Mechanical Analysis and Design
ME 2104

Lecture 11

Embodiment design

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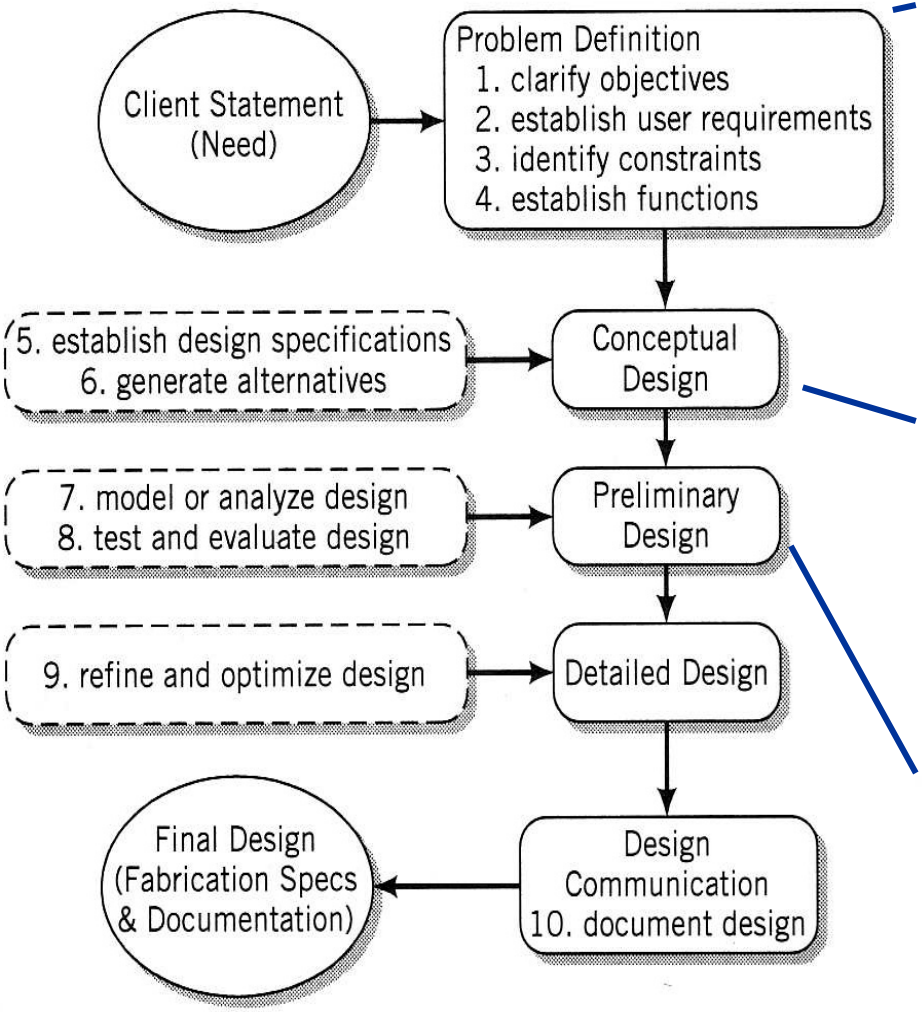
www.staff.city.ac.uk/~ra600/intro.htm

Plan for today

- Review of term 1 (15 min)
  - » What is expected in term 2…
- Presentation from technical staff (40 min)
  - » Manufacturing schedule and principles
  - » Materials provided to teams
  - » Control system
- Lecture Embodiment design (35 min)
- Q&A (10 min)

What did we do in Part 1?



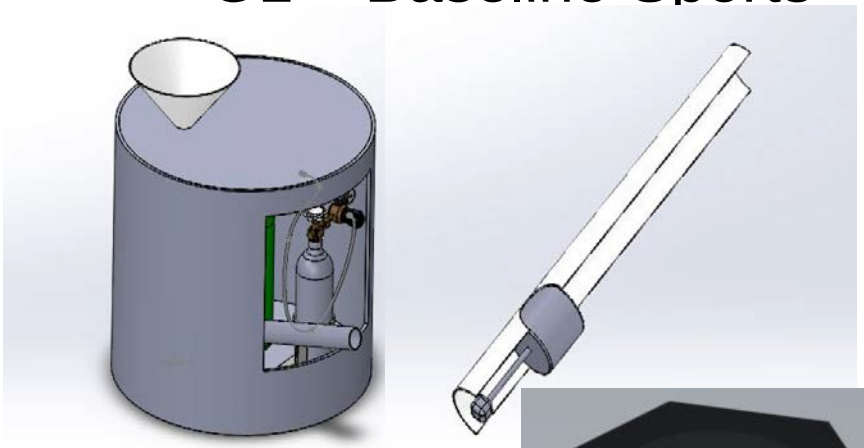
1. Clarify objectives
   The Objectives Tree method
2. Establish user requirements
3. Identify constraints
4. Establish functions
   The Function Analysis method

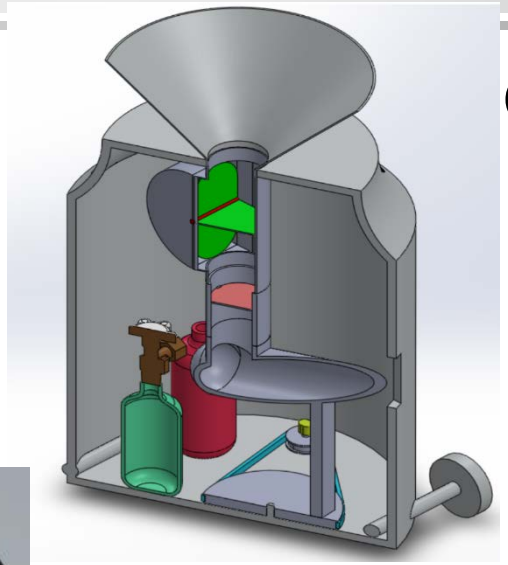
5. Establish design specification
   The Performance Specification method The QFD Method (Design Matrix)
6. Generate alternatives
   The Morphological Chart method

7. Model and Analyse design
   Mechanical Design methods
8. Test end evaluate design
   The Weighted Objectives method

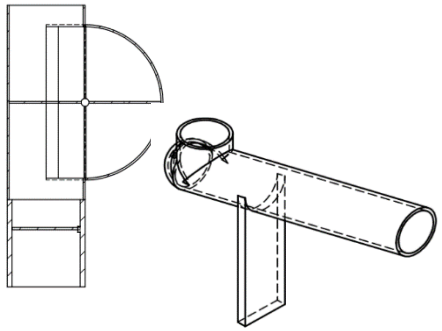
Concepts developed

G1 – Baseline Sports





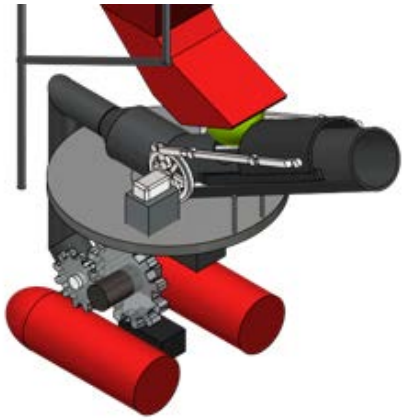
G2 – HAWKEYE

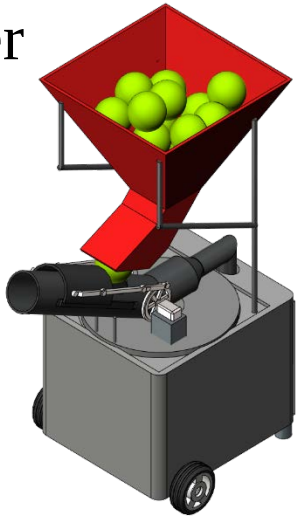


G3

MobiuServer

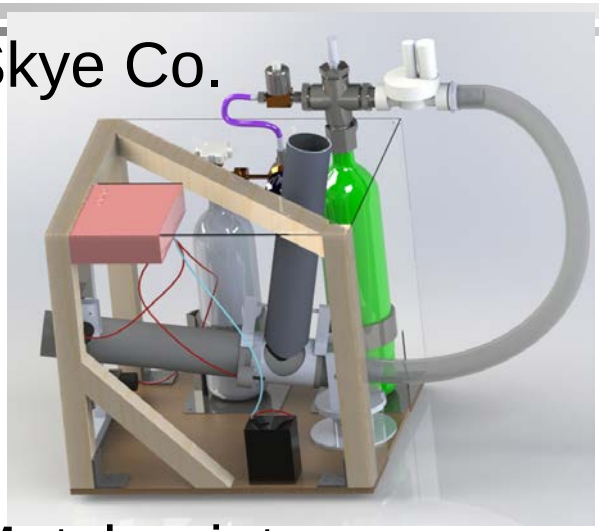
G4 – City Tennis Trainer



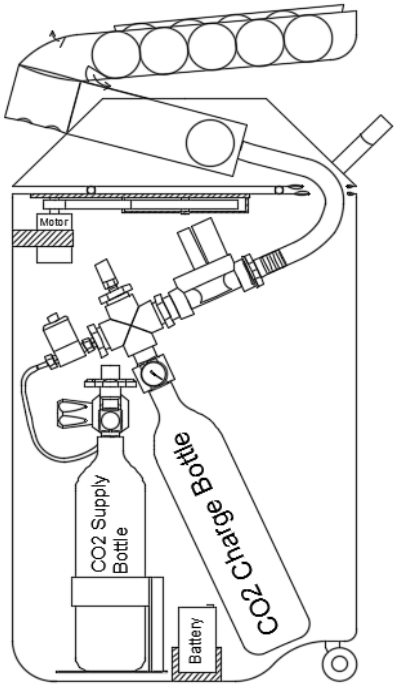


Concepts developed

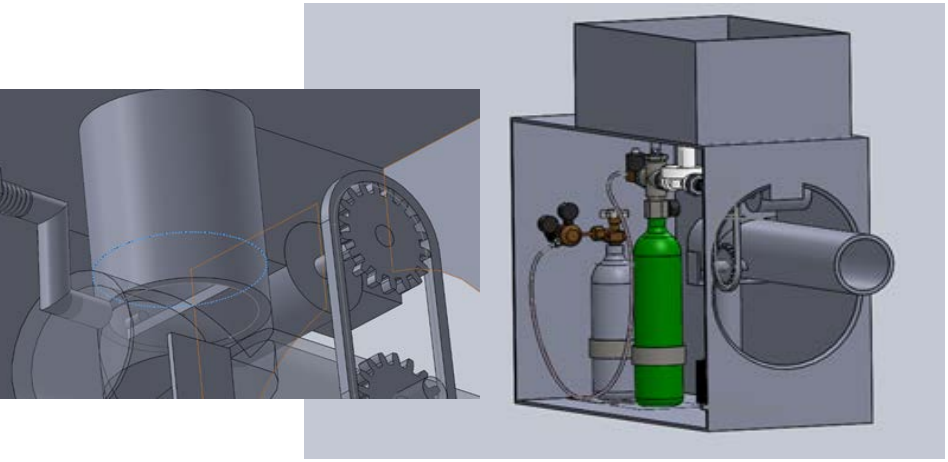
G5 – Skye Co.



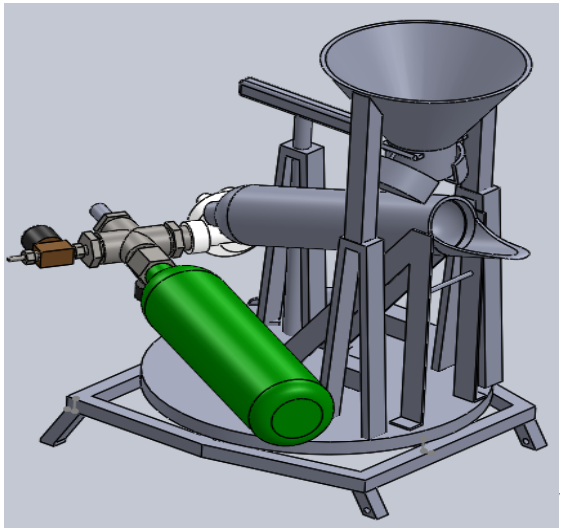
G6 – ACE Master



G7 – Matchpoint

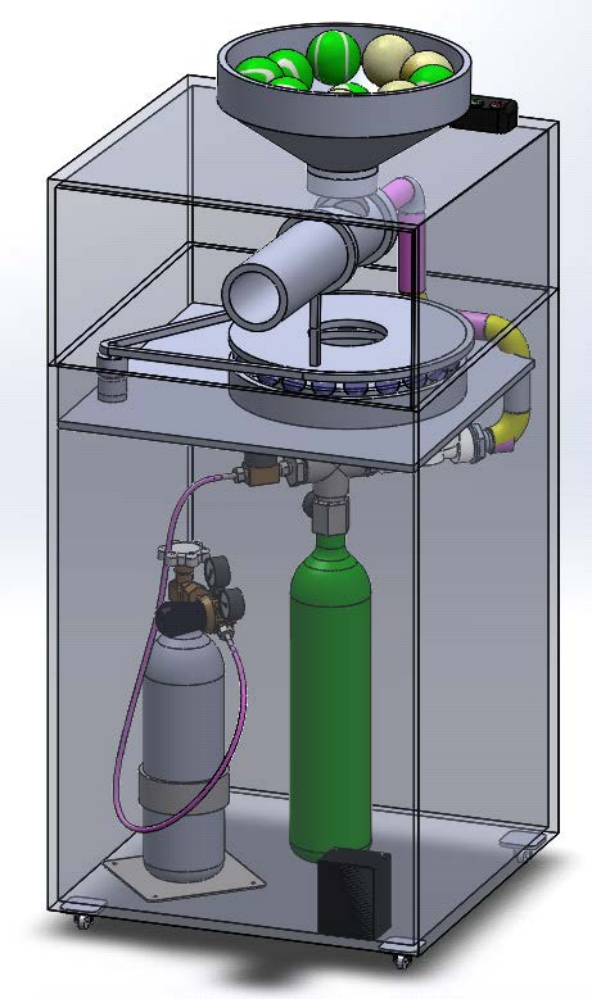


G8 – The Raqueteer

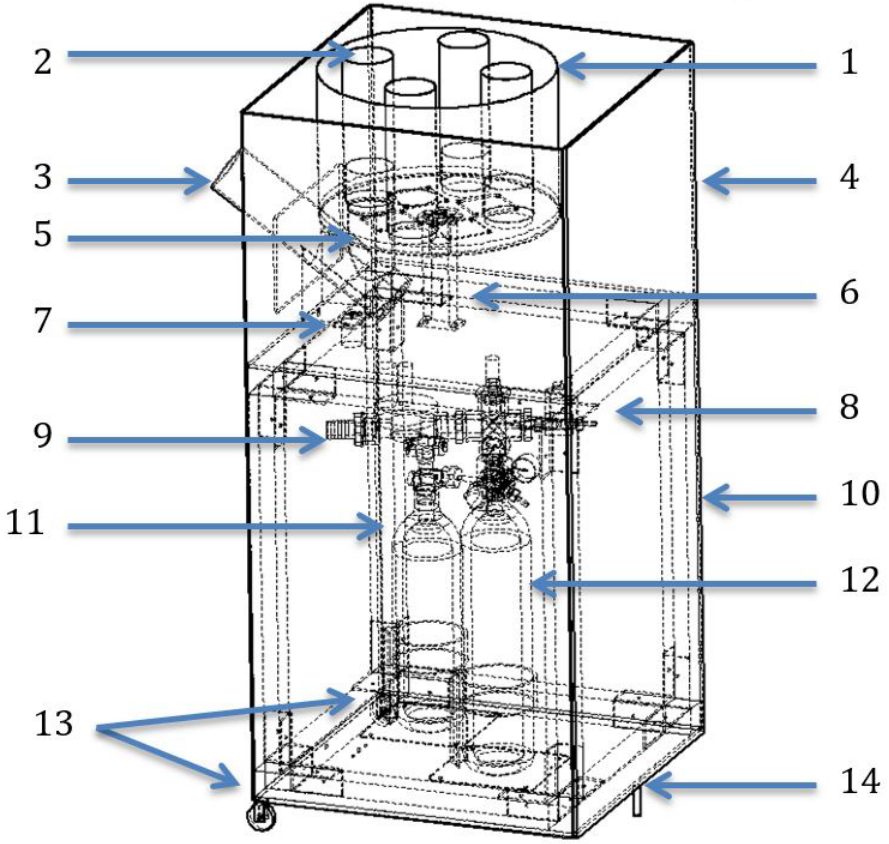


Concepts developed

G9 – Ace



G10 – Aceservers



What next?

- Implement feedback from coaches on 2nd PR
- Embodiment design before 9th February
- Detailed design by 23rd February
  - » To include detailed calculation of all relevant elements (fluid, structure, control…)
  - » Full 3D CAD model and manufacturing drawings (assembly and detailed)
  - » Shopping list and purchase plan
- 3rd Project review -
  Materials to be ordered by 27th February

Schedule

Mechanical Analysis and Design		**ME2104 Part 2**	DAE1: Read
Academic Year		2016/17	DAE2: Kovacevic
Lectures Design:	Prof A.Kovacevic		DAE3: Thomas-Rodriguez
Tutor supervison:	Dr Matthew Read (Dr Sham Rane)		DAE4: Banerjee
Team coaches:	Israt Kabir, Bhagya Chagarlamudi, Abdullah Qaban, Naumana Ayub, Aamir Gulistan		CAD : Rane
Term 1			Return to ME2104 web page

Week	Date	**Design** AG22 - Mondays 9,00-10,50	**Analysis** *C314 - Fridays 10,00-11,50*	**CAD - SolidWorks (ME2110)** *Birley or OTLT Thursdays 14,00-14,50*
1	26-Sep	Introduction to Engineering design,	DAE1: Thermo/Fluid - Lecture/CW	
	30-Sep	Team work and Objectives tree		SW - Lecture 1 - OTLT
2	03-Oct	Team forming, Assignment, Start of	DAE1: Thermo/Fluid - Lecture/CW	
	07-Oct	the project		
3	10-Oct	Objectives Tree, Functional Model	DAE1: Thermo/Fluid - Lecture/CW	
	14-Oct	Project work - Team meeting		
4	17-Oct	Performance Specification, QFD	DAE1: Thermo/Fluid - Lecture/CW	
	21-Oct	Project work - Team meeting		
5	24-Oct	Concepts, Morph Chart	DAE1:Thermo/Fluids - Assesment	
	28-Oct	Project work - Team meeting		SW - Lecture 2 - Birley
RLW	31-Oct	1st Project Review - Vision &	Reflective learning week	
	04-Nov	Project work - Team meeting	Main project - Team meeting	
6	07-Nov	Concept Evaluation and Decision	DAE2: Mechanical Analysis-Lecture	
	11-Nov	Project work - Team meeting		SW - Lecture 3 - Birley
7	14-Nov	Concepts - revision	DAE2: Mechanical Analysis - Tut.	
	18-Nov	Project work - Team meeting		
8	21-Nov	Embodiment Design	DAE2: Mechanical Analysis-Lecture	
	25-Nov	Project work - Team meeting		
9	28-Nov	Embodiment Design - revision	DAE2: Mechanical Analysis-Tut,	
	02-Dec	Project work - Team meeting		
10	05-Dec	2nd Project Review - Embodyment	DAE2: Mechanical Analysis - Assesment	
	09-Dec			

Schedule Term 2

Mechanical Analysis and Design		**ME2104 Part 2**
Academic Year		2016/17
Lectures Design:	Prof A.Kovacevic	DAE1: Read
Tutorials Design:	Dr Matthew Read (Dr Sham Rane)	DAE2: Kovacevic
Team coaches:	Israt Kabir, Bhagya Chagarlamudi, Abdullah Qaban,	DAE3: Thomas-Rodriguez
Term 2	Return to ME2104 web page	DAE4: Banerjee

Week	Date	Design *ELG04 - Mondays 14,00-15,50*	Analysis *C309 - Thursdays 11,30-13,30*
11	23-Jan	Detailed design	DAE3: Dynamics Lecture
	27-Jan	Project work - Embodyment design	DAE3: Vehicle Dynamics - Assignment
12	30-Jan	Detailed design - revision	DAE3: Dynamics - Lecture
	03-Feb	Project work - Detailed design	
13	06-Feb 10-Feb	3rd Project Review - Detailed Design	DAE3: Dynamics - Lecture
14	13-Feb	Detailed design - revision	DAE3: Dynamics - project work
	17-Feb	Project work - Detailed design	
15	20-Feb	Manufacturing - briefing and rules	DAE3: Vehicle Dynamics - Assesment
	24-Feb	Project - Purchasing/Manufacture	
RLW	27-Feb	Reflective learning week - Manufacturing	Reflective learning week
	03-Mar	Work on the Main Project	Work on the Main Project
16	06-Mar	Manufacturing - Issues	DAE4: Elastic/Plastic Lecture
	10-Mar	Project work - Manufacturing	DAE4: Deformations&FEM - assignment
17	13-Mar	Manufacturing - Refining prototypes	DAE4: Materials - Lecture
	17-Mar	Project work - Manufacturing	
18	20-Mar 24-Mar	Testing of Prototypes (FOM)	DAE4: FEM & deformations - Lecture Team meeting - project work DAE4
19	27-Mar 31-Mar	Project work Report preparation	DAE4: Deformations&FEM - project work
20	03-Apr 07-Apr	Final Presentation	DAE4: Deformations&FEM - Assesment

Date	Week no	Time		AE1 & CLG01
Mon 13/02/2017	Week 4	16:00	18:00	Supervised Manufact.
Thu 16/02/2017	(5 hrs)	15:00	18:00	Manufacturing
Mon 20/02/2017	Week 5	16:00	18:00	Supervised Manufact.
Thu 23/02/2017	(5 hrs)	15:00	18:00	Manufacturing
Mon 27/02/2017	Reading	09:00	12:00	Supervised Manufact.
Tue 28/02/2017	week	09:00	17:00	Manufacturing
Wed 01/03/2017		09:00	12:00	Manufacturing
Thu 02/03/2017	(18 hours)	09:00	12:00	Manufacturing
Mon 06/03/2017	Week 6	16:00	18:00	Supervised Manufact.
Thu 09/03/2017	(5 hrs)	15:00	18:00	Manufacturing
Mon 13/03/2017	Week 7	16:00	18:00	Supervised Manufact.
Thu 16/03/2017	(5 hrs)	15:00	18:00	Manufacturing
Mon 20/03/2017	Week 8	14:00	18:00	FOM Testing Sports Centre

Technical issues

Mr Richard Leach – technical lead

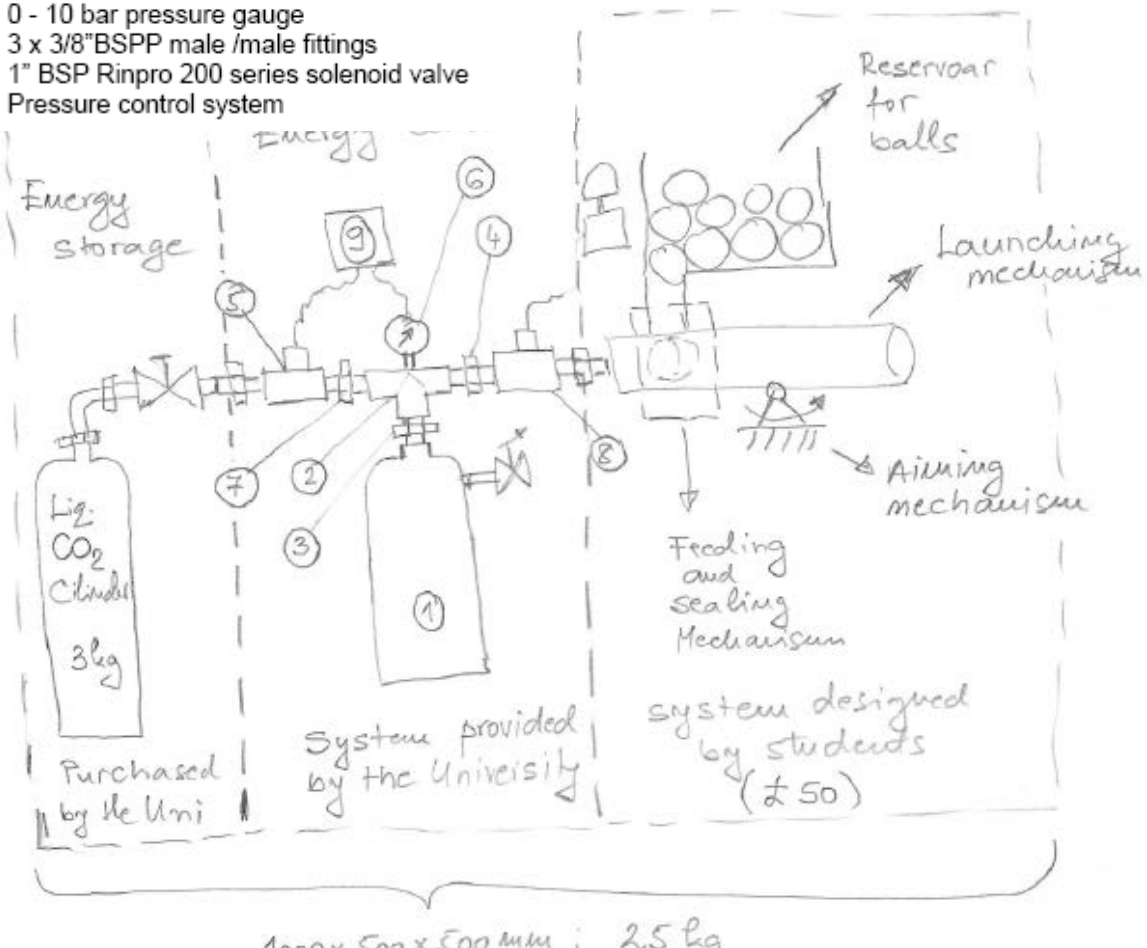
Mr Zaheer Hashim – control systems

Mr Keith Pummet – general support

Mr Grant Clow – fluid system

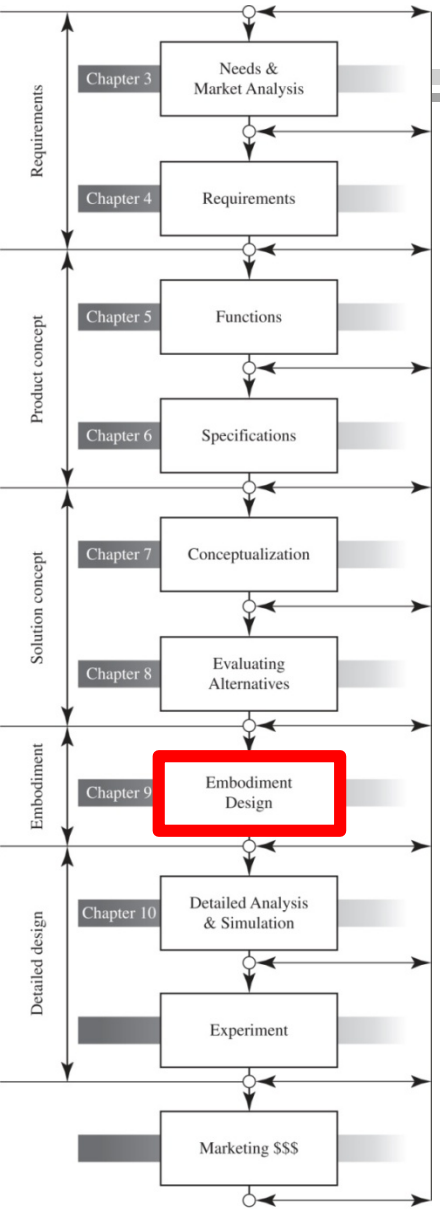
To be supplied to you

1) CO_2 fire extinguishers to use as pressure vessel
2) BSP T piece 1"
3) 1" BSP male – 3/8"BSP female bush
4) 1" BSP male/male nipple
5) 10 bar 3/8"BSP female solenoid valve
6) 0 - 10 bar pressure gauge
7) 3 x 3/8"BSPP male /male fittings
8) 1" BSP Rinpro 200 series solenoid valve
9) Pressure control system



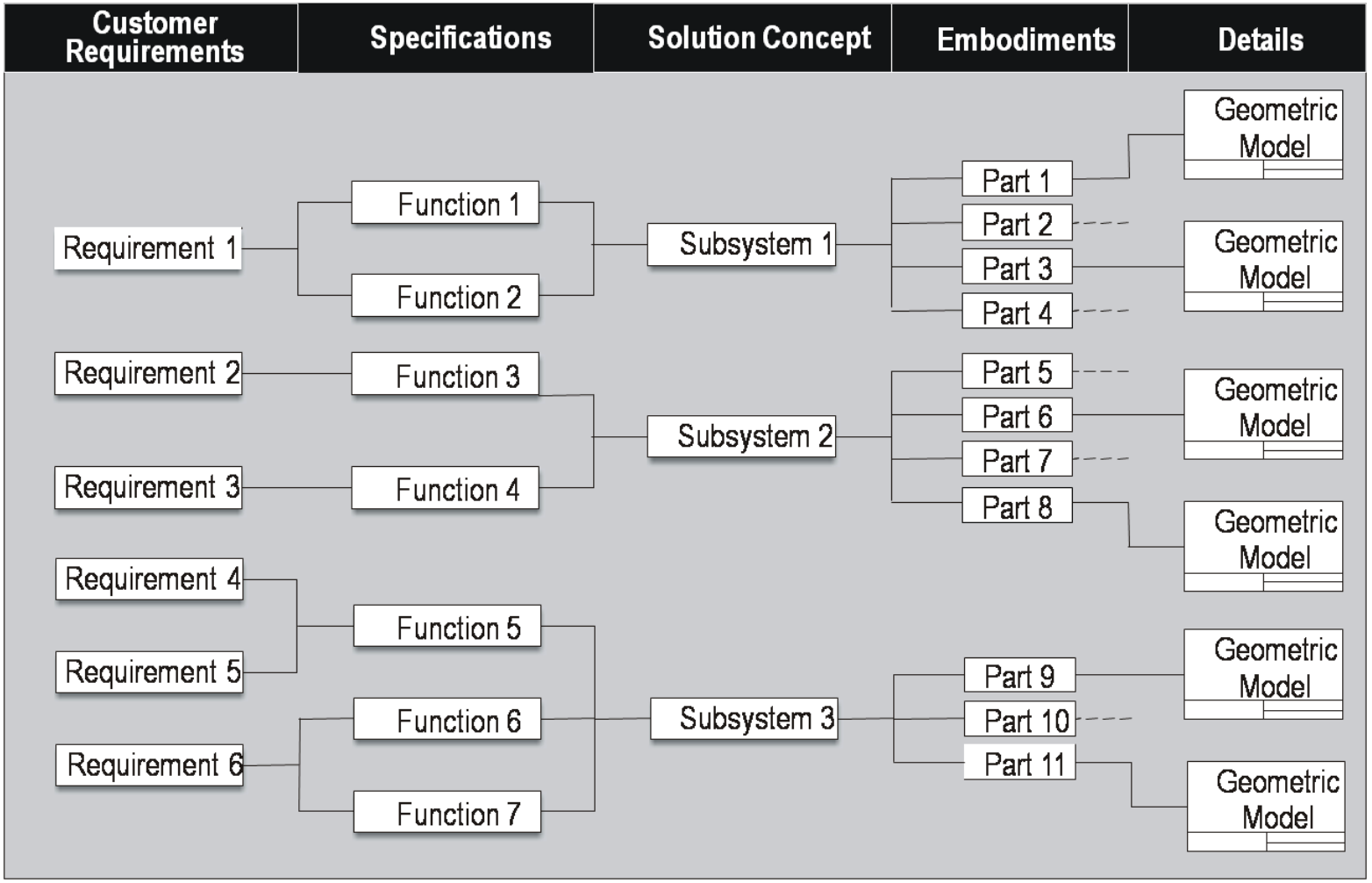
Lecture time!

Embodiment design



- Engineering Design Process 2nd Edition, Chapter 9
  - » Discuss the different types of presentations of a product
  - » Discuss the difference between prototype and mock-up
  - » Understand the term design for ‘X’

Representing Embodiments within the Design Process

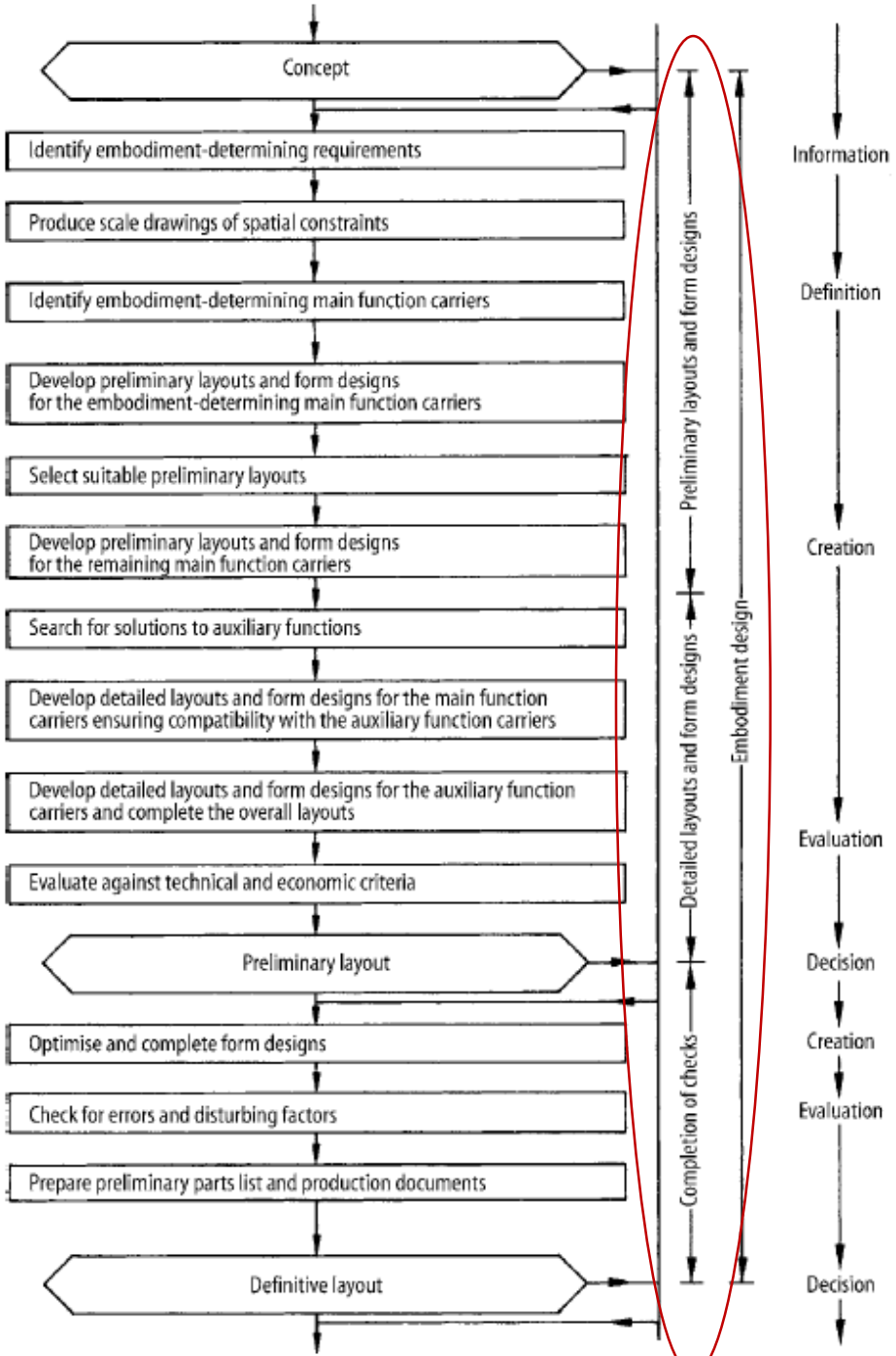


Steps in embodiment design

Embodiment design is the part of design process in which, starting from the principle solution or concept of a technical product, the *design is developed* in accordance *with technical and economic* criteria to the point where subsequent detail design can lead directly to production.

The *definitive layout* must be fully developed so that a clear check of function, durability, production, assembly, operation and costs can be carried out.

Only when this has been done is it possible to prepare the final production documents.



Product documentation

- Sketches – Conceptual design
- Assembly Drawings – Embodiment design
  - » Each component is clearly represented and identified in the list of references
  - » Detailed views are included as necessary
  - » Each component is calculated and validated
- Detail Drawings – Detail design
  - » Complete manufacturing drawings with dimensions, tolerances, material selection and manufacturing details

Design for X

- Design for manufacturing – minimising:
  - » cost of production, time to market
  - » high quality standards
- Design for assembly
  - » reduced number of parts, ease of assembly
- Design for environment
  - » Legislation, disposal, cost

Q & A

Tasks for this week

- Use feedback to update your concepts (select 1)
- Review the elements of conceptual design you made
- Update requirements list and QFD
- Construct main function carrier table
- Start working on identification of parts
- Decide who is going to do what
- Meeting on Thursday: