ME 100
Mechanical and Aerospace ENGINEERING

Spring 2012

Course Site:
http://www.me.unlv.edu/Undergraduate/coursenotes/egg102/egg102.htm

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Course Page

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MEG 100
Mechanical and Aerospace ENGINEERING

Expectations:

•Regular Attendance and Submission of EVERY Homework

•Details: see syllabus (Web and paper copy).

ME 100
Mechanical and Aerospace ENGINEERING

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ME 100
Mechanical and Aerospace ENGINEERING

PREVIEW

•What will I learn?

•Benefits: What will I gain?

•Effort: What will it take?

•What will I learn?

- **Engineering design:**
  Design Methods (you can always improve products)
  Communication (Reports and Presentations)
  Computer Use (become efficient)

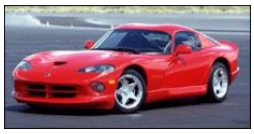
We live in an engineered World

- Everyday, we are exposed to modern tools such as:

Our Engineered World

- Everyday, we are exposed to artifacts such as:
  - Computers

The Engineered World



- Everyday, we are exposed to artifacts such as:
  - Computers
  - Automobiles

The Engineered World

- Everyday, we are exposed to artifacts such as:
  - Computers
  - Automobiles
  - Cellular Phones

Our Engineered World

- Everyday, we are exposed to artifacts such as:
  - Computers
  - Automobiles
  - Cellular Phones
  - Massive Living and Office Structures

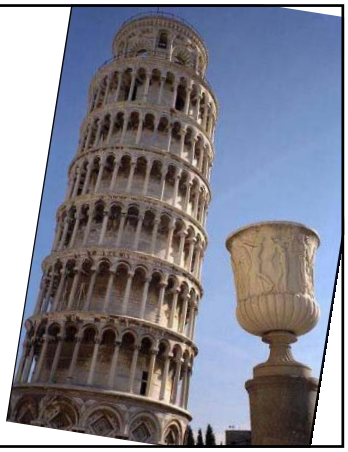
Engineers are Problem Solvers. We use the tools of science:

- Mathematics
- Rigorous Logic
- Scientific Discovery

- Galileo Galilei

Galileo Galilei (1564-1642)

- **Scientific Experiments**
- **Earth rotates about the sun**



Science is:

"systematic knowledge derived from observation, study, and experimentation carried on in order to determine the nature of what is being studied."

Chapter 1
The Engineering Profession

Always: Please read the assigned chapters ahead of class! This will give us time in class for discussion.

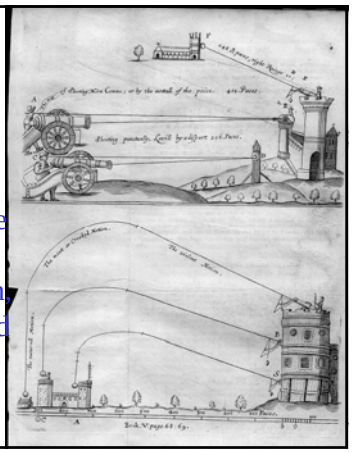
The Place of the Engineer:
Who needs them, and what do they do?

The First Engineers

The problem: In the late Middle ages, any fortification could be breached with cannon balls.

The trajectories of Cannonballs were not easily found, especially before Newton.

Gunnery tables were still a tough job in 1945. In desperation, the US Army funded the first electronic computer, the ENIAC



The Beginnings of Engineering

The NEED: Calculate the trajectory of cannon balls. Conversely: Design fortifications so that they can best withstand cannon impact.

Engineers use

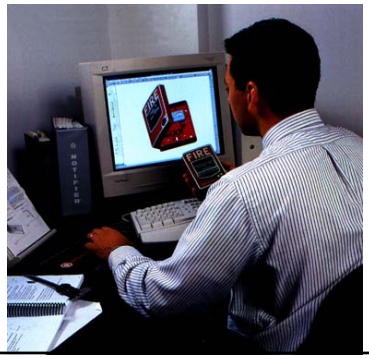
- **Applied Mathematics**
- **Scientific Instruments**

Italians saw engineering skills as ingenuity and named their practitioners 'Ingeniatore' today in It: 'ingegnere'

The First Engineers

The first Ingeniatori such as Nicolo Tartaglia, shown at left, were military engineers. Later, the skills of engineers were found to be useful in the civitas (La Citta) as well. These engineers were (and still are) called 'ingegnere civile'

Today: Design using Solid Modeling Software



El. Circuit Design

The Design Process

Design Steps	Activity Time Schedule: Percentage of Total Time (10 20 30 40 50 60 70 80 90 100)
Identify need	
Define problem	
Search	
Constraints	
Criteria	
Alternatives	
Analysis	
Decision	
Specifications	
Communication	

A time schedule must be developed early in order to control the design process.

The Design Process

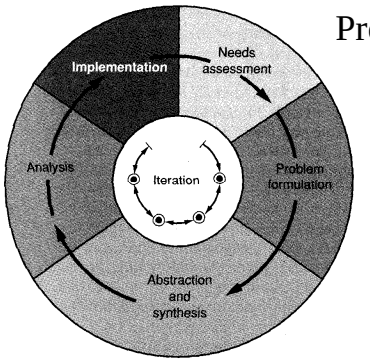


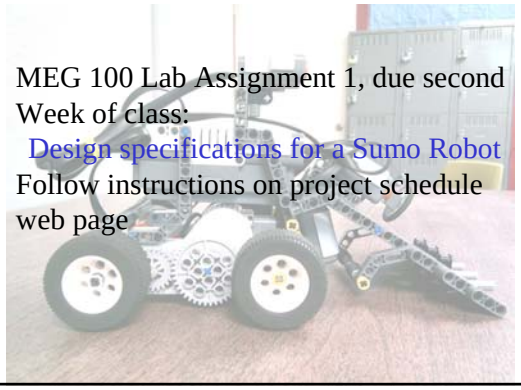
FIGURE 1.1 The engineering design process.

The Design Process

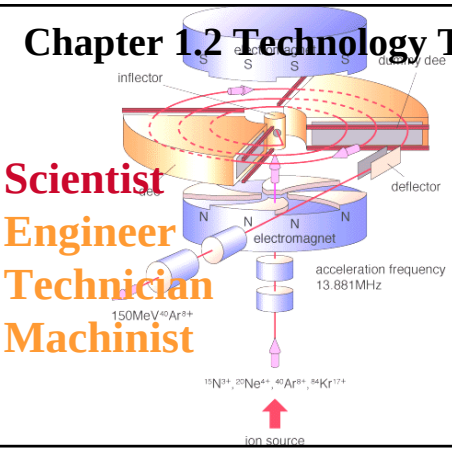
MEG 100 Lab Assignment 1, due second Week of class:

Design specifications for a Sumo Robot

Follow instructions on project schedule web page

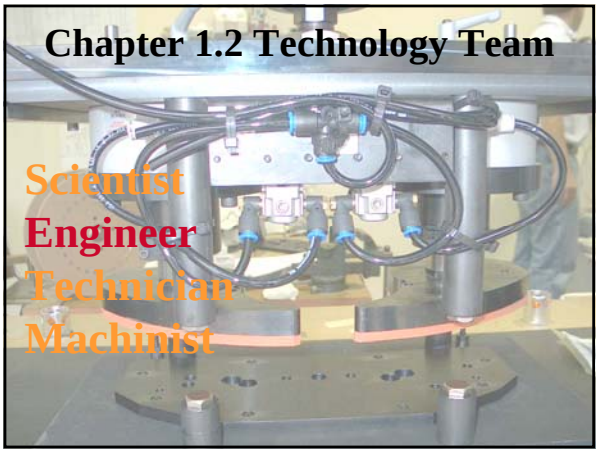


Chapter 1.2 Technology Team



Scientist
Engineer
Technician
Machinist

Chapter 1.2 Technology Team



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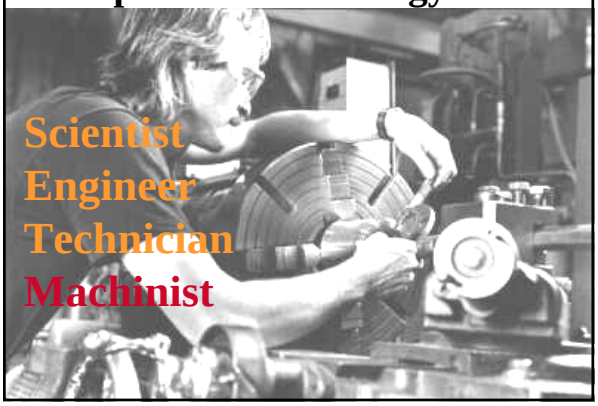
Chapter 1.2 Technology Team



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Chapter 1.3 Functions of the Engineer

Example: Turbine Design

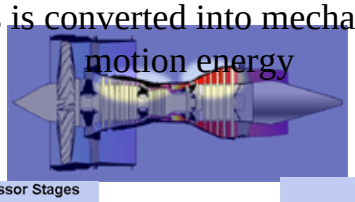
Chapter 1.3 Functions of the Engineer

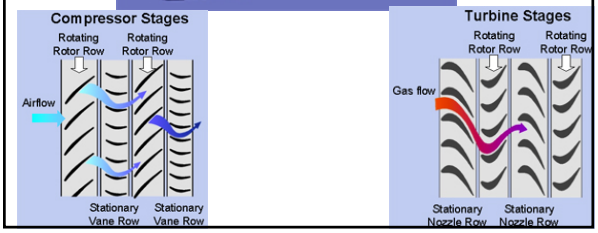
Example: Turbine Design

Chapter 1.3 Functions of the Engineer

What must we know for Turbine Design?

In a turbine, the pressure energy in the gas is converted into mechanical motion energy





Chapter 1.3 Functions of the Engineer

What must we know for Turbine Design?

1. How does it work?
2. **Engineering Science:**

Chapter 1.3 Functions of the Engineer

What must we know for Turbine Design?

1. How does it work?
2. **Engineering Science:**
   - **Fluid Dynamics**
   - **Combustion**
   - **Materials (Strain and Stress)**

Chapter 1.3 Functions of the Engineer

As students in MEG, you will take courses in:

- **Fluid Dynamics**
- **Combustion**
- **Materials (Strain and Stress)**

Chapter 1.3 Functions of the Engineer

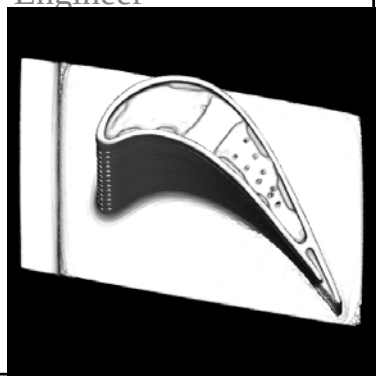
Materials (Strain and Stress)

Example: Finite Element Analysis (FEA)

Chapter 1.3 Functions of the Engineer

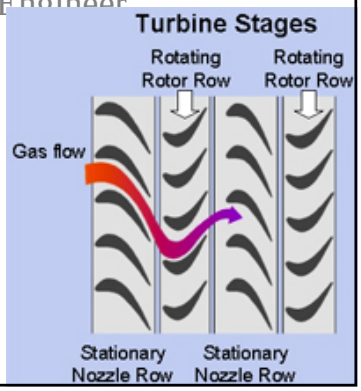
Fluid Flow

Example: Designing the blade surface.



Chapter 1.3 Functions of the Engineer

Fluid Dynamics



Chapter 1.3 Functions of the Engineer

What happens if there is a design or manufacturing error?

Chapter 1.3 Functions of the Engineer

What happens if someone makes a mistake?

Chapter 1.3 Functions of the Engineer

A Boeing 767 made an emergency landing at Sydney on 22 March 1999 after a portion of a fan blade (see preceding slide) in the right engine broke away.
The failure had originated at a foreign object damage impact site 2.54 mm aft of the blade leading edge on the rear face of the blade. Traces of mineral debris indicate that the foreign object damage was the result of stone ingestion. Fatigue crack growth probably occurred during 35 flight cycles.

Chapter 1.4 Functions of the Engineer

Summary:

- **We must understand applied science precisely and thoroughly.**
- **We use mathematical analysis.**
- **Guard against mistakes**
- **Errors can result in accidents**