



# Careers in Engineering and Engineering Technology

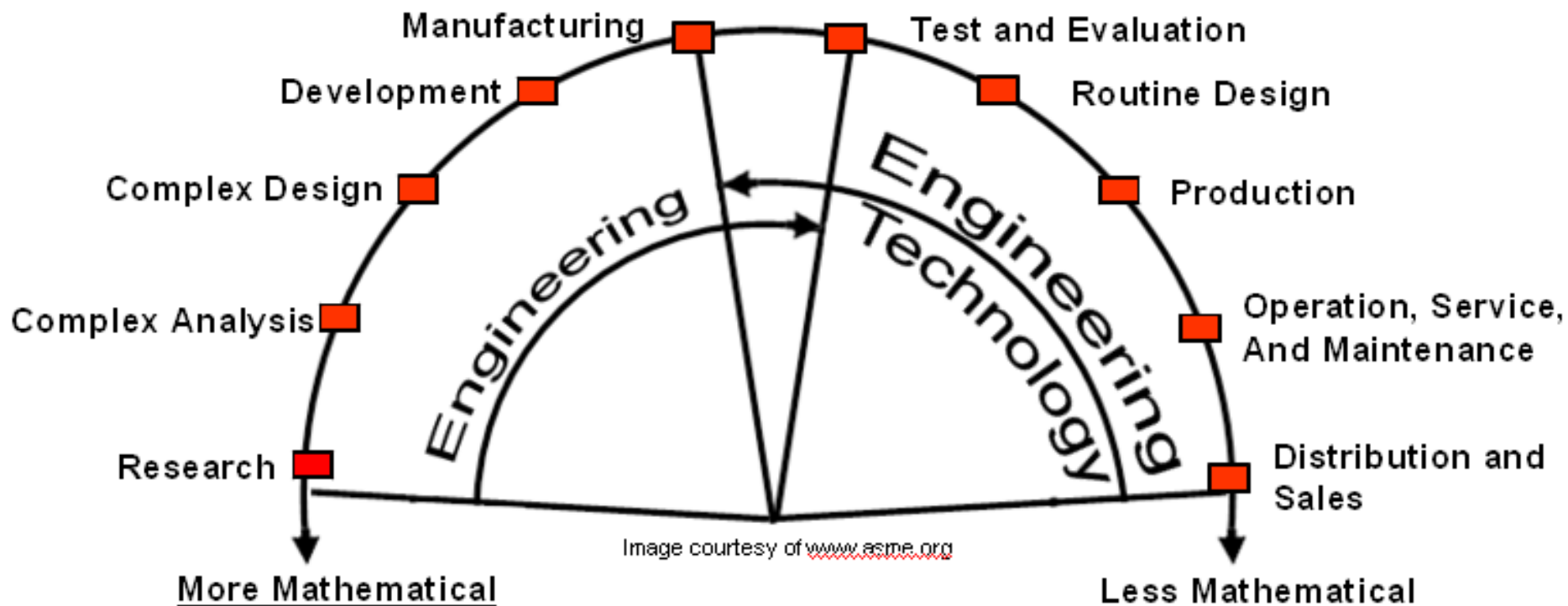
# What is Engineering?

Engineering . . .

- Is using math and science to solve practical problems
- Requires creativity, persistence, and a desire for improvement



# Engineering & Engineering Technology



# Aerospace Engineering

Design, develop, and test aircraft and spacecraft ranging from rockets and spacecraft to gliders and small passenger aircraft.



You might:

- ✓ Design or build instrumentation to colonize space
- ✓ Make planes go faster
- ✓ Make air travel safer
- ✓ Investigate crashes

# Agricultural Engineering

Create technology to advance food, biological, irrigation, and machinery systems.

You might:

- ✓ Design systems for crop growth in small spaces
- ✓ Develop fish-farming systems
- ✓ Research and modify pesticide use
- ✓ Improve food safety



# Biomedical Engineering



Devise procedures and devices to improve medical conditions.

You might:

- ✓ Design artificial organs, limbs, or joints
- ✓ Manufacture medications for diseases such as cancer or AIDS
- ✓ Determine ways to prevent sports injuries

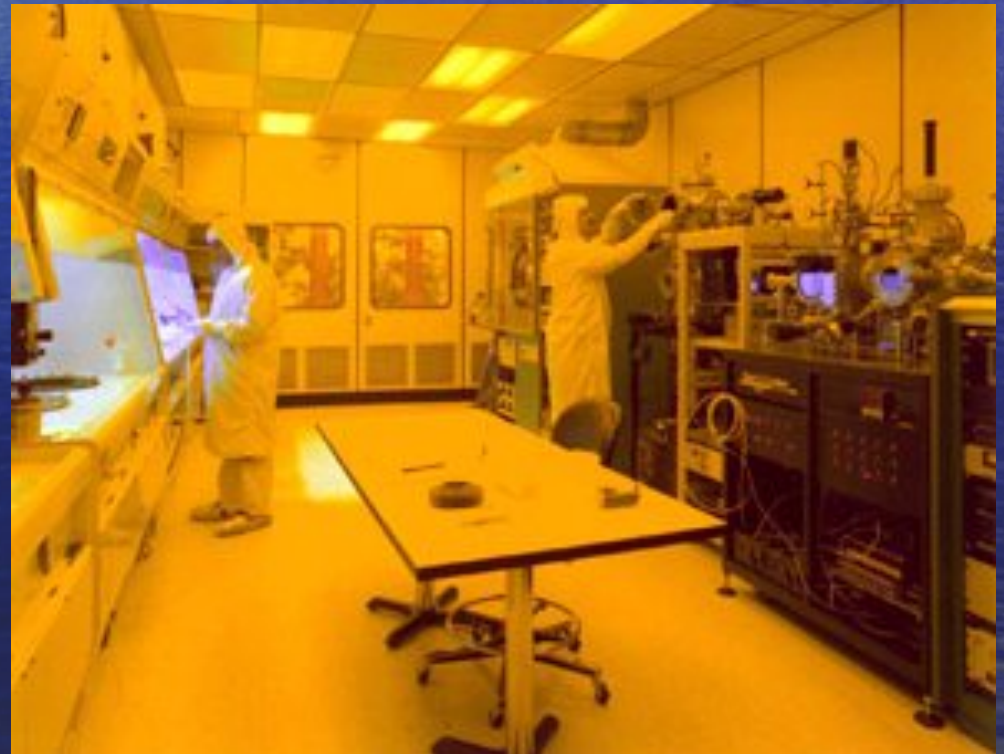


# Chemical Engineering

Address issues related to chemical production, transformation of raw materials, and chemical use.

You might:

- ✓ Create more efficient fuel sources
- ✓ Devise alternative production methods
- ✓ Map the human genome
- ✓ Develop medications



# Civil Engineering

Plan the design, construction, and maintenance of various civil structures.



You might:

- ✓ Build tunnels or bridges
- ✓ Design roller coasters
- ✓ Create airports
- ✓ Determine weather safety designs for buildings



# Computer Hardware Engineering

Research, design, develop, and test computer systems and computer-related equipment.

You might:

- ✓ Design networks
- ✓ Build computer systems for NASA
- ✓ Analyze system requirements



# Electrical Engineering

Design, develop, and test the manufacture of electrical equipment and large-scale electrical systems.



You might:

- ✓ Design an effective radar system
- ✓ Determine new ways to harness electrical power
- ✓ Test aircraft electrical equipment
- ✓ Oversee electric utilities

# Electronic Engineering

Design, develop, and test small electronic systems, such as appliances, telephones, surgical devices, etc.



You might:

- ✓ Create a cell phone design
- ✓ Build video games
- ✓ Invent medical micro robots capable of examining the human body



# Environmental Engineering

Solve environmental problems related to pollution, water use, materials and energy use, waste treatment, etc.



You might:

- ✓ Clean up hazardous waste sites
- ✓ Design technology for reprocessing materials
- ✓ Design methods for reducing pollutants in our atmosphere

# Health & Safety Engineering

Identify potential hazards and develop protocols to prevent or reduce hazardous situations.



You might:

- ✓ Prevent workplace accidents
- ✓ Enforce measures to prevent nuclear accidents
- ✓ Reduce traffic accidents

# Industrial Engineering

Plan the most effective, efficient ways to build structures, lay out production facilities, run organizations, transport goods, etc.

You might:

- ✓ Improve efficiency in hospitals
- ✓ Determine machine layout for manufacturing facilities
- ✓ Design stadium facilities for convenient use



# Marine & Ocean Engineering

Design, construct, operate, and maintain machinery or structures that exist in or near the water.



You might:

- ✓ Build or maintain oil rigs
- ✓ Build robots for deep sea exploration
- ✓ Design marine vessels
- ✓ Improve submarine technology

# Materials Engineering

Develop, process, and test materials to be used to fulfill a specific design purpose.

You might:

- ✓ Improve the safety of combat uniforms
- ✓ Determine material to replace burn victims' skin
- ✓ Design protective materials to be used for space travel
- ✓ Develop materials that efficiently conduct electricity

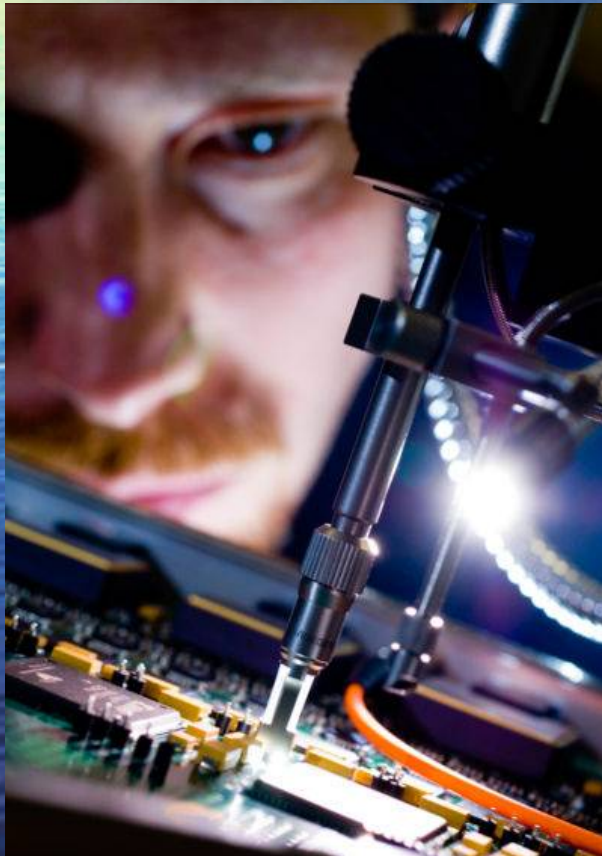


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# Mechanical Engineering

Research, develop, design, manufacture, and maintain devices that produce or consume power.



You might:

- ✓ Design cars
- ✓ Determine new uses for lasers
- ✓ Maintain power-producing equipment, such as wind turbines
- ✓ Build production machines

# Mining & Geological Engineering

Design, develop, and maintain mines, mining equipment, and mining techniques needed to locate and extract ores and minerals from the Earth.

You might:

- ✓ Locate gold or silver deposits
- ✓ Develop explosive methods
- ✓ Create safety procedures for the mining industry
- ✓ Design efficient extraction equipment



# Nuclear Engineering

Develop methods and systems that utilize nuclear materials for energy, medicine, and industry.



You might:

- ✓ Inspect or maintain nuclear submarines
- ✓ Identify new medical uses for radiation
- ✓ Develop methods to utilize nuclear energy for space travel

# Petroleum Engineering

Locate oil or natural gas reservoirs and design methods to extract and transport oil.



You might:

- ✓ Design new methods for extracting oil or natural gas from the Earth
- ✓ Determine the most cost-effective extraction locations
- ✓ Identify locations containing oil and natural gas



# Career Power Point:

Please review the project description while going through the following PowerPoint.

# Become an Earth and Environmental Engineer from Columbia University



# Major Projects:



Tragedy at Love Canal NY

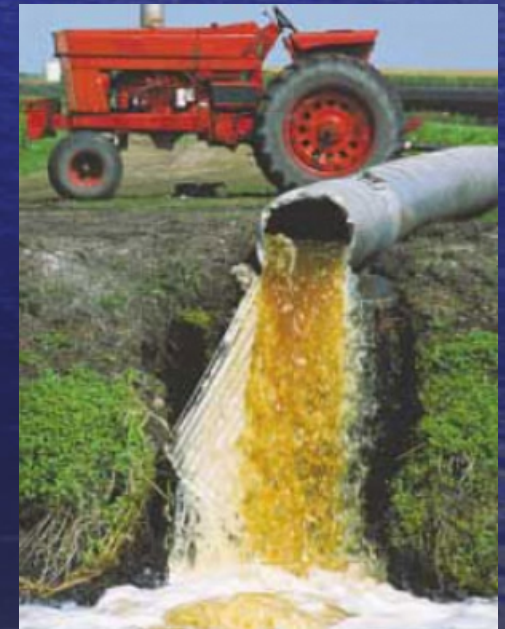


Many people today still lack Access to safe drinking water



Montague Michigan, company uses the hills to dump Toxic waste

Toxic waste was Discarded into the Oceans and lakes



# Michigan



- After Michigan's horrific pollution incident they were the first ever to receive state funding to clean up toxic waste sites
- Today state funding is available to help cleanup the land from accidents such as oil spills and leaks





# What is an environmental engineer anyway?

- An environmental engineer's job includes providing essential materials to society, while pioneering important new environmental initiatives.
  - Environmental Engineering building at Columbia University



# Research at Columbia University

- Waste-to-energy landfills
- Ecological restoration of the Everglades
- Capturing Carbon from the air

(details to follow)

# Focus on Environmental Health

Environmental health engineering focuses on identifying, evaluating and rectifying environmental problems that have a discernable impact on public health and developing engineering solutions to these causal factors.

Actual Research at CU:  
Waste – to – energy landfills  
are a  
Next step but is it impacting  
public  
Health?



# Focus on Water Resources and Climate Risks

Water resources and climate risks focuses on the movement, availability and quality of water throughout the Earth.

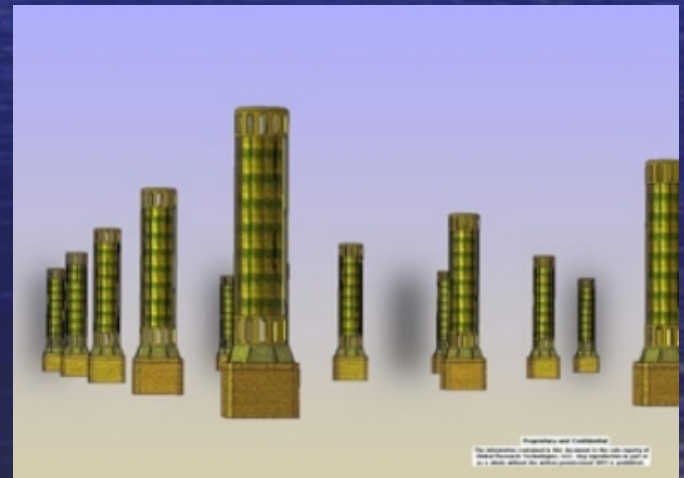


Actual research at CU:  
Using climate for operational management  
And ecological restoration of the everglades

# Focus on Sustainable Energy

Sustainable energy and materials focuses on innovative ways to provide energy and material resources to society in a sustainable and environmentally responsible manner.

Actual research at CU:  
A new technology to capture carbon  
From the air!



What to do if your University does not display their research?

Look up research from another university and state "The University of ... does not display their research opportunities, but the research at ... University in Environmental Engineering is

...

This should not be left blank but you should inform us of where you are getting the information from.

# 10 UNIQUE courses:

## **Alternative energy resources**

Unconventional, alternative energy resources. Technological options and their role in the world energy markets.

Comparison of conventional and unconventional, renewable and non-renewable energy resources and analysis of the consequences of various technological choices and constraints.

# A better planet by design

Introduction to design for a sustainable planet. Scientific understanding of the challenges. Innovative technologies for water, energy, food, materials provision. Solution strategies for developed and developing country settings.





# Earth resource production systems

The aim is to provide a broad background for earth and environmental engineers in careers involving minerals and industrial, large-scale environmental projects.



# **Energy, minerals and materials systems**

Overview of energy resources, resource management from extraction and processing to recycling and final disposal of wastes.

# Introduction to rock mechanics

Rock as an engineering material, geometry and strength of rock joints, geotechnical classification of rock masses, strength and failure of rock, field investigations prior to excavation in rock, rock reinforcement, analysis and support of rock slopes and tunnels, and case histories.



Rock Mechanics

# Processing of metals and semiconductors

Synthesis and production of metals and semiconductors with engineered microstructures for desired properties.

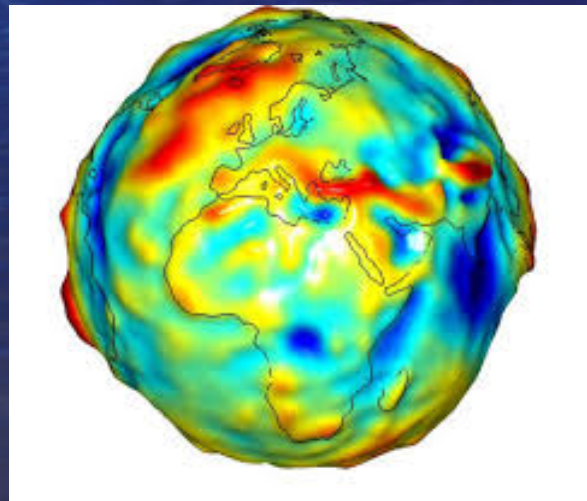
# Summer fieldwork for earth and environmental engineers

The course consists of mine, landfill, plant, and major excavation site visits and brief instruction of surveying methods.



# Environmental geophysics

Overview of principles of geophysics, geophysical methods and techniques (seismic, ground penetrating radar, resistivity, frequency em, and magnetics), and theory and practical aspects of data processing and inversion.



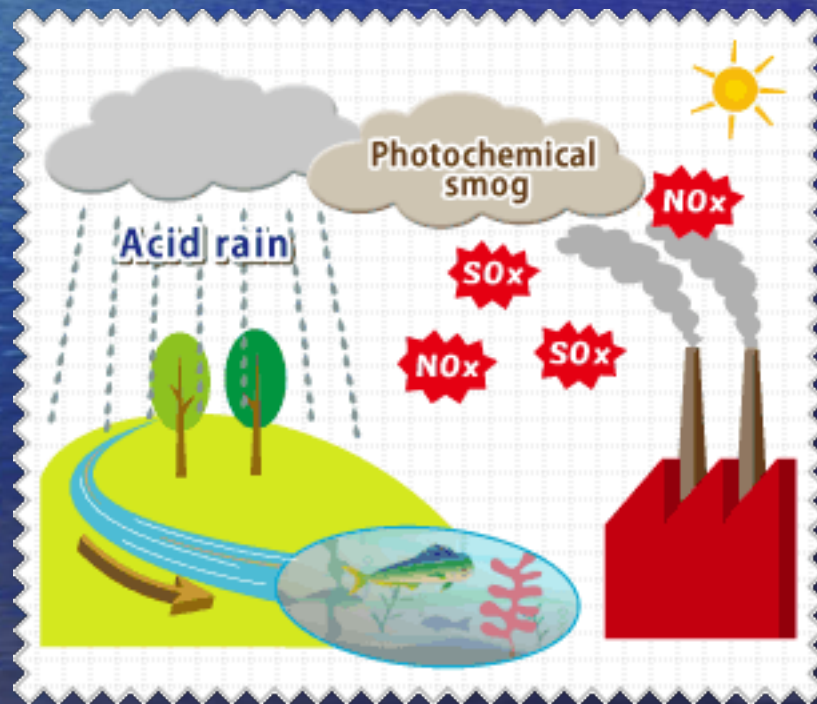
# Hydrosystems engineering

A quantitative introduction to hydrologic and hydraulic systems, with a focus on integrated modeling and analysis of the water cycle and associated mass transport for water resources and environmental engineering.



# Environmental control and pollution reduction systems

Review of engineered systems for prevention and control of pollution.





# **Undergraduate research in Earth and environmental engineering**

Conduct an investigation in Earth and Environmental Engineering, or carry out a special project under the supervision of EAEE faculty.

# What if your University does not display the course descriptions?

You should be able to at least find the course list. Google the course descriptions for each course (not the course #). You should be able to find a similar course description for a similar course. The titles don't have to match exactly.

# What is the tuition?

\$18735 per semester



# Starting Salary?

According to the Bureau of Labor Statistics...

**Table 2: Earnings distribution by engineering specialty, May 2006**

Specialty	Lowest 10%	Lowest 25%	Median	Highest 25%	Highest 10%
Aerospace engineers	59,610	71,360	87,610	106,450	124,550
Agricultural engineers	42,390	53,040	66,030	80,370	96,270
Biomedical engineers	44,930	56,420	73,930	93,420	116,330
Chemical engineers	50,060	62,410	78,860	98,100	118,670
Civil engineers	44,810	54,520	68,600	86,260	104,420
Computer hardware engineers	53,910	69,500	88,470	111,030	135,260
Electrical engineers	49,120	60,640	75,930	94,050	115,240
Electronics engineers, except computer	52,050	64,440	81,050	98,620	119,900
Environmental engineers	43,180	54,150	69,940	88,480	106,230
Health and safety engineers, except mining safety engineers and inspectors	41,850	51,630	66,290	83,240	100,160
Industrial engineers	44,790	55,060	68,620	84,850	100,980
Marine engineers and naval architects	45,200	56,280	72,990	90,790	113,320
Materials engineers	46,120	57,850	73,990	92,210	112,140

# Help Wanted

Facility in Burnside, LA Needs:

Senior Environmental Engineer

We're looking for an Environmental Engineer who will be responsible for ensuring compliance with environmental rules and regulations.

- Bachelor's degree in a related engineering field – Environmental Engineering, Chemical Engineering, etc.
- 5+ years of related experience in a chemical, petrochemical or petroleum production/refining facility.

# Help Wanted: POET Biorefineries

The Environmental Engineer is responsible for designing and overseeing programs that help ensure regulatory compliance for all POET Biorefineries.

- BS or BA or greater in Environmental Science, Engineering or Science is required.
- Up to five (5) years' experience in environmental permitting and/or compliance.
- Successful completion of the Fundamentals of Engineering examination preferred.

# Web Sites Used

<http://www.columbia.edu/>

<http://www.bls.gov/oco/ocos027.htm>

[http://www.kabainc.net/keypersonnel/  
deannanohs.html](http://www.kabainc.net/keypersonnel/deannanohs.html)

<http://www.kabainc.net/>