.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Develop Numerical Control (NC) codes to machine solid geometry features using an integrated feature based solid modelling and multi axis NC manufacturing programming package.
- 2 Operate an integrated feature based solid modelling and manufacturing (mould flow simulation) package.
- 3 Justify the use of rapid prototyping in reducing the time to market of complex shaped components in an industrial environment.
- 4 Examine the concepts of Design of Experiments and Six Sigma analysis including techniques for the optimisation of engineering components.

Indicative Module Content

Computer aided NC programming, set up of manufacture model from solid model, specification of machine tool and cutting tool, identification of surfaces to be machined, creation of machining sequence, post processing. Evaluation of polymer components for moulding, use of software to create the mould model from component solid model, position of sprues and runners, optimisation of material flow in mould to critically assess the mouldability of components. Rapid prototyping, comparison of different rapid prototyping techniques, surface finish, component size, accuracy etc, cost of machine and prototype components, application of the rapid prototyping in the industrial environment. Sensitivity and optimisation: design a range of design variables for geometric and material properties for sensitivity studies for linear elastic static, dynamic and thermal problems to establish initial parameters, perform optimal solution using selected design variables for specified optimisation goal and imposed design constraints, such as displacement, stress, temperature and frequency. Define the concepts of Design of Experiments and Six Sigma analysis and apply the concepts to sensitivity studies for optimisation of engineering components.

Module Delivery

Module delivered by means of lectures, tutorials and self-guided study, integrated with computer-based applications.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	100	N/A
Non-Contact Hours	200	N/A
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	300	N/A
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	1, 2
Description:	Report covering NC manufacturing and solid modelling.				

Component 2

Type:	Examination	Weighting:	50%	Outcomes Assessed:	3, 4
Description:	Online test				

MODULE PERFORMANCE DESCRIPTOR**Explanatory Text**

The module has 2 components and to gain an overall pass a minimum D grade must be achieved in each component. The component weighting is as follows: C1 is worth 50% and C2 is worth 50%.

		Coursework:						NS
		A	B	C	D	E	F	
Examination:	A	A	A	B	B	E	E	
	B	A	B	B	C	E	E	
	C	B	B	C	C	E	E	
	D	B	C	C	D	E	E	
	E	E	E	E	E	E	E	
	F	E	E	E	E	E	F	
	NS	Non-submission of work by published deadline or non-attendance for examination						

Module Requirements

Prerequisites for Module

Completion of EN3109 or equivalent.

Corequisites for module

None.

Precluded Modules

None.

INDICATIVE BIBLIOGRAPHY

- 1 Groover, Mikell. 2017. Principles of modern manufacturing. Hoboken, New Jersey : John Wiley & Sons, Inc.
- 2 JACOB P F., 1992. Rapid Prototyping and manufacturing
- 3 KALPAKJIAN, S. and SCMID S., 2014. Manufacturing engineering & technology. 7th ed. Harlow: Pearson.