Civil Engineering Overview

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ACE Mentoring Program

Objectives

- Increase awareness about Civil Engineering
- Introduce various career paths within CSA professions
- Convey understanding of design process and challenges
- Provide Introduction to some major structures
Civil Engineering includes:

- Coastal Engineering
- Structural Engineering
- Architectural Engineering
- Construction Engineering
- Geotechnical Engineering
- Transportation Engineering
- Environmental/Water Resources Engineering
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Some Statistics

- There are about 200,000 civil engineers in the US
- Starting salary ranges from 45K to 65K
- Earnings after 5-10 years generally range from 70K to 110K
- Top-notch engineers can earn well in excess of 150K
- Most engineers can reach 125K as peak compensation
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Additional Resources

- Building Big: [http://www.pbs.org/wgbh/buildingbig/](http://www.pbs.org/wgbh/buildingbig/)
- American Society of Civil Engineers: [http://www.asce.org](http://www.asce.org)
- American Institute of Architects: [http://www.aia.org](http://www.aia.org)
- Johns Hopkins University – Perspectives on the Evolution of Structures (includes structures in and around the city of Baltimore): [http://www.ce.jhu.edu/perspectives/libraries.htm](http://www.ce.jhu.edu/perspectives/libraries.htm)
What is Coastal Engineering?

- Multi-disciplinary branch of civil engineering working in waterway environments
- Sustainable development and protection of coastal, ocean, ports, waterways, and wetlands
- Examples of work: Ports (piers, wharves, jetties) and Harbors, Waterways, Coastal Structures, Wetlands and Sediment Management, Offshore Facilities, Shore Protection, etc
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What is Coastal Engineering?

Chek Lap Kok Airport
Location: Hong Kong
Photo Date: 1/1/1993

Qatar North Field development
Location: Qatar
Photo Date: 1/1/1992
What is Structural Engineering?

- Design and analysis of structures to withstand forces of nature (gravity, wind/tornado, earthquake, rain, ice, waves, fluid pressure, temperature, etc) and forces from equipment/accidents (blast, impact, loads due to weight, vibration, thrust, operating torque, etc).

- Understanding of behavior of construction materials such as steel, concrete, timber, masonry (stress-strain, ductility, durability, jointability, etc).
What is Structural Engineering?

Chek Lap Kok Airport
Location: Hong Kong
Photo Date: 1/1/1993

Palo Verde nuclear power plant
Location: Phoenix, AZ
Photo Date: 3/1/1987
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What is Structural Engineering?

Turbine Building Analytical Model  Structural Steel Detailing
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Structural Design Challenges

- Safety, Performance, Economy
- Site Specific Conditions
- Unique Owner Requirements
- International Codes
- Local Materials & Methods
- Design, Fabrication and Construction Lead Times
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What is Architectural Engineering?

- Design/Manufacturing of architectural (non-structural/mechanical/electrical) systems of the building; including but not limited to windows, cladding, doors, ceilings, roofing, waterproofing, etc.

- Architectural systems for buildings and secured facilities (blast/impact resistant doors, windows, and cladding)
What is Construction Engineering?

- Deals with engineering and management issues associated with construction of building and industrial structures
- Includes construction planning, quality control, field inspections, surveying, site safety, construction tools and techniques, etc
- Addresses temporary facilities, hauling, rigging, construction equipment, etc
What is Construction Engineering?

Tacoma Narrows Bridge
Location: Tacoma, WA
Photo Date: 8/1/2005

Nuclear Steam Generator Replacement
Location: Byron, IL
Photo Date: 1996
What is Geotechnical Engineering?

- Use of soil for the purpose of supporting foundations and pavements
- Evaluation of soil properties, seismic effects, lateral earth pressure loading, slope stability, etc
- Involves shallow/deep foundations, earth retaining structures, soil dynamics, earth dams/embankments, soil improvement techniques, geosynthetics, soil erosion, pavement sub-bases, etc
What is Transportation Engineering?

- Planning and design of public transportation projects such as highways, airports, mass-transit systems
- Involves surveying/planning traffic needs, layout of highways, airports, subway/light-rail/monorail/railway systems
- Negotiating rights-of-way, land acquisitions, etc
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What is Transportation Engineering?

Jubilee Line Project
Location: London, UK
Photo Date: 1/1/2000
What is Environmental/Water Resources Engineering?

- Study of hydraulics, waterways, ground water hydrology, water treatment, sewage treatment, storm drainage, watershed management, treatment of hazardous waste
- Applications are irrigation projects, water/sewage treatment plants, dams, canals, landfills, soil/site remediation projects
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Make Civil Engineering Your Future!