

Lecture 1

Introduction

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

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Plan for today

- What is Engineering Design
- About ME2104
- Teams and Personal preferences
- Team development
- Design Documents

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What is DESIGN in Engineering?

Design is:

- » Systematic **Process** by which solution to the needs of humankind are obtained and communicated
- » Essence of **Engineering**
- » Structured problem solving activity

Engineering Design Process is:

- » Multidisciplinary task which contains:
 - Technological factors
 - Social factors
- » Team iterative work

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Engineering & Mechanical Design

Engineering design process

an iterative decision making activity, to produce plans by which resources are converted, preferably optimally with due consideration for environment into systems and devices (products) to meet human needs.

(Woodson.T.T)

Mechanical design process

is the use of scientific principles and technical information along with innovations, ingenuity or imagination in the definition of a machine, mechanical device or system (product) to perform pre specified functions with maximum economy and efficiency.

(Engineering Design Council, UK)

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Products

Classical definition:

- » **Products are artifacts** (i.e. artificial object) made by industry in order to fulfill society needs.

Conventional industrial economy is currently shifting to a service economy. In that light, the notion, role and appearance of products are all drastically changing with current economical changes.

Progressive definition:

- » **Products are flexible systems** (packages) of artifacts and/or services aimed to fulfill society needs in sustainable ways.

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Plan for this academic year

- Topics :
 - » Management of Engineering design process
 - » 3D CAD - Catia (part of ME2110)
 - » Research, Conceptual, Preliminary & Detailed Design
 - » Design, build and test project
- Lecturer: Prof Ahmed Kovacevic
- Tutors: Dr Matthew Read, Mr Sham Rane
Mr Mo Arjeneh, Mr Amir Hosseinpour
- Room: C302
Monday 11,00 – 12,50

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Agenda Web Page

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Additional tutorial rota

ME2109/ME2111/AE2203/ME2104 Tutorial Rota: Groups and Room Allocations										
Term 1	Oct-Dec		A1	A2	A3	A4	MA1	MA2	MA3	MA4
Week 1	Thu 14-15	ME2109 Tut 1/1 1st hour	ME2109 Structures CLG36	AE2203 Tutorial C322	ME2109 Thermo C158	ME2111 Maths CG56				
	Thu 15-16	ME2109 Tut 1/1 2nd hour	ME2109 Thermo C158	ME2111 Maths CG56	ME2109 Structures CLG36	ME2104 Tutorial C322				
	Fri 14-15	ME2109 Tut 2/1 1st hour	ME2111 Maths CG56	ME2109 Thermo C158	ME2109 Structures CLG36	ME2104 Tutorial C322				
	Fri 15-16	ME2109 Tut 2/1 2nd hour	ME2109 Mechanics C122	ME2109 Fluids C159	ME2111 Maths CG56	ME2109 Thermo C158				
Week 2	Thu 14-15	ME2109 Tut 1/1 1st hour	AE2203 Tutorial C322	ME2109 Structures CLG36	ME2109 Thermo C158	ME2111 Maths CG56				
	Thu 15-16	ME2109 Tut 1/1 2nd hour	ME2109 Thermo C158	ME2111 Maths CG56	ME2104 Tutorial C322	ME2109 Structures CLG36				
	Fri 14-15	ME2109 Tut 2/1 1st hour	ME2111 Maths CG56	ME2109 Thermo C158	ME2109 Fluids C159	ME2109 Mechanics C122				
	Fri 15-16	ME2109 Tut 2/1 2nd hour	ME2109 Fluids C159	ME2109 Mechanics C122	ME2111 Maths CG56	ME2109 Thermo C158				
Term 2	Jan-Mar									
Week 3	Wed 9-10	ME2109 Tut 1/2 1st hour	ME2109 Fluids C159	AE2203 Tutorial CLG36	ME2109 Thermo C158	ME2111 Maths CG56				
	Wed 10-11	ME2109 Tut 1/2 2nd hour	ME2109 Thermo C158	ME2111 Maths CG56	ME2109 Fluids C159	ME2104 Tutorial CLG36				
	Thu 9-10	ME2109 Tut 2/2 1st hour	ME2111 Maths CG56	ME2109 Thermo A107	ME2109 Mechanics A108	ME2109 Structures CLG36				
	Thu 10-11	ME2109 Tut 2/2 2nd hour	ME2109 Mechanics A108	ME2109 Structures CLG36	ME2111 Maths CG56	ME2109 Thermo A107				
Week 4	Wed 9-10	ME2109 Tut 1/2 1st hour	AE2203 Tutorial CLG36	ME2109 Fluids C159	ME2109 Thermo C158	ME2111 Maths CG56				
	Wed 10-11	ME2109 Tut 1/2 2nd hour	ME2109 Thermo C158	ME2111 Maths CG56	ME2104 Tutorial CLG36	ME2109 Fluids C159				
	Thu 9-10	ME2109 Tut 2/2 1st hour	ME2111 Maths CG56	ME2109 Thermo A107	ME2109 Structures CLG36	ME2109 Mechanics A108				
	Thu 10-11	ME2109 Tut 2/2 2nd hour	ME2109 Structures CLG36	ME2109 Mechanics A108	ME2111 Maths CG56	ME2109 Thermo A107				

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What you need to have and what to do ?

- » Course web page: Moodle
- » A lot of patience and time to learn
- » Attendance to lectures, tutorials and design studio
- » Each week 1-2 hours work out of class for good results
- » Group Notebook – Will be marked
- » Individual note book – Will be marked

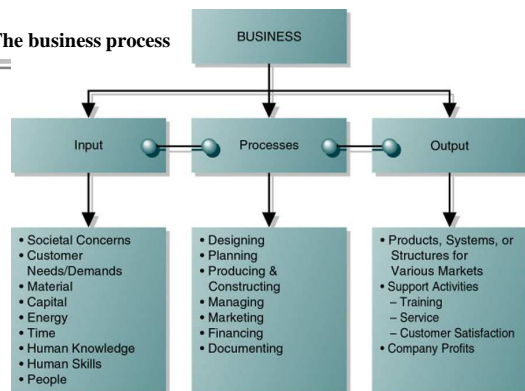
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Recommended literature

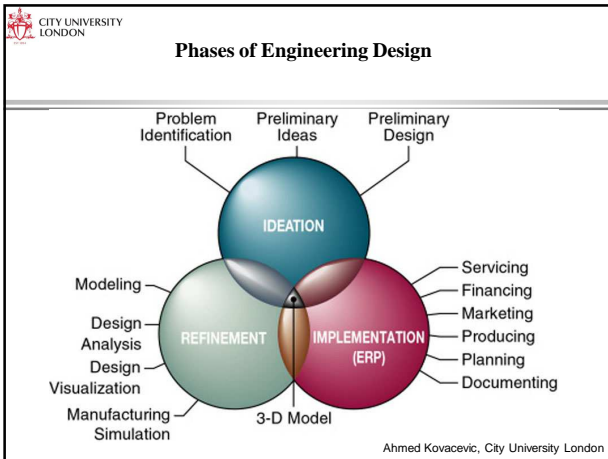
- Engineering Design Process, Yousef Haik, Tamer Shahin, Cengage Learning Engineering 2011, ISBN-13: 9780495668169
- Product Design and development, Ulrich, Eppinger, McGraw Hill, 2003, ISBN 007-247146-8
- The Mechanical Design Process, 3rd Edition, Ullman, McGraw Hill, 2003, ISBN 007-112281-8
- Mechanical Engineering Design, 7th edition, Shigley, Mischke, Budynas, McGraw Hill, 2004, ISBN 007-252036-1
- An Introduction to Mechanical Engineering, J Wickert, Brooks/Cole – Thomson learning, 2004, ISBN 0-534-39132-X
- Fundamentals of Manufacturing for Engineers, Waters, 1996, ISBN 1-85728-338-4
- <http://www.staff.city.ac.uk/~ra600/intro.html>

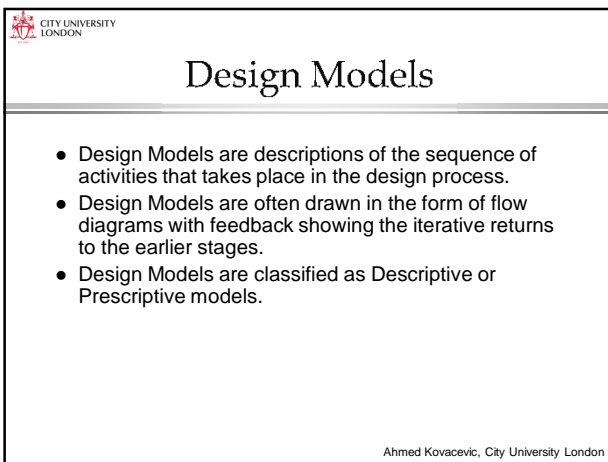
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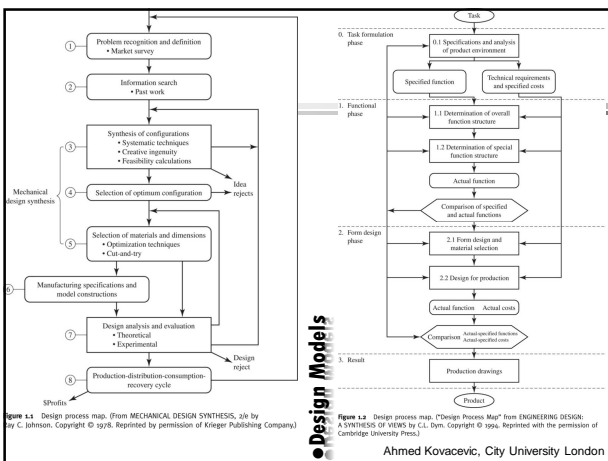
The business process

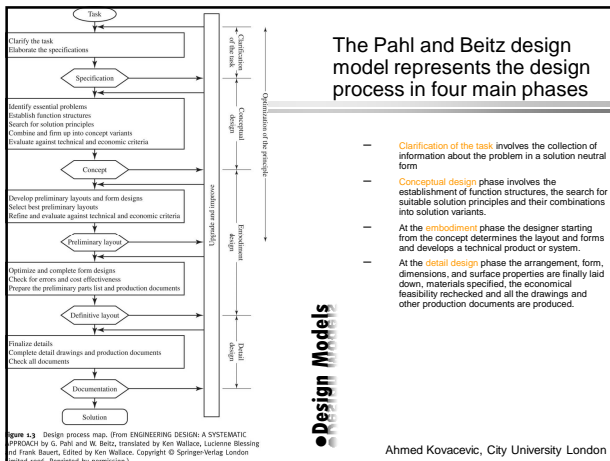


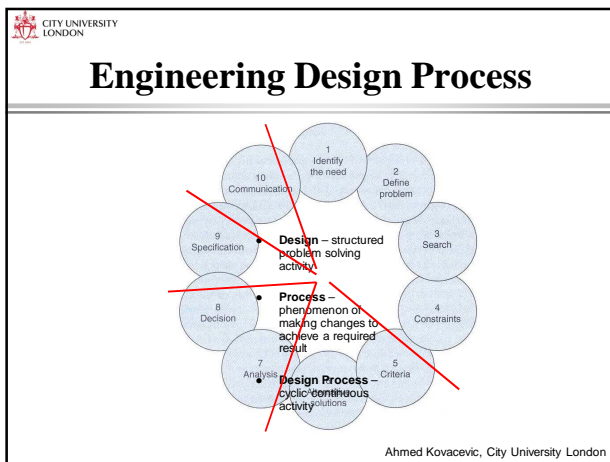
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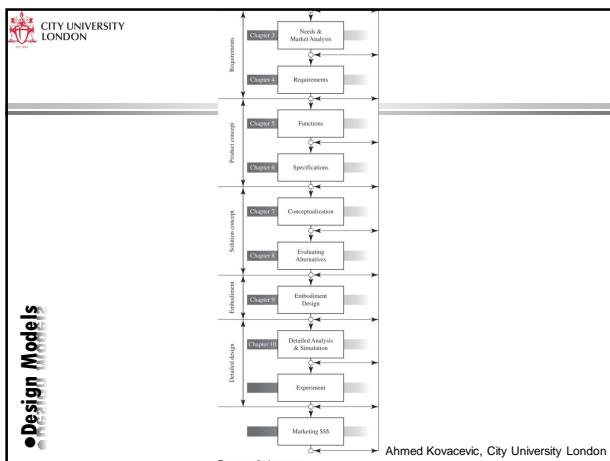


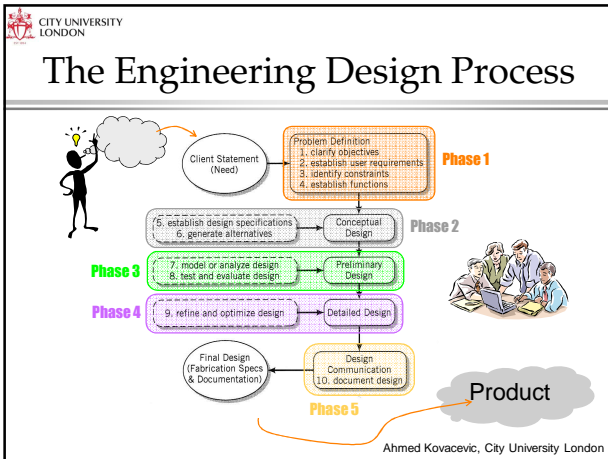


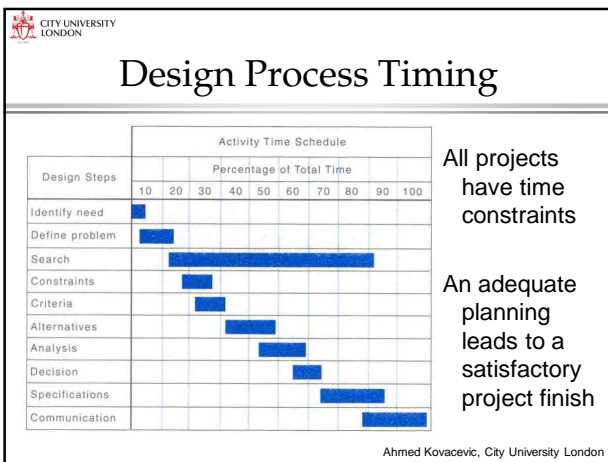


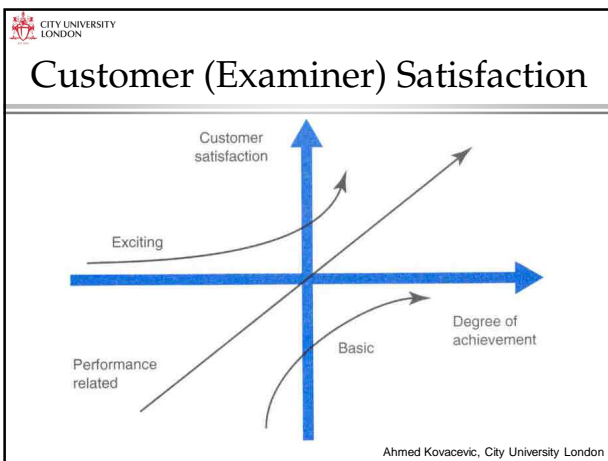


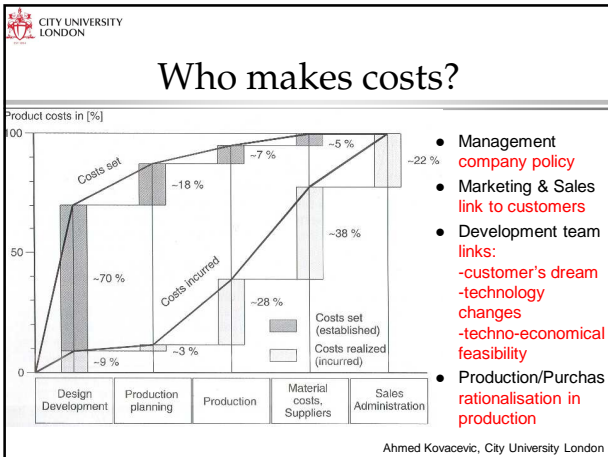


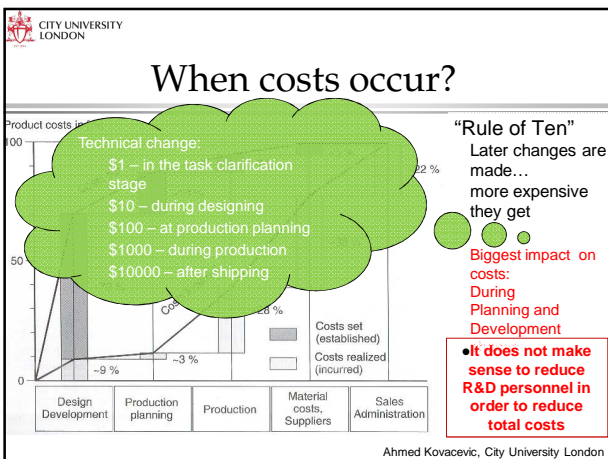













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Philosophy of Designing in general

- 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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Teamwork and Personality Preferences

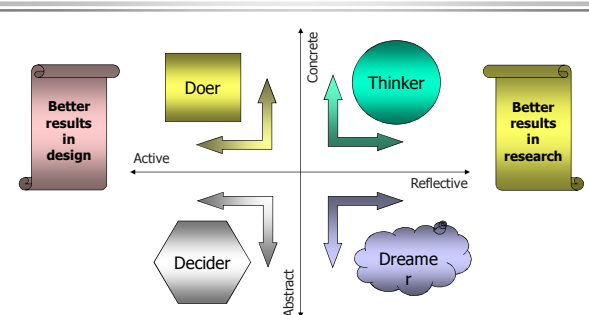
- Working in Teams**
 - » Today, most new products, systems and processes are produced by teams
 - » Teams bring together INDIVIDUALS with different strengths to generate a better product
 - » Individually created items tend to be from a past era
 - » Most of products are multidisciplinary

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Influence of activity styles



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Teamwork and Personality Preferences

- Personality Preferences – important for success**
 - » MBTI-Meyers-Briggs Type Indicator
 - » Provides a measure of your preferences along four dimensions
 - » Personality preferences influence problem-solving approaches
 - » Teams that are diverse in terms of personality preferences are often more effective
- Tasks:**
 - » See MBTI self-score and explanation sheet
 - » Fill in MBTI for yourself

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Question 1: Where do you prefer to focus your attention or recharge?

- **Extraversion - E**

- » Attuned to external environment
- » Prefer talking
- » Breadth of interest
- » Tend to speak first, reflect later
- » Sociable and expressive

- **Introversion - I**

- » Attuned to internal environment
- » Prefer writing, listening
- » Depth of interest
- » Think before speaking
- » Private and contained

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Question 2: How do you take in data, find out about things?

- **Sensing - S**

- » Focus on details
- » Value practical applications
- » Factual and concrete
- » Present-oriented
- » Like step-by-step
- » Trust experience

- **iNtuition - N**

- » Focus on *big picture*
- » Value imaginative insight
- » Abstract and theoretical
- » Future-oriented
- » Jump around, leap in anywhere
- » Trust inspirations

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Question 3: How do you make decisions?


- **Thinking - T**

- » Analytical
- » Logical problem-solvers
- » Strive for objective truth
- » Reasonable and fair

- **Feeling - F**

- » Sympathetic
- » Assess impact on people
- » Strive for harmony
- » Compassionate and accepting

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Question 4:


How do you orient to the outside world?

- **Judging - J**
 - » Scheduled
 - » Organized
 - » Systematic
 - » Like to plan
 - » Avoid last-minute stress

- **Perceiving - P**
 - » Spontaneous
 - » Open-ended
 - » Casual
 - » Adaptable
 - » Energized by last-minute pressures

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ISTJ (16.5%) <i>Stop working so hard!</i> Projects get done when we pay attention to facts and to what needs to happen now. Play comes later.	ISFJ (4.6%) <i>Stop worrying about everyone!</i> Each team member matters. Attention to each person's needs and wants helps us function well.	INFJ (2.7%) <i>Stop staring off into space!</i> Thinking about the future and its implications for our team is vital to team productivity.	INTJ (9.5%) <i>Stop being so stubborn!</i> A team's vision that's well thought out is worth fighting for!
ISTP (6.2%) <i>Stop nit-picking!</i> Precision and accuracy of information allows our team to produce good work.	ISFP (2.6%) <i>Stop wearing your heart on your sleeve!</i> Caring for our teammates displays our humanity and can translate into increased team involvement.	INFP (3.9%) <i>Stop feeling hurt!</i> Exploring our deeply held beliefs and values keeps this team on the right path.	INTP (8.5%) <i>Stop being so theoretical!</i> Teams need to develop models and carefully analyze concepts before they can begin effective work.
ESTP (4.2%) <i>Stop being so blunt!</i> Sometimes this team needs a jolt to get it back to work.	ESFP (2.3%) <i>Stop playing!</i> Life should be lived; work should be enjoyed. Happy people are productive people.	ENFP (3.7%) <i>Stop changing your mind!</i> This team needs to explore all the options as it gets down to work.	ENTP (7.4%) <i>Stop generating new actions!</i> Entrepreneurial teams keep business coming in.
ESTJ (12.7%) <i>Stop driving things so hard!</i> Some tough work needs to be done right now.	ESFJ (3.5%) <i>Stop socializing!</i> Friends and relationships keep people committed and loyal to the team.	ENFJ (2.1%) <i>Stop talking!</i> Knowing each team member well is one of the things that holds this team together.	ENTJ (9.4%) <i>Stop trying to manage us!</i> Someone needs to take charge.
Personality preferences for students <small>Kretschmer, S., 1992. MBTI Team Building Program: Leader's Resource Guide, Consulting Psychologists Press, Inc.</small>			



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Assignment

- Can you identify your personality preference
- We need to make teams.
 - » From ME1 and ME2 -> 4 teams
 - » From ME3 and ME4 -> 4 teams

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