Liverpool John Moores University

Title:	Computer Aided Design I
Status:	Definitive
Code:	**4001PDE** (120076)
Version Start Date:	01-08-2016
Owning School/Faculty:	Electronics and Electrical Engineering
Teaching School/Faculty:	Electronics and Electrical Engineering

Team	Leader
Jamie Finlay	Y

Academic Level:	FHEQ4	**Credit Value:**	20	**Total Delivered Hours:**	72
Total Learning Hours:	200	**Private Study:**	128		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Practical	24
Tutorial	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	Test	In-class solid modelling test	50	
Portfolio	Portfolio	CAD Portfolio	50	

Aims

Gives students the knowledge and skills needed to use computer aided design (CAD) techniques in a design context.

Learning Outcomes

After completing the module the student should be able to:

1 Design 3D parts
2 Design 3D assemblies
3 Produce engineering part and assembly drawings from 3D models
4 Produce rendered images from 3D models

Learning Outcomes of Assessments

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

In class solid modelling test	1	2
CAD Portfolio	3	4

Outline Syllabus

Module introduction
Module guide; aims; learning outcomes; assessment and marking schemes. Outline syllabus; module timetable and student feedback. Availability and license agreement of the student version of SolidWorks.

Advantages of CAD
Quality; accuracy; time; cost; electronic transfer of information; links with other software e.g. CAD/CAM, rendering software, animation software, finite element analysis (FEA).

CAD Elements
Software:
Operating systems; CAD software packages e.g. AutoCAD, AutoCAD/Inventor, Catia, Pro/ENGINEER, SolidWorks; minimum system requirements e.g. hard disk space, memory required, processor, video card.

File Management
How to store, retrieve and use files correctly. Parts classification and coding systems.

Hardware:
Hardware selection. Keyboard; mouse; other input devices e.g. light pen, digitiser, joystick, thumbwheel; monitor; printer; other output devices e.g. plotter, rapid prototyping; storage e.g. Cloud storage, hard disk, memory stick, CD, network.

3D modelling:
3D techniques e.g. addition and subtraction of material, 3D coordinate entry (x, y, z), wire frame modelling, 2D to 3D (thickness, extrusion); solid models; surface models.

Preparation:
Design intent, location of origin, selection of planes and units.

Terminology:

Basic geometry, axis, planes, origin, face, edge, vertex geometric relationships, horizontal, vertical, intersection, parallel, collinear, perpendicular, coincident, document properties and system options.

User interface:
Opening and saving files, toolbars, menus' feature manager, property manager, configuration manager toolbox, standard component libraries, help and tutorials.

Navigation:
View control, view display, display modes, standard views.

Sketching:
Sketching environment, sketching tools, dimensioning sketches, editing sketches, applying relations in sketches, understand concept of fully defined sketch.

Solid extrusions:
Creating solid and thin base features, adding bosses and cutting features.

Features:
Creating chamfers, fillets, shelling, ribs, draft angles, use of hole wizard.

Common operations:
Converting entities, mirroring, linear and circular patterns, revolved extrusions/cuts, sweeps, lofting, adding and editing relations, creating additional planes.

Interpret:
Determine properties of 3D object e.g. distance, area, volume, mass, radius of gyration, centre of gravity.

Assemblies:
Creating bottom up assemblies; inserting and manipulating components, degrees of freedom, adding mate relations, create sub-assemblies, editing assembly mates, editing assembly models, mirrored and patterned components.

Design fundamentals
Standard forms: e.g. sheet and plate, bar-stock, pipe and tube, sectional, extrusions, ingots, castings, forgings, pressings, granular, powder and liquid.

Machine elements: Screw fixings, bearings and, seals.

Design reference material: Manufacturers' catalogues e.g. screw fixings, bearings, seals, electrical connectors, drive belts, gear drives; materials databases e.g. mechanical properties, physical properties; design databases e.g. structural beam sections and their benefits, corrosion protection, anthropometric data.

Design documentation: e.g. design diary, logbook, product specification; design calculations e.g. sizes of materials to meet strength requirements, electric motor power, electronic circuit performance, battery life.

Engineering drawing
Preparation: BS8888, paper size and orientation, component / assembly size and complexity, scale and required technical information. Types of drawings: Part drawings, assembly drawings, layout drawings. Projections: Orthographic, first-angle / third angle projection. Multi-view drawings: Selection / number of views, auxiliary views, detail views and cross sections. Types of line: visible, hidden, centre, cutting planes, section and hatching. Drawing threaded components. Dimensioning: Parallel, running, chain, combined, co-ordinates, tabular, holes, circles and radii. Hole and shaft based tolerancing; Bilateral and unilateral tolerancing; surface finish.

Converting a 3D model into an engineering drawing
Creating part drawings and assembly drawings from 3D models, drawing templates and modification, sheet format and editing, dimensioning and specialized views. Annotations, machining and general symbols and other conventions.

Rendering using Photo360:
User interface and workflow, previewing renders, applying appearance, surface finish, decals, scenes, backgrounds, lighting, rendering a scene, camera's, model updates, image size and format' final render & save, system options & animations.

Learning Activities

This module will be delivered through an integrated series of lectures, tutorials, practical sessions, guided design activities and case studies. The learning activities are to be student focused and develop the students design knowledge through experiential learning.

Notes

This module is delivered using a variety methods including lectures, seminars, tutorials and practical sessions. The module will be delivered from a engineering and product design perspective.