

MODULE CODE: M4X01160
TITLE: Engineering Design
DATED: 17/07/2014

LEVEL: 4
CREDITS: 20

JACS CODE: H300

AIMS

This module introduces students to both 2D and 3D CAD drafting and solid modelling and a familiarity with the engineering design process.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- 1 show a detailed knowledge and understanding of: the design processes and the ability to apply them and evaluate their effectiveness; the impact of and from the Environment and legislation factors on the design process and engineering companies. (Component A)
- 2 demonstrate skills in communicating the design, material and manufacturing of products through the preparation and reading of Engineering Drawings to BS8888 through the medium of 2D and 3D CAD tools. (component B)
- 3 demonstrate cognitive skills to allow choice of material and manufacturing processes to meet specific design criteria with relationship to manufacturing volume, mechanical properties, cost, dimensional accuracy and automation. (components A and B), and
- 4 demonstrate key transferable skills in problem formulation and decision making, communication and self-management skills as well as working with others (component A)

INDICATIVE CONTENT

- 1 Methodologies for the generation of design solutions to conceptual and adaptive design problems, to include; creativity, innovation, evaluation, optimisation, design isolation, manufacture, reliability, sustainability, safety and cost implications
- 2 Engineering Graphics – basic sketching and drawing skills in the creation and interpretation of engineering drawings. British Standard 8888 (or equivalent standard). General assembly drawings
- 3 Computer Aided Drawing – introduction to the use of Solidworks or UGS NX (or equivalent software) for the creation of 3D solid models, assemblies and 2D engineering drawings

- 4 Methodologies for the generation of design solutions to conceptual and adaptive design problems. To include; creativity, innovation, evaluation, optimisation, design isolation, manufacture, reliability, sustainability, safety and cost implications
- 5 Tolerancing principles, limit and fit calculations, geometric dimensioning and tolerancing theory and applications

LEARNING AND TEACHING STRATEGY

The theoretical concepts and techniques will be delivered in lecture format. Demonstrations will be given and supervised laboratory work will facilitate the introduction of the software applications required for this module.

Supportive tutorial periods will focus on reviewing retrospectively work covered earlier with the aim of addressing difficulties encountered by individual students. Similarly, further application examples can be undertaken at a pace to meet individual needs (within reason).

Allocation of teaching to deliver the module is as follows:

Activity type	Hours	Percentage
Scheduled learning	60	30
Independent learning	140	70
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component A – 50%

Practical Detail

The first element of assessment is intended to assess the student's ability to use the solid modelling software to create individual components and to construct assemblies models with appropriate degrees of freedom.

This will take the form of an assignment which will may be carried out during a time constrained, supervised laboratory session (assessment session). The component and assembly models will be graded directly. A written report will, therefore, usually not be required.

Assessment Component 2 – 50%

Mini Project Coursework

The second element of assessment will involve students being issued with a design challenge/problem and involve the application of design methodologies and tools in order to arrive at a design solution.

A report, detailing the strategies applied and the tools employed will be compiled by the students and submitted for assessment. The report will be accompanied by solid models and technical drawings used to specify the final designs.

Exemplar:

Students will be asked to complete a mini-project in small groups – maximum of 3.

The aim of the project is to design or redesign a component of their choice preferably that does work – and must include an assembly.

- 1 Students are expected to develop a specification and following the course guidelines, justifying all their design decisions*
- 2 Engineering drawings are compulsory and should be presented in accordance to BS8888. Each student must draw at least one of the parts of the assembly*
- 3 A 10-minute presentation to the company's Chief Designers (Dragon's Den type) and presentation of written supporting information in the form of a report no longer than 20 pages (plus appendix) at the time of the presentation (word count - 2500-3000)*

Assessment Summary

Activity type	Percentage
Written	0%
Coursework	50%
Practical	50%
TOTAL	100%

BIBLIOGRAPHY

Essential

Pugh, S., Total Design: Integrated Methods for Successful Product Engineering (Prentice Hall, 1990)

Simmons, C. and Maguire, D., Manual of Engineering Drawing to British and International Standards (Newnes, 2003)

Recommended

Pahl, G., Beitz, W., Feldhusen, J. and Grote, K .H., Engineering Design: A Systematic Approach (Springer, 2006)

Ullman, D. G., The Mechanical Design Process (McGraw Hill Higher Education, 2002)

Solidworks Tutorials and Help Files

Background

Bolton, W., Mechanical Science (Wiley-Blackwell, 2006)