MODULE DESCRIPTOR

Module Title

Mechanical Engineering Design 2

Reference	EN2101	Version	4
Created	February 2024	SCQF Level	SCQF 8
Approved	July 2018	SCQF Points	30
Amended	April 2024	ECTS Points	15

Aims of Module

This module will develop an understanding of the formal design process and expand the knowledge of engineering principles and analysis introduced in the first year, with application of these principles to the design of components and systems and machine elements.

Learning Outcomes for Module

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

1	Use theory of beam bending behaviour, linear stress-strain and deflection relationships, complex stresses and strains in two-dimensions, principal strains/stresses, torsional loading in shafts and shear stresses in beam bending to solve engineering problems.
2	Undertake design problems on power transmission systems and bearing systems.
3	Explain the importance of embodiment design and apply effective integrated design methods to the production of technical solutions to specific problems.
4	Show understanding of accessibility and professional codes of conduct requirements applicable to product design.
5	Practice designing mechanical components and assemblies using knowledge of engineering design processes and consideration of product life cycles.

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Indicative Module Content

Beam bending theory and the bending equation; properties of plane areas; beam deflection; stress-strain relationships in two-dimensions and Mohr's circle techniques; strain gauge rosettes; relationships between elastic constants; torsion of circular solid and hollow section shafts; shear stresses in beams due to bending; complex loaded beams: lateral and axial loading, SF and thrust; combined bending torsion and axial loading. Thin cylinders and spheres; introduction to strain energy methods in structural analysis. Power transmission shafting; couplings; keys; and splines; types of bearings; parameters involved in design and selection of ball and roller bearings; lubrication and seals; assembling and securing bearings on shafts; selection of ball/roller bearing using manufacturer's data/catalogues. Design process for the solution of engineering systems and components; identifying customer needs and requirements and establishing the engineering characteristics; sources to gather information; creative thinking for concept generation; evaluation methods for concept selection Embodiment design: product architecture; configuration design; best practices for configuration design; parametric design; dimensions and tolerance; human and environmental factors; prototyping and testing. Human-centered design and accessibility. Detail design: final design review, product lifecycle management.

Module Delivery

The module is delivered in Blended Learning mode using structured online learning materials/activities and directed study, facilitated by regular online tutor support. Workplace Mentor support and work-based learning activities will allow students to contextualise this learning to their own workplace. Face-to-face engagement occurs through annual induction sessions, employer work-site visits, and modular on-campus workshops.

Indicative Student Workload	Full Time	Part Time
Contact Hours	30	N/A
Non-Contact Hours	30	N/A
Placement/Work-Based Learning Experience [Notional] Hours	240	N/A
TOTAL	300	N/A
Actual Placement hours for professional, statutory or regulatory body	240	

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, 4
Description:	Logbook of tutorials and online tests.				

Component 2

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	3, 5
Description:	Design report with corroborative evidence.				

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

Module Requirements

Prerequisites for Module	Completion of EN1100, EN1106, EN1102, EN1103 or equivalent.
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1	ULRICH, K. T. and EPPINGER, S.D., 2016. Product Design and Development. 6th ed. New York: McGraw-Hill.
2	DIETER, G, E. and SHHMIDT, L, C; 2009. Engineering Design. 4th ed. New York: McGraw-Hill.
3	COLLINS, J A; BUSBY H; STABB G., 2010. Mechanical Design of Machine Elements and Machines. 2nd ed. Wiley
4	British Standard BS 8888:2011 - Technical product documentation and specification
5	CHUNG, W.C., 2019. The praxis of product design in collaboration with engineering. Cham, Switzerland : Springer.
6	HEARN, E.J., 1997. Mechanics of Materials Vol 1. 3rd ed. Oxford: Butterworth-Heinemann
7	HIBBELER, R.C., YAP, K.B., 2018. Mechanics of Materials. 10th ed. Harlow : Pearson.
8	CHADHA, S., 2023. Beyond accessibility compliance : building the next generation of inclusive products. New York : Apress