

Liverpool John Moores University

Title: Engineering Design Practice
Status: Definitive
Code: **4501ENGICA** (119079)
Version Start Date: 01-08-2018

Owning School/Faculty: Engineering
Teaching School/Faculty: HICOM University College Sdn,Bhd

Team	Leader
Russell English	

Academic Level: FHEQ4
Credit Value: 20
Total Delivered Hours: 142
Total Learning Hours: 200
Private Study: 58

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	22
Off Site	24
Practical	10
Tutorial	44
Workshop	42

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Portfolio	workshop	Portfolio of basic workshop items	20	
Portfolio	drawing	Portfolio: Technical Drawing and CAD models	30	
Report	report	Professional engineers role and responsibilities report	20	
Portfolio	exercise	Portfolio: Reverse Engineering exercise	30	

Aims

This module will provide students with fundamental design skills and an appreciation of different manufacturing processes. They will learn to appreciate the role and associated responsibilities of a professional engineer.

Students will undertake a course of workshop practice.

The core elements of technical graphics will be taught through an introduction to reading and producing engineering drawings using traditional (hand drawn) methods. Following this, students will be given a comprehensive introductory course in modern 3D parametric CAD modelling and its application to generating engineering drawings which meet recognised standards.

Learning Outcomes

After completing the module the student should be able to:

- 1 Explain the fundamental design and manufacturing processes.
- 2 Produce simple workshop items using a variety of techniques.
- 3 Manually produce engineering drawings
- 4 Produce solid models and drawings using CAD
- 5 Discuss the role and associated responsibilities of a professional engineer

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

basic workshop items	1	2	5
Drawing and CAD	3	4	
role report	5		
reverse eng ex	1	3	4

Outline Syllabus

Introduction to the Design Process:

This part of the course will give students an appreciation of how a fundamental design process should be followed and the key phases of such a process:

- *The design brief and Product Design Specification (PDS).*
- *Conceptual Design*
- *Embodiment Design*
- *Final/Detail Design*

Reverse Engineering:

This part of the course will teach students to critically evaluate the design, manufacture and assembly of an existing mechanical device. Students will also apply learning gained in CAD and Technical graphics to record their findings in the form of drawings and models:

- *Mechanical Dissection*

- *Artifact Analysis*
- *Product Strip & Model*

Technical Graphics:

This part of the course will teach students the fundamental knowledge which they will need to create good quality technical drawings which conform to well known standards. Students will also learn to read and interpret engineering drawings.

- *Engineering drawing and sketching techniques*
- *Geometric construction technique, Orthographic projections, rules and conventions.*
- *Generating working drawings (detail, assembly, layout, etc.)*
- *Symbols (geometric and dimensional tolerances, limits and fits)*

Workshop Practice:

Workshop experience giving the student opportunity to operate machine tools and apply engineering workshop practices to a range of items. Operations undertaken include:

Bench work, cutting, filing, drilling, riveting and simple heat treatment.

Turning of simple components using a range a materials, forming of screw threads

Milling of simple rectangular forms, marking out and indexing.

Welding.

Role and associated responsibilities of a professional engineer

This introduces the concepts of sustainable development and professional responsibilities to society and the environment. Topics covered include:

Alternative forms of energy supply, energy distribution and conservation.

Recycling of materials and redundant products, alternative and natural materials.

Water treatment, sewage and waste water streams and their treatment.

Socio-economic factors affecting development.

Solid Modeling:

This part of the course will provide students with an essential introduction to using SolidWorks to produce 3D parametric CAD models and to generate drawings and assemblies according to recognized standards. Content will include:

- *Basic geometry: Concepts such as axis, planes, origin, faces, edges, and vertices. Geometric relationships and constraints. Preparation, design intent, location of origin and selection of planes.*
- *User interface: Opening and saving files. Navigating toolbars, menus' feature manager, property manager, configuration manager toolbox, standard component libraries. Getting help, using tutorials. Document properties and system options.*
- *Navigation: View control, view display, display modes, standard views.*
- *Sketching: Sketching environment, sketching tools, dimensioning sketches, editing sketches, applying geometric relations in sketches, understand concept of fully defined sketches.*
- *Solid Extrusions: Creating solid and thin base features, adding bosses and cutting features.*
- *Features: Understanding and using chamfers and fillets. Applications of shelling and draft angles. Use of the hole wizard.*
- *Assemblies: Creating bottom up assemblies; inserting and manipulating components, degrees of freedom, adding mate relations, creating sub assemblies,*

editing assembly mates, editing assembly models, mirrored and patterned components.

- *Drawing: Creating part drawings and assembly drawings from given models, drawing templates and modification, sheet format and editing, dimensioning and specialized views. Annotations, symbols and conventions.*

Learning Activities

Lectures, tutorials, case studies and workshop training.

Course Material	Book
Author	Pugh
Publishing Year	1991
Title	Total Design
Subtitle	
Edition	
Publisher	Prentice Hall
ISBN	

Course Material	Book
Author	Nigel Cross
Publishing Year	2008
Title	Engineering Design Methods
Subtitle	
Edition	4th
Publisher	Wiley
ISBN	

Course Material	Book
Author	Donald Norman
Publishing Year	2002
Title	The Design of Everyday Things
Subtitle	
Edition	9th
Publisher	Basic Books
ISBN	

Course Material	Book
Author	R C Budynas, R Budynas & K. Nisbett
Publishing Year	2010
Title	Shigleys Mechanical Engineering Design
Subtitle	
Edition	
Publisher	McGraw Hill
ISBN	9780073529288

Notes

This module aims to equip the student with important underpinning engineering skills. A student must successfully complete all sections of the module to a satisfactory level.