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ME 1110 – Engineering Practice 1

Engineering Drawing and Design - Lecture 1

Introduction

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www.staff.city.ac.uk/~ra600/intro.htm

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Definition of Design

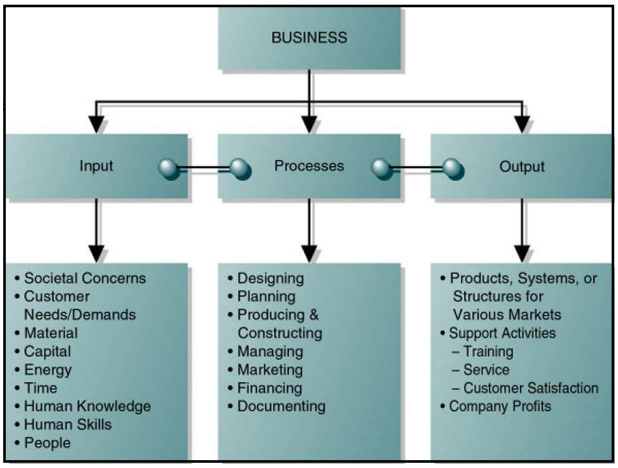
Design is ***process*** of ***conceiving or inventing*** ideas mentally and ***communicating*** these ideas to others in a form that is easily understood.

Design is a ***systematic*** action by which solution to the ***needs*** of humankind are ***obtained and communicated***.

Design is essence of ***Engineering***.

Designing is a ***multidisciplinary*** task influenced by *technological* and *social* factors.

Designing is ***iterative***, ***team work*** and continually learning process.



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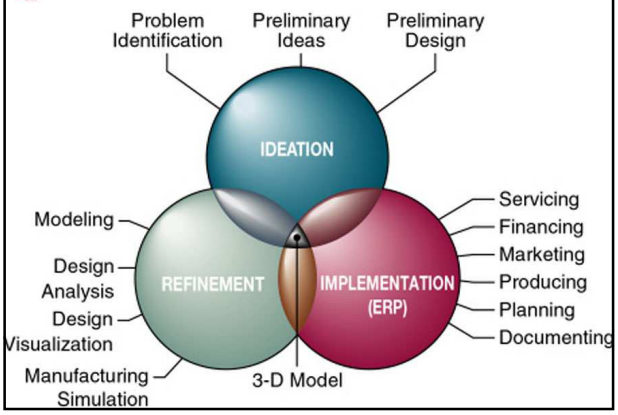
Phases of Engineering Design



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The Nature of Design

People have always *DESIGNED* artefacts*!
(Everything which is not a simple untouched peace of Nature has been designed)

In craft-based societies concepts of 'designing' and 'manufacturing' are not separate.
(Example is a potter who makes a pot directly from his head)

In modern societies these processes must be separate. Making process cannot normally start before the artefact has been designed
(In electronics, design can take months and manufacturing only seconds)

Design has to provide a clear description of the artefact that has to be made.
(Almost nothing should be left to the discretion of those who manufacture the artefact)

Despite the method used to design an artefact, the essential design activity is *to produce its 'description'*.

*Artefacts are artificial objects, products, processes, etc.

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Communication of Design

Design has to be delivered in a form *understandable* to those who make or approve an artefact .

The most widely used form of communication is *DRAWING*.

Drawings need to convey information in the most precise manner – must be made in accordance to a certain rules and principles.

Learning to read and make drawings is a very important part of design education!

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Philosophy of Designing in general

- Governing everything could be seen in one overriding principle of 'Necessity'
  - » Principle of 'Necessity' dictates that the form always perfectly fits function in nature, with no insufficiency or redundancy; it compels every force to expand itself in the most direct way available for it; it prescribes that the simplest design to achieve a given end will be followed; and it must be respected by any human contriver of artificial things.
- 'Necessity' is the mistress and teacher of nature; necessity is the theme and inventor of nature, the curb, the rule and the theme.'
- The universal architecture of Necessity is geometry

From Martin Kemp's book "Leonardo"

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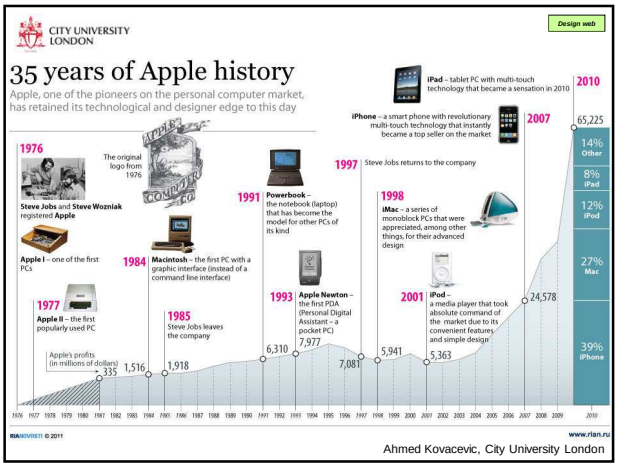

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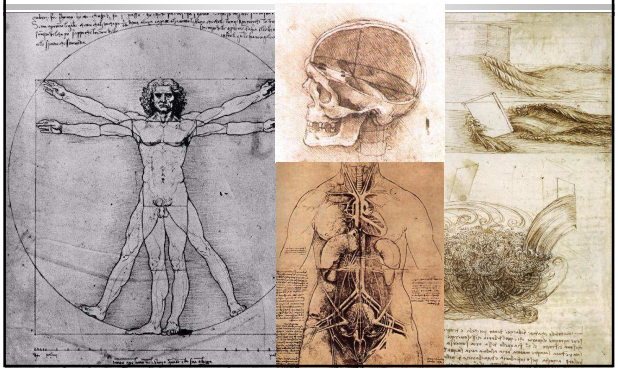
Understanding the Nature



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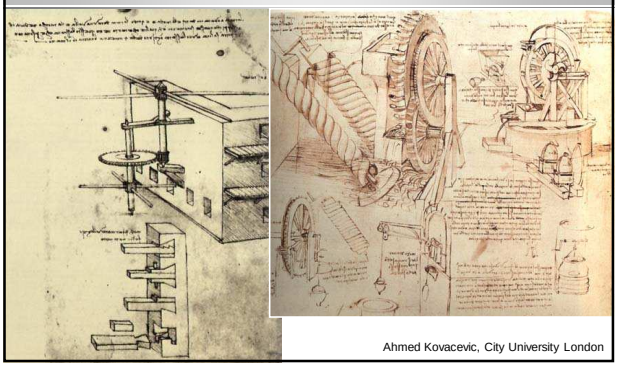
Generation of ideas



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Real model created with a rapid prototyping system

Source: Courtesy of 3D Systems, Inc.

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Virtual reality technology

Source: Courtesy of Fakespace Systems, Inc.

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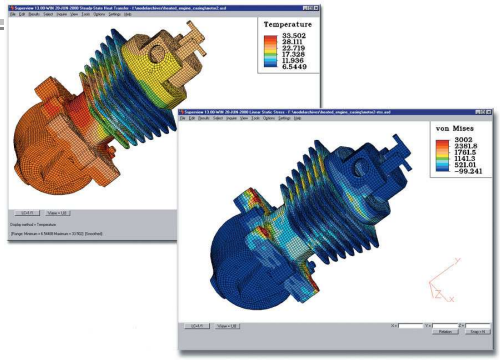
Thermal analysis



Source: Photo courtesy of Algor, Inc.

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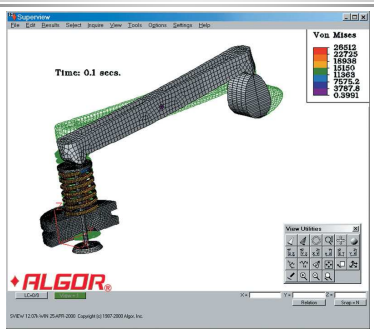
Stress analysis



Source: Photo courtesy of Algor, Inc.

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Assembly analysis

Source: Courtesy of Gary Bertoline.

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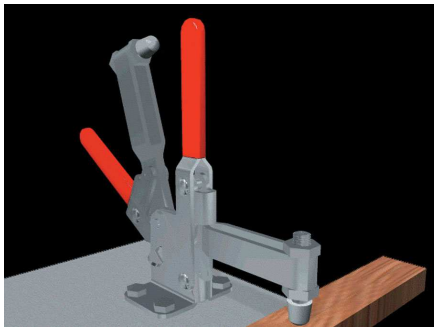
Kinematic analysis



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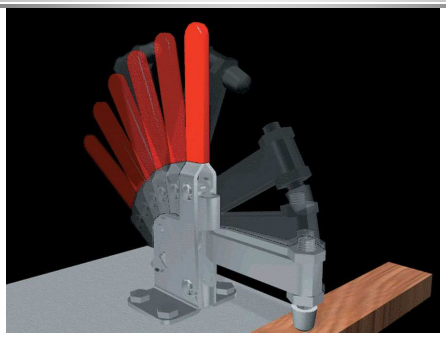
Dynamic analysis



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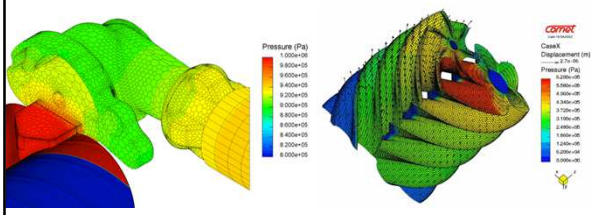
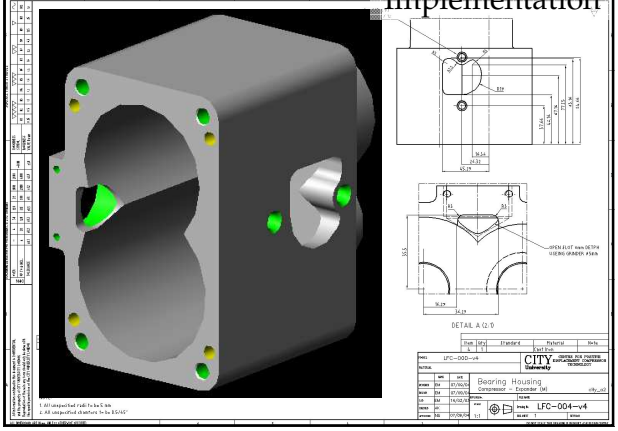
Fluid dynamics and Fluid solid interaction analysis



Source: Courtesy of Gary Bertoline.

Implementation



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Abstract design

Source: © Matthew Kaplan: Photri.

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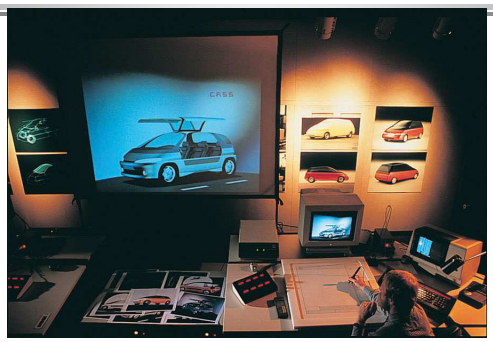
Aesthetic design



Source: © Michael Rosenfeld: Stone.

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Functional design

Source: © Michael Rosenfeld: Stone.

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Aesthetic and functional design

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Objectives of the course

- Develop ability to design and communicate
- Use of scientific principles in design
- Use of design tools (CAD, CAE etc)
- Work in **engineering design teams**
- Make design process creative

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Engineering Drawing and Design

- Course Outline :
  - Basic concepts of engineering drawing
  - Introduction to Computer Aided Design – AutoCAD
  - Introduction to Engineering Design
  - Introduction to Mechanical Design
  - Series of exercise through CV to learn above…

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Engineering Drawing and Design

Term 1

Lectures : Mondays 13^{00} – 13^{50}
Venue : BG02
Course leader and Lectures: Prof Ahmed Kovacevic
CAD lectures: Ms Mary Aylmer
Tutorial leader: Mr Sham Rane

Term 2

Lectures : Mondays 10^{00} – 10^{50}
Venue : Geary
Course leader and Lectures: Prof Ahmed Kovacevic
Tutorial leader: Mr Sham Rane

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Tutorials

Course leader:
Prof Ahmed Kovacevic
(C130)
Tutorial leader:
Mr Sham Rane
(A309)
Tutors:
Miss Homa Naseri
Mr Milad Mirshani
(A303)

Tutorial Part1 ME1110 - Engineering Drawing and Design

Group	Term 1	Tutor
A	Tuesdays CLG54/55; 14^{00}-16^{50}	Mr M. Mirshahi
B	Thursdays CLG54/55; 09^{00}-11^{50}	Miss H Naseri
C	Tuesdays CLG54/55; 09^{00}-11^{50}	Mr M. Mirshahi
D	Wednesdays CLG54/55; 09^{00}-11^{50}	Miss H Naseri
EM&E	TBD TBD	Mr M. Mirshahi

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How are you assessed?

Coursework only, **No Final Year Exam**

- 5 Drawing and 3 CAD exercises (2 in-class)
- 2 design exercises
- 2 group projects
- 2 in-class tests (one in each term)

Marks obtained from coursework tutorial classes and in-class tests are added together to calculate the final grade.

Pass mark – 40% overall

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Syllabus, Marking Scheme, Deadlines

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Textbooks

- Technical Drawing with Engineering Graphics, 14/e, Giesecke, Mitchell, Spencer, Hill, Dygdon, Nocak and Lockhart
- Engineering Design Graphics, Leak and Borderson
- Manual of Engineering Drawing: To British and International Standards Simmons and Maguire
- Practical Engineering Drawing, B. Hadley ISBN 0 582 36983 5
- Fundamentals of Graphical Communication, 3/e, G.R.Bertoline, E.N.Wiebe, C.L. Miller, McGrawHill
- Engineering Design and Problem Solving, Eide, Jenison, Mashaw, Northup, McGrawHill
- Engineering Design Methods Nigel Cross, John Willey & Sons, LTD, ISBN 0-471-87250-4

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What you need to have and what to do ?

» Course material: Moodle and Course web page:
http://www.staff.city.ac.uk/~ra600/intro.htm

» Drawing equipment:
- 2 pencils (one soft and one hard), rubber eraser
- set of rulers and a compass
- A3 paper

» Essential for good results:
- Attendance to both lectures and tutorials
- Patience and time invested in learning
- Each week 1-2 hours of out of class work

» Submit coursework directly to MEA General Office.

» Late submission penalty applies:
- 20% for 1 Week late
- 60% for 2 Weeks late
- 100% for > 2 Weeks late

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NOTE ?

» Student must attend all Tutorial classes.
Attendance is recorded and used in Examiners board

» No student will be allowed in the class without necessary DRAWING INSTRUMENTS and INSTRUCTION SHEETS

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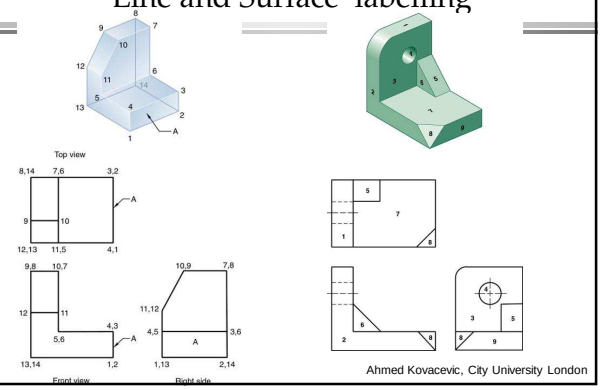
Line and Surface labelling



Exercise DrE-1a

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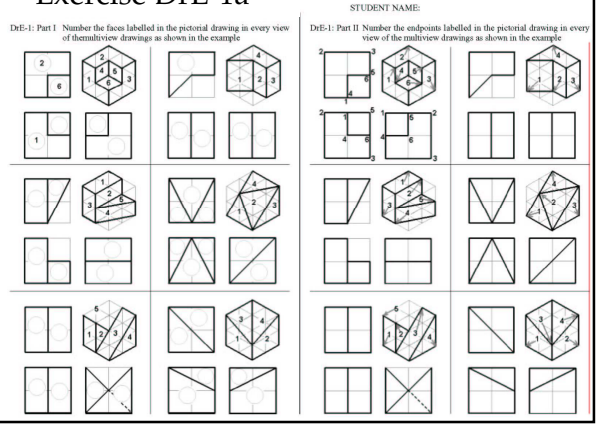

Exercise DrE-1a

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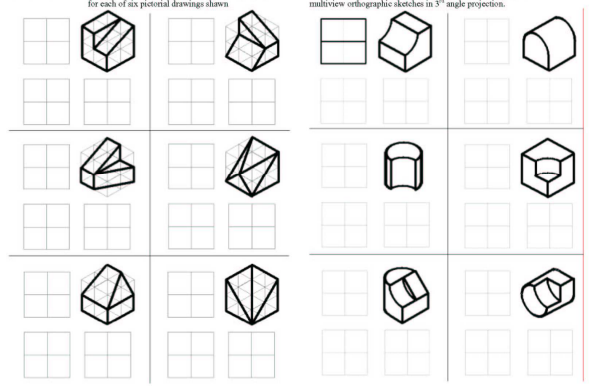
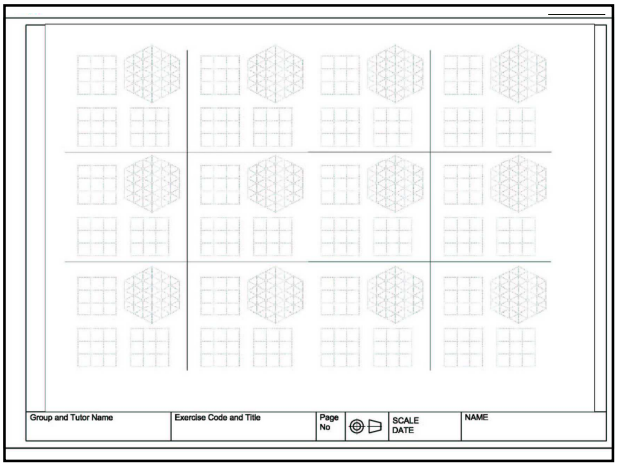
DrE-1: Part III

Complete the multiview drawing in 3rd angle projection for each of six pictorial drawings shawn

Part IV: After completing this sheet use template on attached A3 page, draw the border and title block, fill in the block and transfer both pictorial sketches and multiview orthographic sketches in 3rd angle projection.





Group and Tutor Name	Exercise Code and Title	Page No		SCALE DATE	NAME