MECH06018
Computer Aided Design (TK)

Full Title	Computer Aided Design (TK)		
Status	Uploaded to Banner	**Start Term**	2020
NFQ Level	06	**ECTS Credits**	10
Module Code	MECH06018	**Duration**	Stage - (26 Weeks)
Grading Mode	Numeric	**Department**	Mechanical & Industrial Eng
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Module Description

Computer Aided Design 1 is a 3-hour weekly computer lab that introduces students to the modelling and creative design process through the use of CAD software.

Computer Aided Design teaches the fundamental principles of technical drawing and modelling through an active learning environment where students are required to complete weekly assignments and also a design-and-build project at the end of each semester.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Use three dimensional solid modeling software (CREO 3.0) in the design of engineering components.
2.	Apply engineering graphics standards.
3.	Use various technical commands and be able to select the appropriate methodology (design intent) required for the creation of a solid model.
4.	Create drawing files displaying orthographic layouts from the solid model as well as dimensioning and applying dimensional and geographic tolerances to the drawing file.
5.	Select and use the optimum software techniques to create parts and assemblies models.
6.	Use standards parts libraries for the selection of appropriate standard components in the design / assembly process. Teaching and Learning Strategies

Indicative Syllabus

Sketch mode: sketcher environment, user interface, menus, modes, working directory, entering commands, units, changing units, sketcher toolbar, mouse functions. 2D sketching primitives, lines, circles, rectangles, polygons, arcs, fillets, splines, points, text. Editing entities, mirroring entities, trim and divide, creating and modifying dimensions, strong and weak dimensions, converting weak dimensions into strong dimensions, centrelines, construction circles, help menu. Graded exercises to apply above commands and functions.

Sketch mode: design intent - implementation of intent manager - on and off modes, geometric constraints, tangency, co linearity, symmetry, equal length or radius, parallelism, horizontal and vertical, perpendicularity, alignment. Disabling constraints, converting weak constraints into strong constraints, over and under constrained sketches, resolving sketches, Scaling, rotating and copying entities, Importing 2D drawings in the sketch mode. Graded exercises to apply above commands and functions.

Solid mode: protrusion: part name, creating datum planes - reference planes and sketch planes, co-ordinate systems, extrusion dashboard, creating simple and sketched holes, cuts, chamfers, fillets, ribs, drafts. Editing definitions/references and regenerating the model. Deleting features, model tree, view and display commands, model colour, creating new work-planes, mirroring and copying in solid mode.

Drawing standards: ISO 128 (BS 8888) drawing standard, alternative standards, sketching in 2D and 3D, sheet sizes and layout - title blocks, abbreviations: as given in ISO 128. Terminology used to describe features of engineering components - ribs, boss, undercut etc. Conventions: methods of representing engineering components as presented in ISO 128-screw threads, gears.

Solid mode: revolved solids, revolved cuts, rectangular and rotational patterns, uni and bi-directional patterns. Patterns of grouped features. Child/parent relationships, implicit and explicit. Layers as organisational tools, creating and assigning items to layers. Suppressing and hiding items. Graded exercises to apply above commands and functions.

Orthographic projection: theory of first and third angle projection, sections and part sections, exceptions allowed in sections, hidden detail, dimensioning according to ISO 128, application of toleranced dimensions. Graded exercises to apply the principles of orthographic projection, sectioning and dimensioning.

Drawing mode: extracting orthographic layouts from the solid model, dimensioning the views, adding 3D views, inserting layout sheets, creating text.

Sweeps: closed section- open trajectory sweeps. Open section - closed trajectory sweeps. Thin sweep protrusions. Swept cuts.

Blends: parallel - rotational and general options. Shell options -constant and variable thickness.

Printing: print hard copy
Assembly modelling: assemble parts as a mechanical assembly, assembly constraints - mate, offset, align etc. Checks for clearance and interference; Subassemblies, assembly display management, exploding assemblies, assembly display management. Part creation and editing in assembly mode. Assembly drawings, exploded views, bill of materials,

Parts created in earlier lessons can be used for assembly mode. Engineering drawing theory: assembly drawings: exploded views. Advanced blends, sweeps and splines: helical and variable section sweeps Welding symbols: BS 499, application of the symbols used to indicate welds and weld preparation.

Customisation: interface customisation tools; configuration files.

Standard parts library: use of electronic parts libraries for standard components.

Parametric modelling: parametric equations, creating relationships between dimension values, conditional relationships, implications of design intent. Incorporating design intent by establishing relationships between dimensions. Design table spreadsheets.

Creating assemblies using local or online standard-parts libraries or commercial catalogs.
Graded exercises to apply above commands and functions

Teaching and Learning Strategy

CAD is taught in in a computer lab to a small cohort of students . Small group learning can be of great benefit when trying to promote active learning, critical thinking, creativity and life skills in general. Understanding many aspects of CAD cannot be achieved through the inactive practice of listening. Students must actively practice the techniques involved, discuss alternative methods and get feedback from as many sources as possible. Small group learning encourages these activities as well as introducing students to a more collaborative learning environment as opposed to the traditional competitive environment and helping students improve the real world skills required by companies.

The teaching strategy focuses on three main areas, namely, outlining the objectives of each three hour class, analysing the teaching method (involves both students and lecturer) and the role of the lecturer.

The teaching method is as follows:
A Class plan is presented to students at the start of each class. This plan outlines the drawing/modelling techniques to be covered during that specific class.

Each drawing/modelling techniques is demonstrated in class (through the use of lecturer demonstration with the projector), after which the students are required to complete one or more exercises focusing on practicing this technique.

Once the students are satisfied with their understanding of each new drawing/modelling technique they are given a set of exercises/problems to complete which relate to this learning. Students are required to pratice these techniques outside their formal contact hours in order to finish their exercises.

Students who miss class can access all notes relating to each class on Moodle. It is always recommended to students that they attend class as notes on Moodle are no substitute to the valuable learning experience they gain from actually being in attendance.

Problem solving helps cultivate deeper learning. When presented with a problem (mathematical / research / programming) students are immediately presented with a goal and something to work towards.

Apart from the advantages of problem setting and solving in encouraging a deeper learning this method of learning is a critical factor in advancing the competitiveness of people and their ability to meet the challenges of the workplace. Using problem solving can help in fostering communication skills (when working in groups), teamwork skills and a strong work ethic. All of these attributes are important factors in the development and preparation of people who are about to enter the workforce.

Assessment Strategy

CAD is 100% continuous Assessment. Students are required to complete a set of exercises each week. These exercises relate to a specific topic which is covered in class that week. Students received prompt feedback relating to their weekly exercises, thus helping them understand very quickly where their competence and weakness lies. This method of assessment also allows the lecturer to follow the progress of each individual student more closely

Repeat Assessment Strategies

Students who fail CAD have the opportunity to repeat by means of a three hour exam in September.

Indicative Coursework and Continuous Assessment:		100 %		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assessment	CAD Exercise	100 %	OnGoing	1,2,3,4,5,6

Blended Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	***Description***	***Location***	***Hours***	***Frequency***	***Weekly Avg***
Practical	Tutorial	Laboratory	3	Weekly	3.00

Recommended Reading Book List

Tickoo, P., (2015). *PTC Creo Parametric 3.0 for Designers*. CADCIM Technologies.

Online Resources

https://learningexchange.ptc.com/

Programme Membership

GA_EAURG_B07 202000 Bachelor of Engineering in Automation & Robotics
GA_EAURG_C06 202000 Higher Certificate in Engineering in Automation & Robotics
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