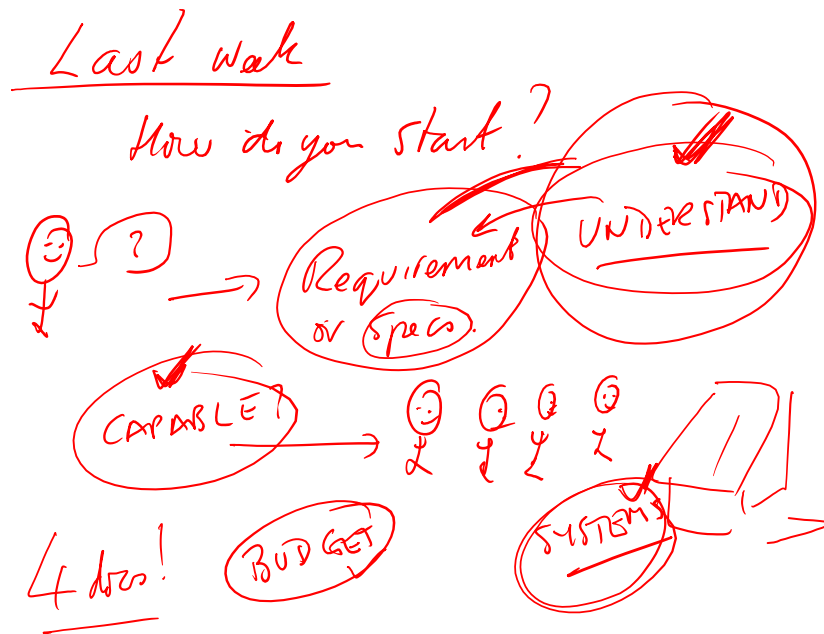


# ECSE-211

## Design Principles and Methods

Lecture: Design 4

1 February 2019



## Now What?

- Are the documents complete?

YES!

NO

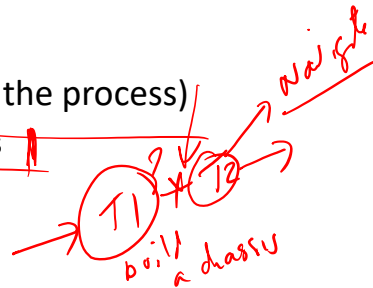
## Now What?

- Are the documents complete?
  - If we believe they are at this point, what do we do with them?

←

## Engineering Design is a Process

- Process Management – the initial documents have identified a starting point..
  - Resources (needed to implement a process)
    - People ✓
    - Knowledge ✓
    - Equipment ✓
  - Tasks (define the steps of the process)
    - Achieve goals – milestones
    - Dependencies



## Engineering Design is a Process

- We have been approached to produce a solution to a problem – *A design*
- Identify the requirements – what does the user need?
  - ✓ Do we understand it? – is everyone on the same page?
  - Can we solve it? ?
  - What is missing?
  - Identify the unknowns

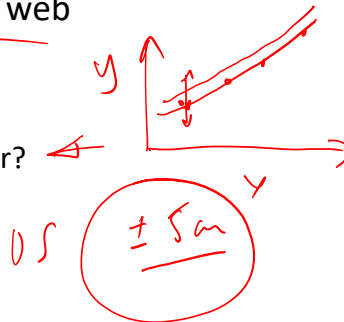
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## Identify the Unknowns

- Given the information you have and the problem to be solved, identify the unknowns..
- A new set of questions...
- Answering questions involves
  - Research
  - Development
- Set up an R&D program to resolve the unknowns so that a solution plan can be established...

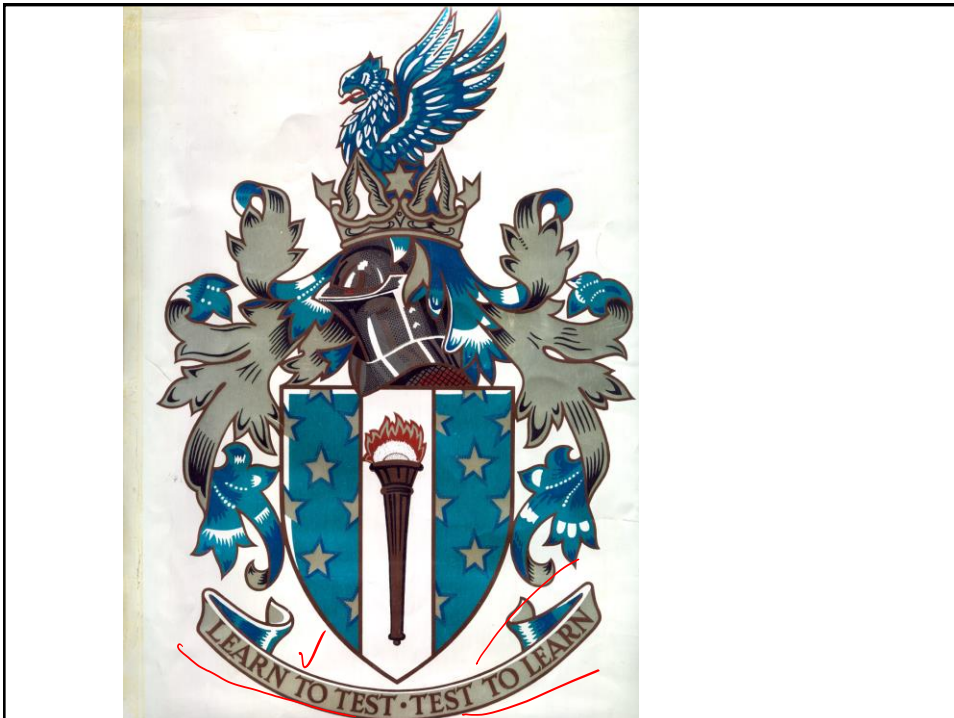
## The Research and Development Phase

- It is unlikely that you have all the information to solve the design problem
- The questions lead to a need for research
  - Documents, books, papers, web
  - Experiments –
    - What is possible?
    - What are the sources of error?
    - Design the laboratories...



## The Research and Development Phase

- The Labs...
  - Investigate the capabilities of Mindstorms
  - Understand the theory behind the tasks needed to solve the problem...
  - Implement some experiments to gain knowledge..



## Design – What's Next?

- So you have fully understood the project, you have researched the unknowns and now have the knowledge base which allows you to understand the user requirements and system constraints... What should be done next?

## Design – What's Next?

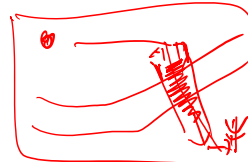
- So you have fully understood the project, you have researched the unknowns and now have the knowledge base which allows you to understand the user requirements and system constraints... What should be done next?

– Plan a solution and look for ways of getting there

– Define and sketch the system which might satisfy the requirements of the problem

– Identify the key elements before applying the appropriate physical laws

- In EE draw a circuit diagram
- In Mechanics, sketch a free-body diagram
- Create a Functional Diagram?



# Design Process

- From a first idea
  - Identify the possible components
  - Create sub-problems
    - Each subproblem becomes a design problem
  - Nested set of design problems to be solved
    - The solution process for each one may be different

