

Liverpool John Moores University

Title: ENGINEERING DESIGN PRACTICE
Status: Definitive
Code: **4001ME** (115877)
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: Maritime and Mechanical Engineering

Team	Leader
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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	AS1	Coursework - Portfolio of Basic Workshop Items	20	
Portfolio	AS2	Coursework - Technical Portfolio	50	
Report	AS3	Coursework - Field Trip Report	20	
Self Awareness Statement	Reflection	Complete a World of Work Skills Bronze statement on Self Awareness and then reflect on your feedback using a standard template.	10	

Aims

This module will provide students with fundamental design skills and an appreciation of different manufacturing processes.

Students will undertake a course of workshop practice and will make a visit to the Center for Alternative Technology (CAT) where they will learn to appreciate the role and associated responsibilities of a professional engineer.

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
- 6 Identify and reflect upon the following aspects of personal development: strengths and weaknesses, motivations and values, ability to work with others

Learning Outcomes of Assessments

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

Portfolio of Basic Workshop It	1	2	5
Portfolio: Technical Portfolio	1	3	4
Field Trip Report	5		
Bronze Statement & Reflection	1	6	

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/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 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 drawings 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, filings, drilling, rivetsing and simple heat treatment.

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

Milling of simple rectangular forms, marking out and indexing.

Welding.

Field Trip:

This activity 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 Modelling:

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. Navigation 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, field trip and workshop training.

Notes

This module aims to equip the student with important underpinning engineering skills. Completion of this module is a requirement for compliance with the Engineering Council UK Spec and accreditation of the programme by the engineering professional bodies. A student must therefore successfully complete all sections of the module to a satisfactory level.