



NILE UNIVERSITY of NIGERIA

DEPARTMENT OF PETROLEUM & GAS ENGINEERING

GET 101 2021. Introduction to Engineering. Presentation 1 - INTRODUCTION TO ENGINEERING

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

1. INTRODUCTION

What is Engineering?

Definition of Engineering

- *The profession in which knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied with judgment to develop ways to use, economically, the materials and forces of nature for the benefit of mankind.*

Engineering



- THE CREATIVE APPLICATION OF SCIENTIFIC PRINCIPLES AND MATHEMATICS TO DESIGN OR DEVELOP STRUCTURES, MACHINES, APPARATUS, OR MANUFACTURING PROCESSES, OR WORKS UTILIZING THEM SINGLY OR IN COMBINATION; OR TO CONSTRUCT OR OPERATE THE SAME WITH FULL CONGNIZANCE OF THEIR DESIGN; OR TO FORECAST THEIR BEHAVIOR UNDERS SPECIFIC OPERATING CONDITIONS; ALL AS RESPECTS AN INTENDED FUNCTION, ECONOMICS OF OPERATION AND SAFETY TO LIFE AND PROPERTY.

American Engineers' Council for Professional Development

Or, Simply Stated

- THE DISCIPLINE, ART, AND PROFESSION OF ACQUIRING AND APPLYING SCIENTIFIC, MATHEMATICAL, ECONOMIC, SOCIAL, AND PRACTICAL KNOWLEDGE TO DESIGN AND BUILD EVERYTHING

Engineering



What is Engineering?

The Accreditation Board for Engineering and Technology (ABET) defines engineering as:

“the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.”



Technology

technology

The purposeful application of information in the design, production, and utilization of goods and services, and in the ...



BusinessDictionary

Technology

WHAT IS TECHNOLOGY?



technology

the use of scientific knowledge for practical purposes or applications, whether in industry or in our everyday lives



Technology

Technology is the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, methods of organization, in order to solve a problem, improve a preexisting solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function.

**What will the world look like without
Engineers?**

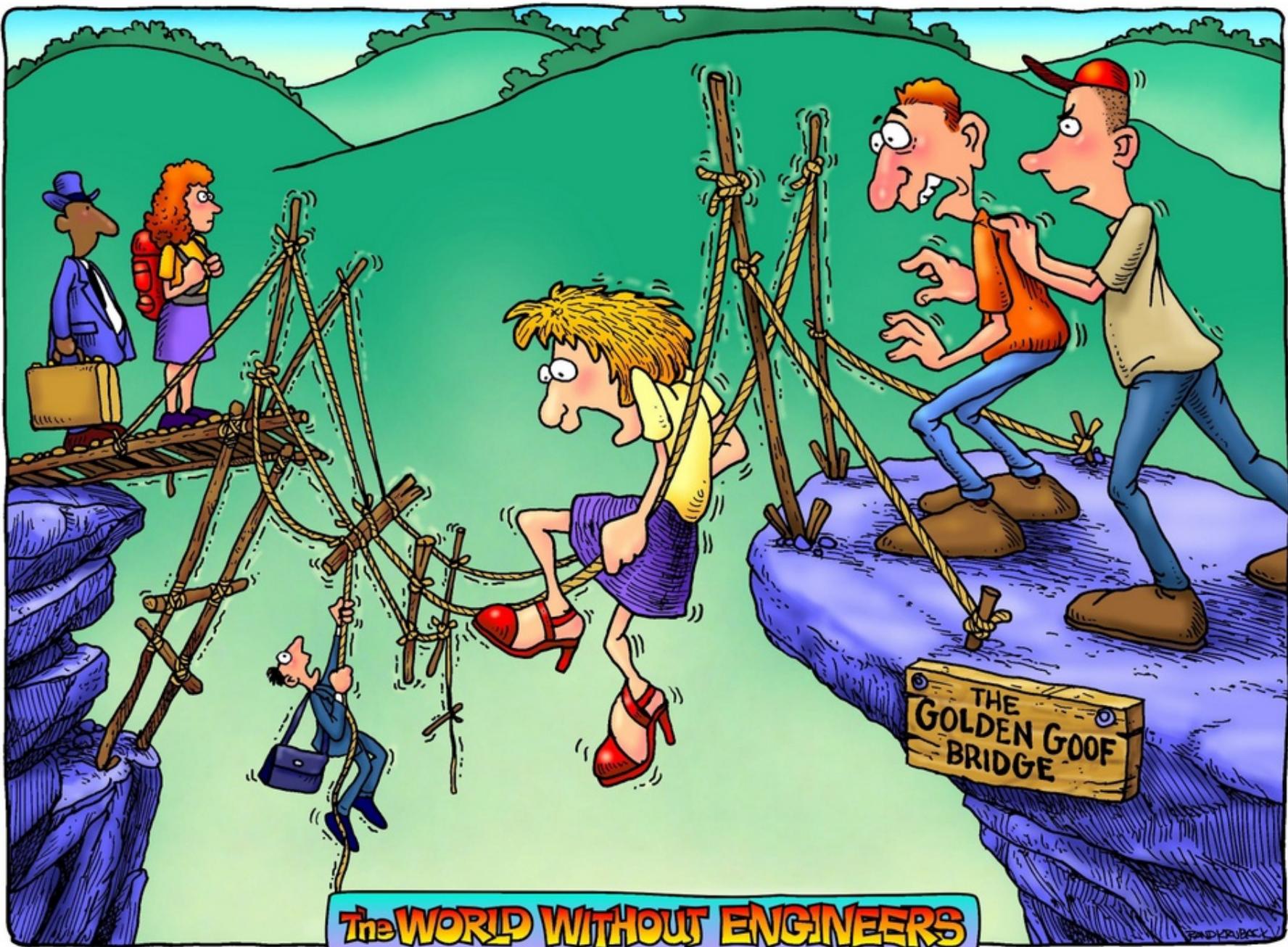


The WORLD WITHOUT ENGINEERS



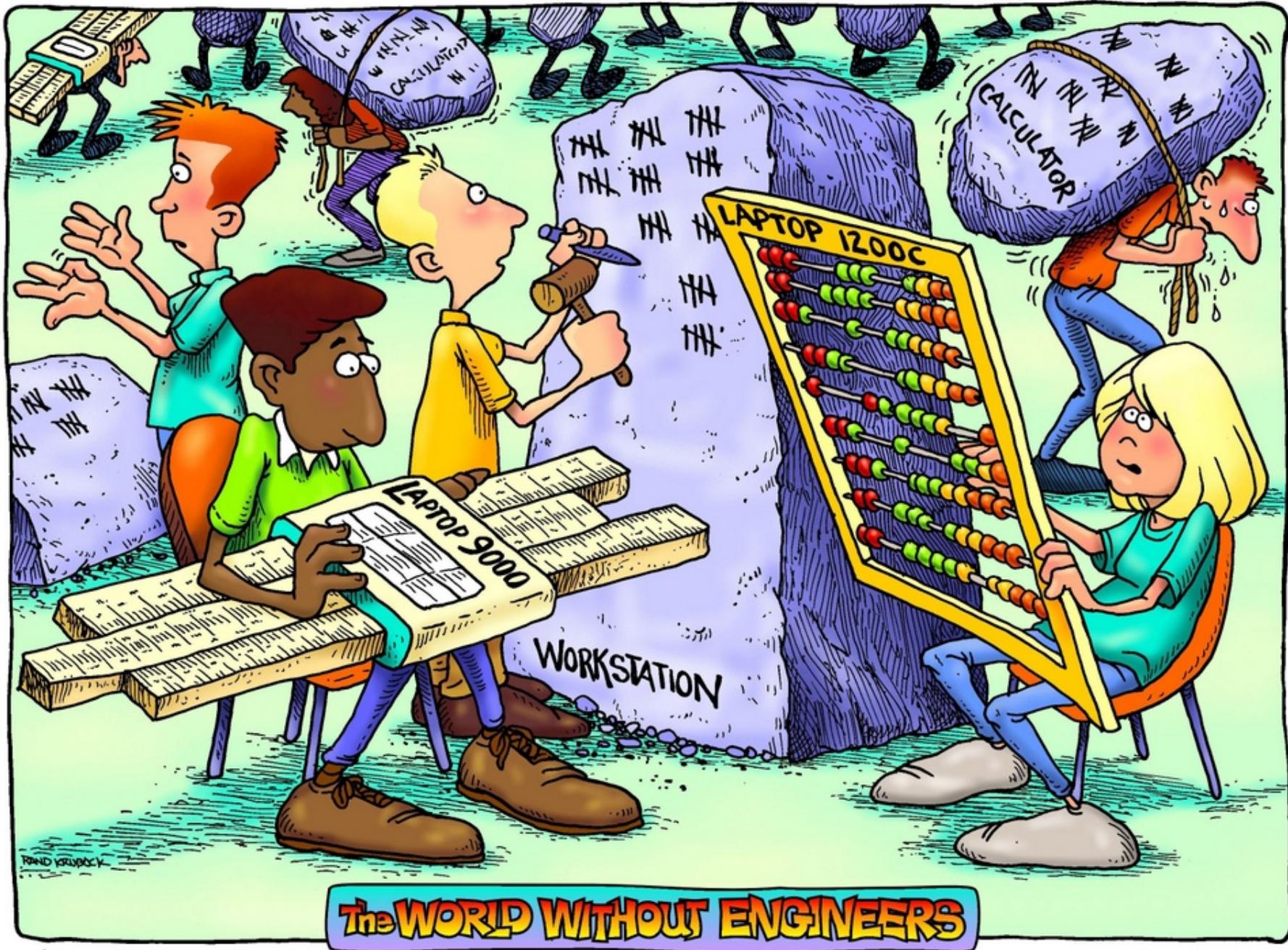
Agilent Technologies

<http://www.agilent.com/find/edu>

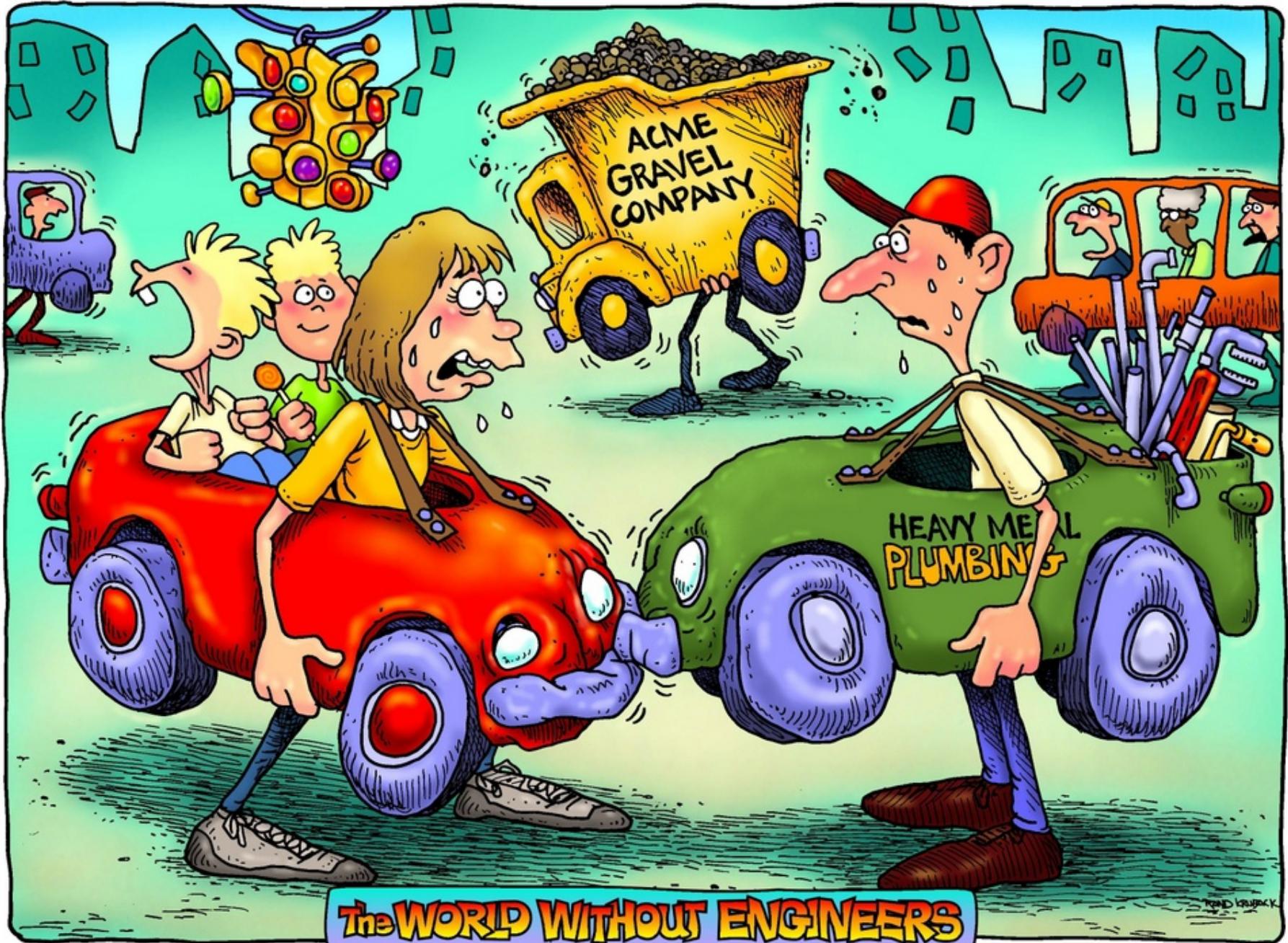


The WORLD WITHOUT ENGINEERS









The WORLD WITHOUT ENGINEERS



The WORLD WITHOUT ENGINEERS

Engineers are Inventors!

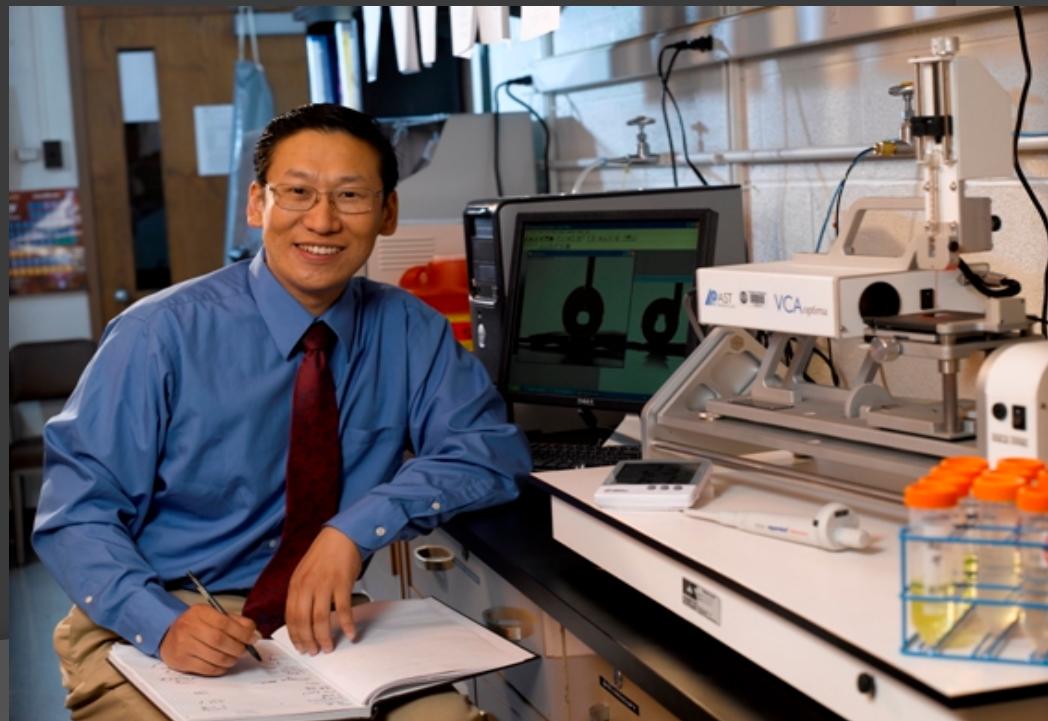
- Engineers use science and math to solve real world problems!
- What are some of the types of engineers you've heard of?
- Possibly:
 - Chemical, electrical, mechanical, software, civil, biomedical, and environmental. AND MANY MORE!

Look around you, virtually every manmade contraption you see was conceived of and created by an engineer!

Now let's take a look at
some real life engineers and
what they're working on
right now!

Separating Oil from Water

- ◎ Di Gao, a chemical engineer at the University of Pittsburg, invented a plastic-coated cotton material that could clean up the Gulf.



Designing Better Cars

- ◎ Marcus Ashford, a mechanical engineer at the University of Alabama, has invented a car engine with 80% less exhaust emissions.



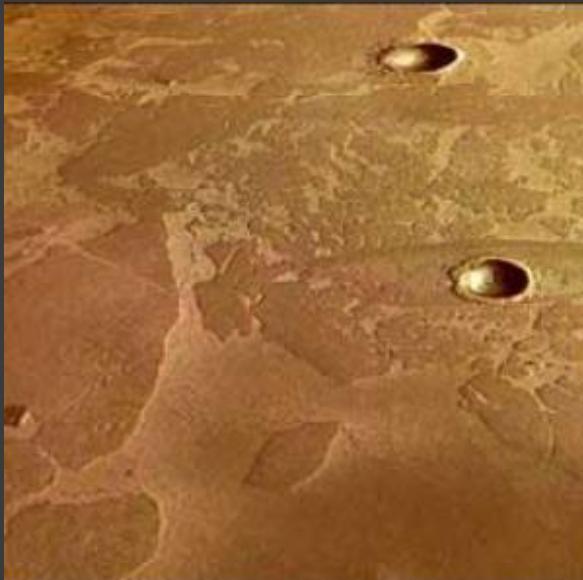
Cleaning Up the Ocean

- Alexandria Boehm is an environmental engineer who works on ways to clean up oceans near where people live.



Designing Space Colonies

- Kimberly Jones is a civil engineer working on purifying water so that we can one day go to Mars!!!

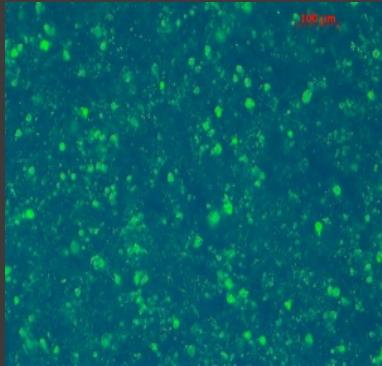


Controlling Computers with Thoughts

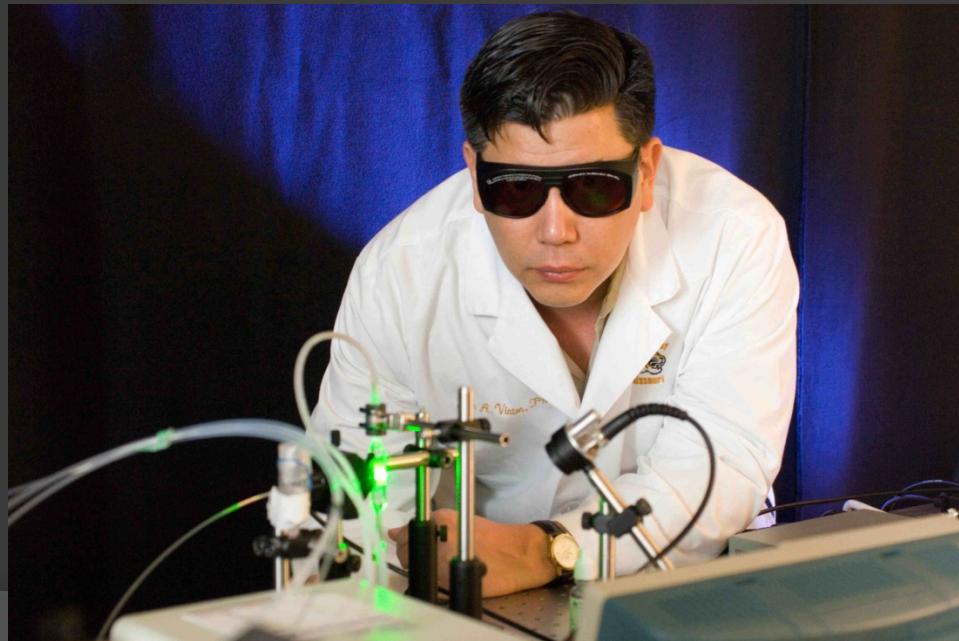
- ◎ Daniel Moran, a biomedical engineer at Washington University, has invented a way to play video games using only the human mind!



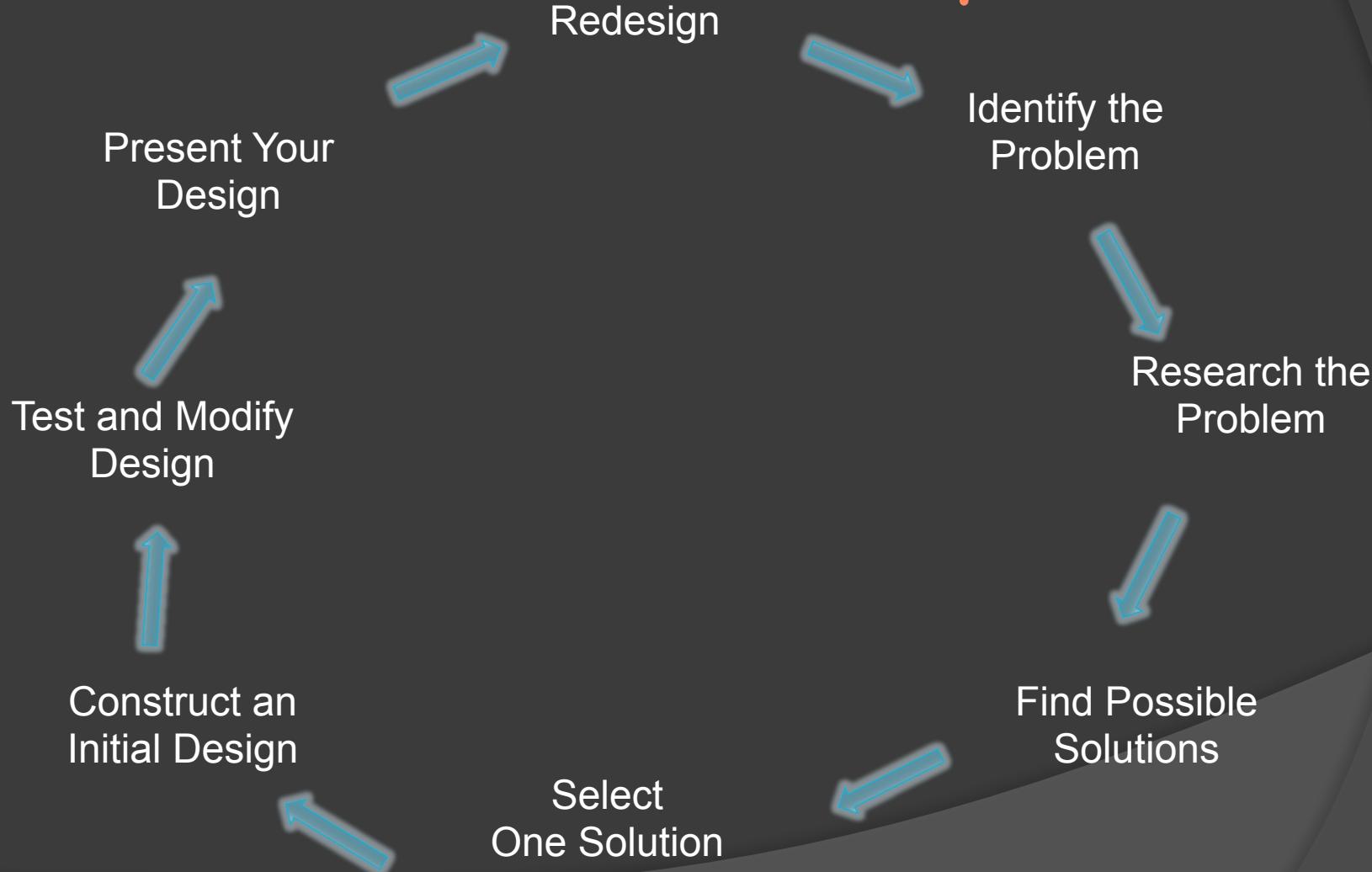
Listening for Cancer



- John Viator, a biological engineer, has invented a way to hear cancer cells.



The Engineering Design Process Loop



You will be an Engineer!

- ◎ Throughout this curriculum, you will answer:
 - 1. What is the problem that we have?
 - 2. What can you find out about the problem?
 - 3. What ideas are there already out there that could help us solve the problem?
 - 4. How can you use those ideas to determine a solution?
 - 5. What would your design look like?
 - 6. Build and test it. Does your design work?
 - 7. Show others!
 - 8. Make it better!



Why do you want to be an Engineer?

What is an Engineer?

What is an Engineer? What is an Engineer?

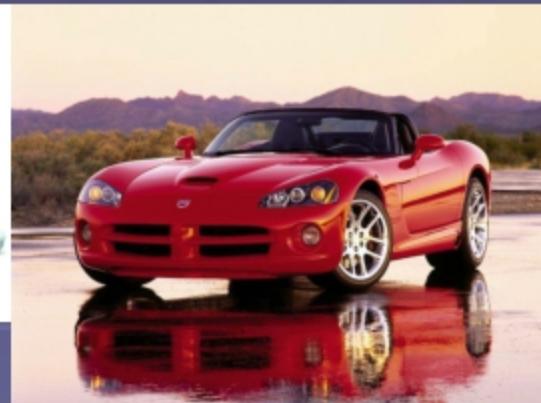


What is an Engineer?

- Someone who uses Engineering Problem Solving techniques to Develop and Improve...
 - Consumer Products
 - Drugs (the good kind)
 - Factory Processes
 - Buildings and Bridges
 - Computer programs
 - Electronics

What is an Engineer?

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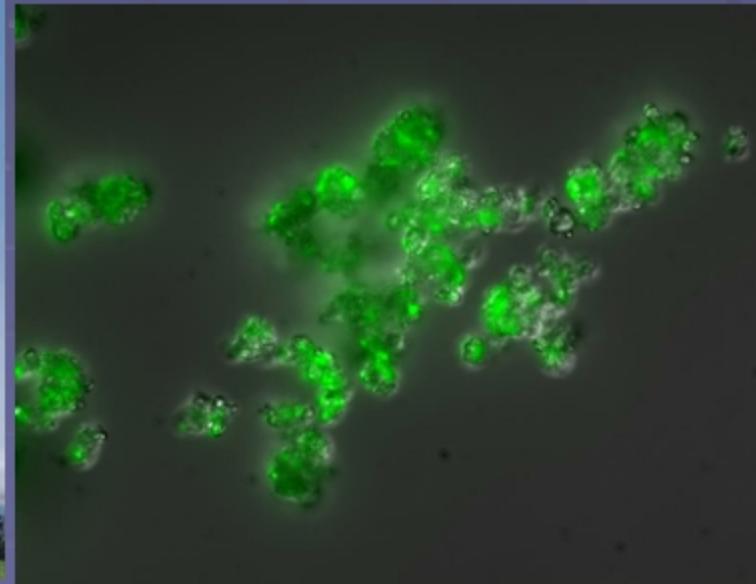
Types of Engineers

- Aerospace
- Agricultural
- Architectural
- Automotive
- Biological
- Ceramic
- Chemical
- Civil
- Computer Science
- Electrical
- Environmental
- Geological
- Marine
- Mechanical
- Materials
- Mining
- Nuclear
- Ocean
- Petroleum
- Systems
- Textile
- Transportation

Biological Engineering

Understanding Biological Systems
Designing Medical Devices

<http://techtv.mit.edu/file/336>



Chemical Engineering

Design Products and Processes



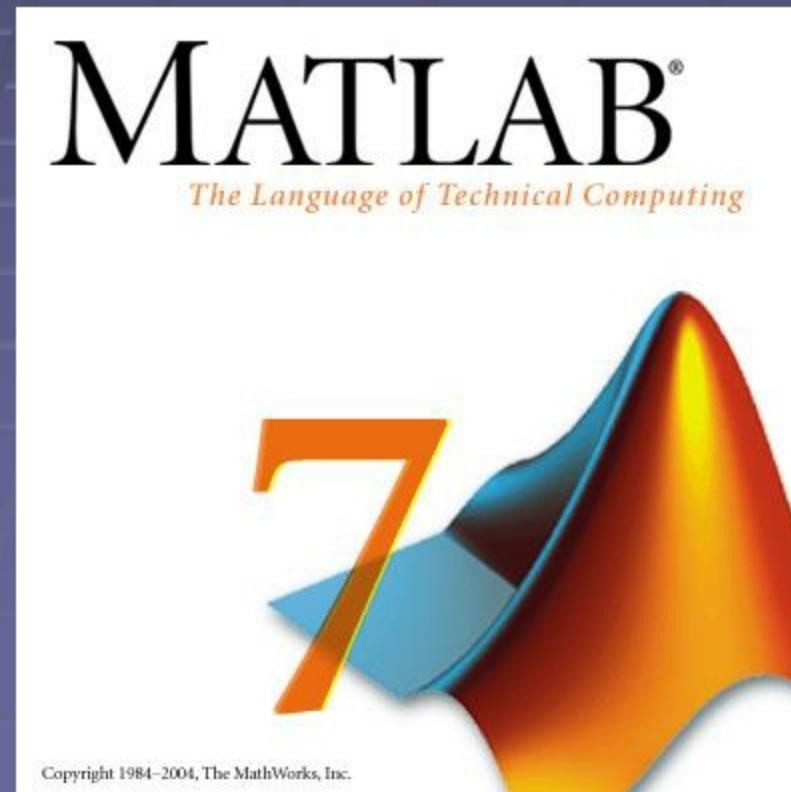
Civil Engineering



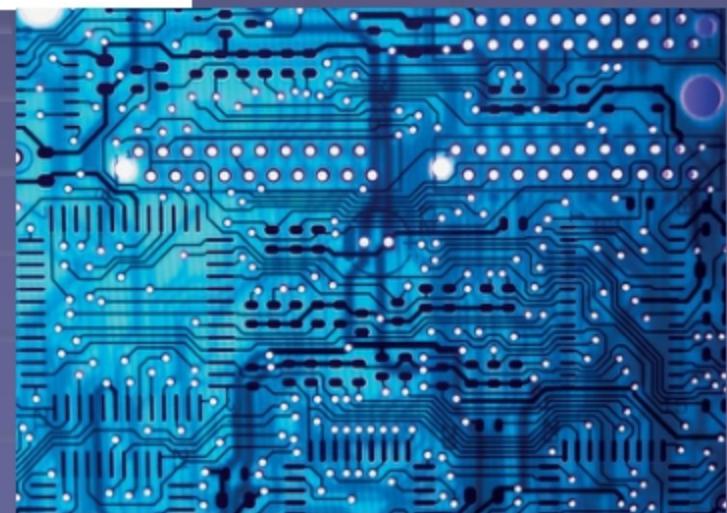
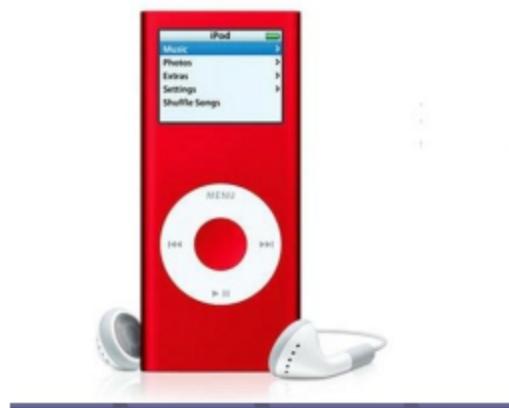
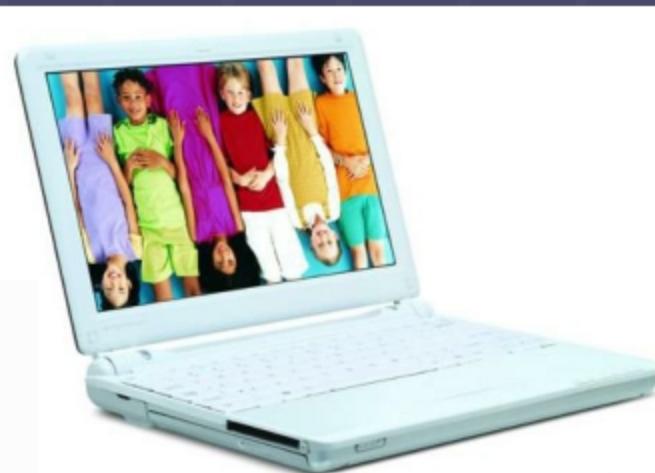
Design Buildings, Bridges, Roads,
and other kinds of Infrastructure

Computer Science Engineering

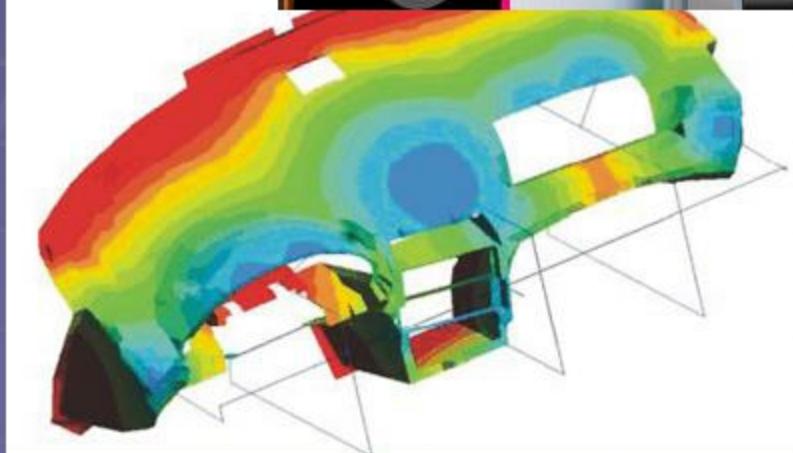
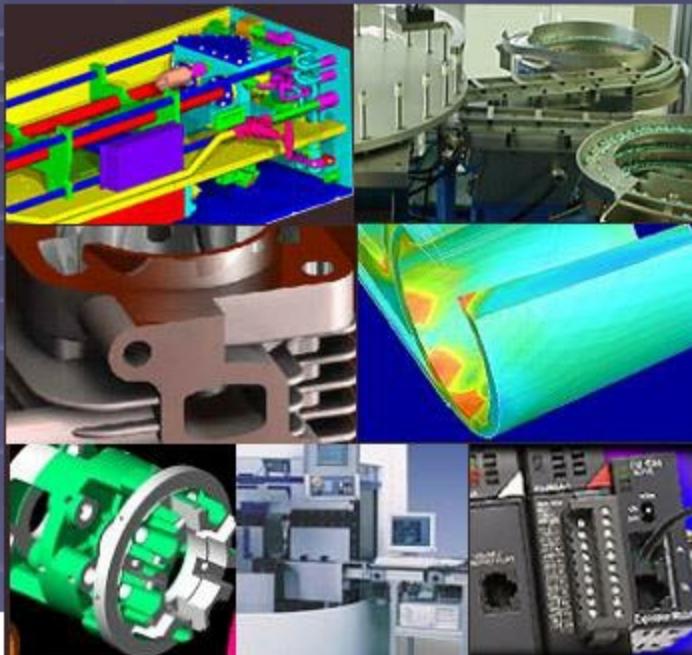
Software and Computer Programs



Electrical Engineering



Mechanical Engineering





Benefits of Engineering

- Challenging (You Don't Get Bored)
- Flexible Job Opportunities
- Good Pay and Benefits
- Lasting and Tangible Products
- Help to humankind

Engineering Problem Solving

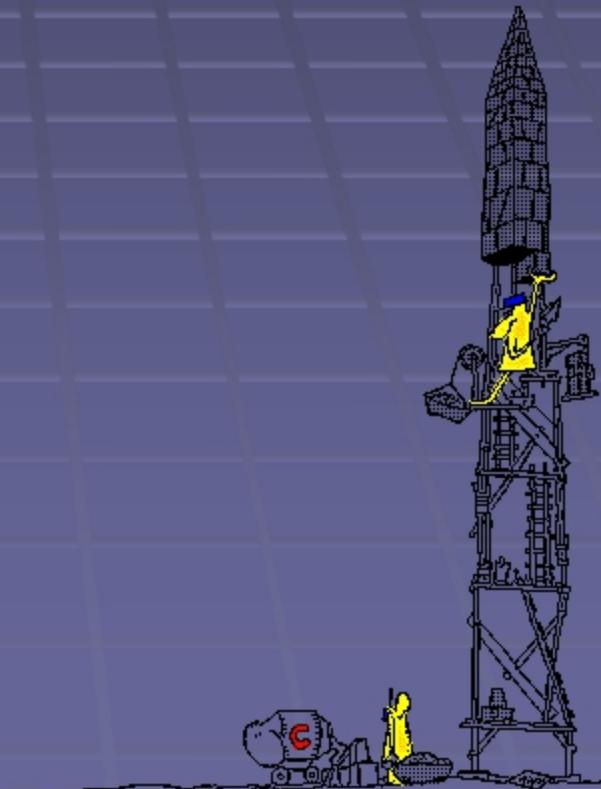
- How to Engineers approach a problem?
- Problem Type: What is the underlying mechanism/theory?
- Use: Scientific Method
 - Define the Problem
 - Research what's been done before
 - Lots of thinking
 - Form a hypothesis (testable prediction)
 - Test Hypothesis (actual experiment)
 - Analyze Data (could be more involved than you would expect)
 - Form Conclusions
 - Take appropriate actions based on conclusions

Engineering Problem Solving

- How do Engineers approach a problem?
- Problem Type: I want to build something amazing!
- Use: Design Process
 - Define the Problem
 - Research what's been done before
 - Lots of thinking
 - Create Criteria
 - May be known
 - May use scientific method to determine
 - Design Product
 - Computer simulations
 - Optimization
 - Improve it!
 - Build a prototype
 - Lets customers know what they are getting

Activity

- Build the tallest free-standing tower
- Use only the provided newspaper and tape



Engineering Problem Solving

- How do Engineers approach a problem?
- Problem Type: I want to build something amazing!
- Use: Design Process
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Interesting Links

- www.engineeringedu.com/petimes.htm Pre-Engineering Times Newsletter: a free pre-engineering newsletter filled with resources to catapult engineering education success.
- www.jets.org JETS is a national non-profit education organization that has served the pre-college engineering community for more than 50 years.
- www.AmericanEngineeringCampaign.org/informationkit.html The National Society of Professional Engineers has an easy reading site for students and teachers.
- www.asee.org/precollege American Society of Engineering Education is a guide for high school students and others interested in engineering and engineering technology careers.
- www.swe.org Society of Women Engineers provides a wealth of information for females interested in technology.
- www.usfirst.org FIRST or "For Inspiration and Recognition of Science and Technology" is a non-profit organization whose mission is to generate an interest in science and engineering among today's youth through annual robot competitions.
- www.discoverengineering.org What does an engineer do? How much does s/he make? What are different types of engineering?
- www.nsf.gov/funding/ National Science Foundation: funds summer programs around the country for all ages
- tbp.mit.edu/highschool Guide to HS Programs in Sci+Engr: awesome resource!



- The way people behave based on how their beliefs about what is right and wrong influence behavior (www.ethics.org/resource/definitions-values).
- ‘Ethics’ comes from the Greek ‘Ethos’, meaning character, or what a good person is or does to have a good character (Jay Black and Chris Roberts Doing Ethics in Media, pp. 17).

ethics (noun)

i. (philosophy) The study of principles relating to right and wrong conduct.

Ethics: A group of moral principles or set of values that define or direct us to the right choice

Morality



What is Morality?

- ▶ morality can be defined as:

a system of rules for guiding human conduct, and principles for evaluating those rules.

Two points are worth noting in this definition:

- ▶ (i) morality is a *system*; and
- ▶ (ii) it is a system comprised of moral *rules* and *principles*.
- ▶ moral rules can be understood as "rules of conduct," which are very similar to "policies."



Morality

- **Morals:** are personal principles
- **Morality:** is one's exhibited behavior influenced by personal principles
- **Moral Distress:** occurs when a situation involves conflict between 2 ethical principles
- **Moral Reasoning:** is thinking and reasoning about what one ought to do based on ones morality
- **Moral Judgment:** a decision to act or not act based on what an individual believes is good/bad—right or wrong
- **Moral Accountability:** Being responsible for one's actions==
(Duty To Oneself)

Ref. Guido (2010) Ch. 1 and 2

Ethics vs Morality



ETHICS VS MORALS

ETHICS

Reasoning Involved

Beyond Rules

Usually considered universal

For the survival of the society

MORALS

Adhere to what is described

Hard and Fast Rules

Relative to society/culture

For the survival of the individual

Ethics vs Morality



Ethics and Morality

Ethics is defined as *the study of morality*, which raises two questions: (a) What is *morality*? (b) What is *the study of morality*?

- Morality can be defined as: *a system of rules for guiding human conduct, and principles for evaluating those rules.*
Two points are worth noting in this definition: i) morality is a *system*; (ii) it is a system comprised of moral *rules* and *principles*.
- There are two kinds of rules of conduct:
 - 1) *Directives* for guiding our conduct as individuals (at the micro-level)
 - 2) *Social Policies* framed at the macro-level.
- The rules of conduct in a moral system are evaluated by way of standards called *principles*. For example, the principle of "social utility," promoting the greatest good for the greatest number.

ANY QUESTION?







NEXT TOPIC

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The Engineering Profession