NILE UNIVERSITY of NIGERIA

DEPARTMENT OF PETROLEUM & GAS ENGINEERING

GET 101 2021. 2nd Intake. Introduction to Engineering.
Presentation 2 - THE ENGINEERING PROFESSION

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&

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بسم الله الرحمن الرحيم

1. INTRODUCTION

What is Engineering?

CHOOSING A CAREER

Choosing Engineering

- Numerous and diverse careers available
- No one can (or should) make the decision for you
- Choosing your course and ultimately your career is a process
- Constantly evaluate and reevaluate what you learn and experience
- True success in a profession is not measured in monetary terms
    - job satisfaction
    - enjoying what you do
    - doing what you enjoy

CHOOSING A CAREER

Choosing Engineering - Asking the Right Questions

- What do I already know about my Engineering degree course?
- What courses will I take to earn a degree in this major?
- Do I have the appropriate academic preparation to complete my engineering course? If not, what will I have to do to acquire it?
- Am I enjoying my courses? Do I feel challenged or stressed?
- What time demands are involved? Am I willing to spend the time it takes to complete my Engineering degree course?
- What kinds of jobs will this major prepare me for? Which sounds most interesting?
- What kinds of skills will I need to do the job I want? Where can I get them?

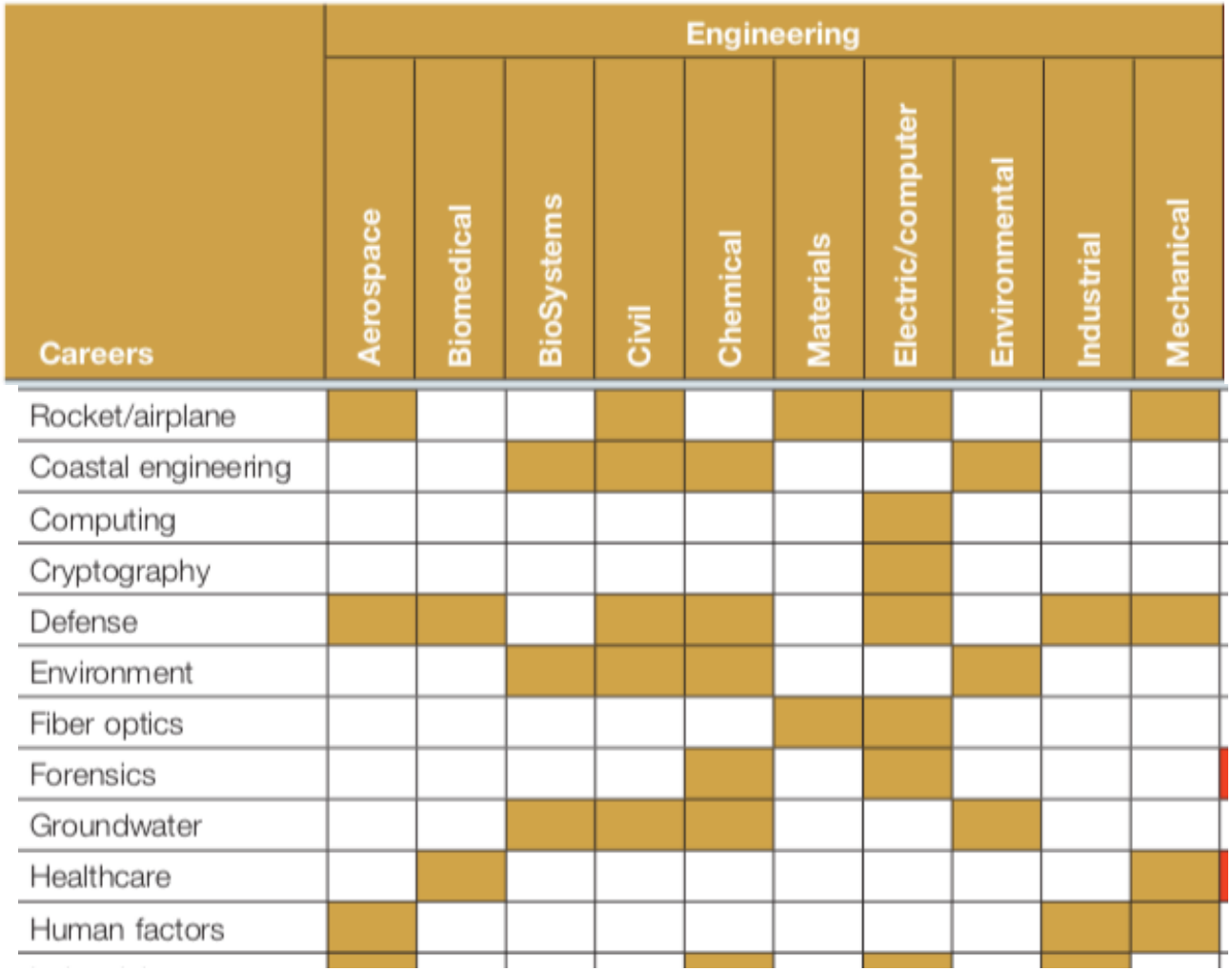
CHOOSING A CAREER

Choosing Engineering - Possible Career Paths

Careers	Engineering									
	Aerospace	Biomedical	BioSystems	Civil	Chemical	Materials	Electric/computer	Environmental	Industrial	Mechanical
GENERAL										
Energy industry				■	■		■	■		■
Machines		■					■		■	■
Manufacturing					■	■	■		■	■
Materials	■	■		■	■	■				
Structures	■			■		■			■	■
Technical sales		■	■	■	■	■	■		■	■

CHOOSING A CAREER

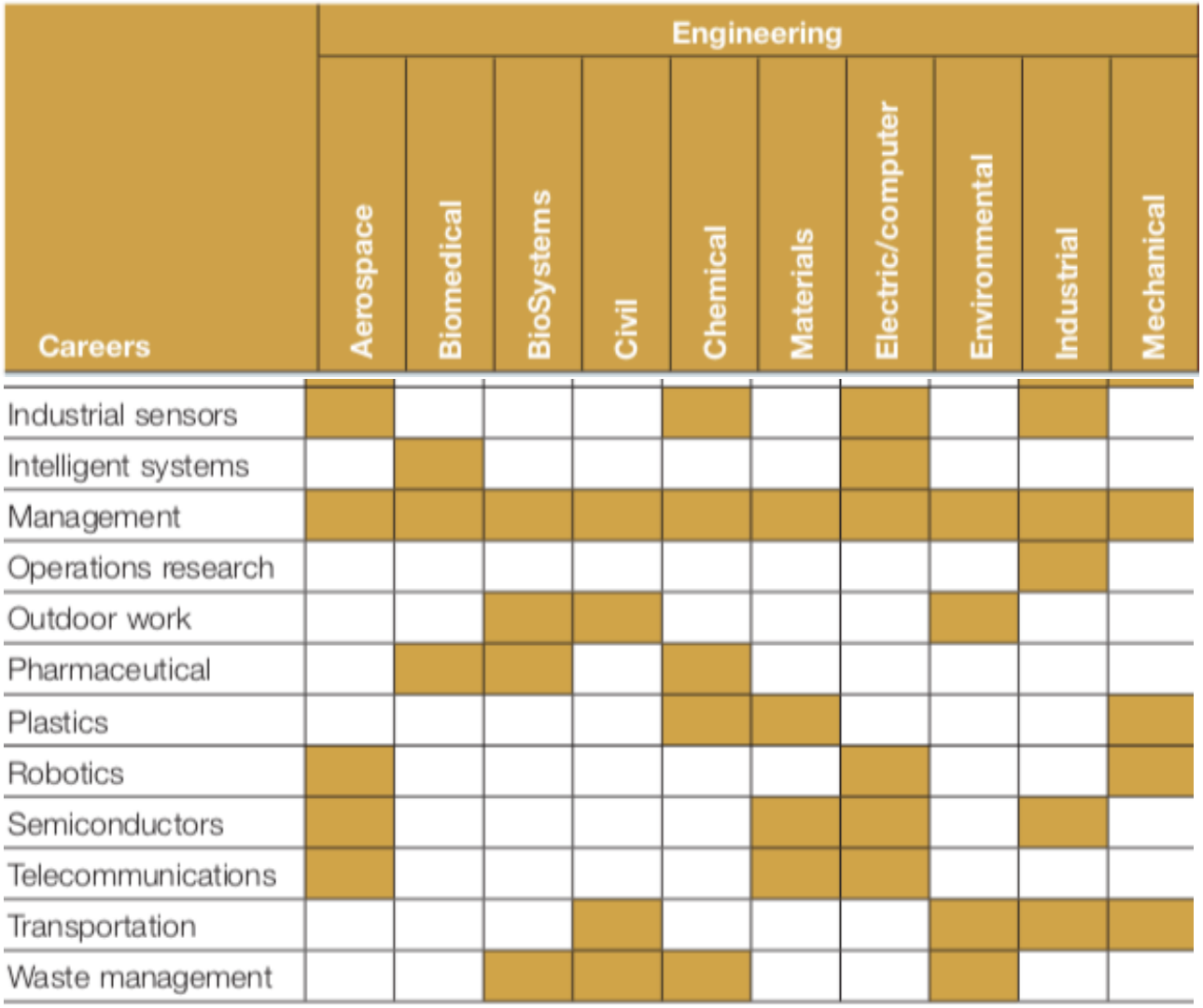
Choosing Engineering - Possible Career Paths



Careers	Engineering									
	Aerospace	Biomedical	BioSystems	Civil	Chemical	Materials	Electric/computer	Environmental	Industrial	Mechanical
Rocket/airplane	■			■		■	■			■
Coastal engineering			■	■	■			■		
Computing							■			
Cryptography							■			
Defense	■	■		■	■		■		■	■
Environment			■	■	■			■		
Fiber optics						■	■			
Forensics					■		■			
Groundwater			■	■	■			■		
Healthcare		■								■
Human factors	■								■	■

CHOOSING A CAREER

Choosing Engineering - Possible Career Paths



Careers	Engineering									
	Aerospace	Biomedical	BioSystems	Civil	Chemical	Materials	Electric/computer	Environmental	Industrial	Mechanical
Industrial sensors	■				■		■		■	
Intelligent systems		■					■			
Management	■	■	■	■	■	■	■	■	■	■
Operations research									■	
Outdoor work			■	■				■		
Pharmaceutical		■	■		■					
Plastics					■	■				■
Robotics	■						■			■
Semiconductors	■					■	■		■	
Telecommunications	■					■	■			
Transportation				■				■	■	■
Waste management			■	■	■			■		

CHALLENGES OF ENGINEERING

Technological Innovations

Many technological innovations changed the course of human society

1. The printing press, 1430s
2. Electricity, late 19th century
3. Penicillin, 1928
4. Semiconductor electronics, mid-20th century
5. Optical lenses, 13th century
6. Paper, second century
7. The internal combustion engine, late 19th century
8. Vaccination, 1796
9. The Internet, 1960s

CHALLENGES OF ENGINEERING

Technological Innovations

10. The steam engine, 1712
11. Nitrogen fixation, 1918
12. Sanitation systems, mid-19th century
13. Refrigeration, 1850s
14. Gunpowder, 10th century
15. The airplane, 1903
16. The personal computer, 1970s
17. The compass, 12th century
18. The automobile, late 19th century
19. Industrial steelmaking, 1850

CHALLENGES OF ENGINEERING

Technological Innovations

20. The pill, 1960
21. Nuclear fission, 1939
22. The green revolution, mid-20th century
23. The sextant, 1757
24. The telephone, 1876
25. Alphabetisation, first millennium b.c.
26. The telegraph, 1837
27. The mechanised clock, 15th century
28. Radio, 1906
29. Photography, early 19th century

CHALLENGES OF ENGINEERING

Technological Innovations

30. The moldboard plow, 18th century
31. Archimedes' screw, third century b.c.
32. The cotton gin, 1793
33. Pasteurisation, 1863
34. The Gregorian calendar, 1582
35. Oil refining, mid-19th century
36. The steam turbine, 1884
37. Cement, first millennium b.c.
38. Scientific plant breeding, 1920s
39. Oil drilling, 1859

CHALLENGES OF ENGINEERING

Technological Innovations

40. The sailboat, fourth millennium b.c.
41. Rocketry, 1926
42. Paper money, 11th century
43. The abacus, third millennium b.c.
44. Air-conditioning, 1902
45. Television, early 20th century
46. Anesthesia, 1846
47. The nail, second millennium b.c.
48. The lever, third millennium b.c.
49. The assembly line, 1913
50. The combine harvester, 1930s


ZUCCHERO
Coffee Break

CHOOSING A SPECIFIC ENGINEERING FIELD

BioEngineering (BioE) & BioMedical Engineering (BME)

- Apply engineering principles to the understanding and solution of medical problems
- Research and development in all areas of medicine
    - investigating the physiological behaviour of single cells
    - designing implants for the replacement of diseased or traumatised body tissues, etc
- Design new instruments, devices, and software,
- Assemble knowledge from many scientific sources to develop new procedures
- Conduct research to solve medical problems.

CHOOSING A SPECIFIC ENGINEERING FIELD

BioEngineering (BioE) & BioMedical Engineering (BME)

- Typical bioengineers work in such areas as
  - artificial organs,
  - automated patient monitoring,
  - blood chemistry sensors,
  - advanced therapeutic and surgical devices,
  - clinical laboratory design,
  - medical imaging systems, biomaterials, and sports medicine

CHOOSING A SPECIFIC ENGINEERING FIELD

BioEngineering (BioE) & BioMedical Engineering (BME)

- Bioengineers are employed in
    - universities,
    - industry,
    - hospitals,
    - research facilities, and
    - government.
- In industry, they may be part of a team serving as a liaison between engineers and clinicians.
- In hospitals, they select appropriate equipment and supervise equipment performance, testing, and maintenance. In government agencies, they are involved in safety standards and testing.

CHOOSING A SPECIFIC ENGINEERING FIELD

BioSystems Engineering, BE

- Most closely allied with advances in biology
- BE emphasizes two main areas:
    - bioprocess engineering, with its basis in microbiology
    - ecological engineering, with its basis in ecology.
- Focuses on the sustainable production of biorefinery compounds
    - biofuels,
    - bioactive molecules, and
    - biomaterials)
    - using metabolic pathways found in nature and green processing technologies.

CHOOSING A SPECIFIC ENGINEERING FIELD

BioSystems Engineering, BE

- Design of sustainable communities utilising low-impact development strategies (bioretention basins, rainwater harvesting)
    - for stormwater retention and treatment and
    - ecologically sound food and energy-crop production.
- Scientific emphasis is shifting toward the biosciences.
- BioSystems engineers
    - apply engineering design and analysis to biological systems
    - incorporate fundamental biological principles to engineering designs to achieve ecological balance.

CHOOSING A SPECIFIC ENGINEERING FIELD

BioSystems Engineering, BE

BioSystems Engineers:

- Design bioprocesses and systems for biofuels (biodiesel, hydrogen, ethanol), biopharmaceutical, bioplastics, and food processing industries
- Develop ecological designs (permeable pavement, bioswales, green infrastructure) to integrate water management into the landscape
- Integrate biological sustainability concepts into energy, water, and food systems
- Provide engineering expertise for agriculture, food processing, and manufacturing
- Pursue medical or veterinary school or graduate school in the fields of BE, BME, or Ecological Engineering

CHOOSING A SPECIFIC ENGINEERING FIELD

Chemical Engineering, ChE

- Incorporates strong emphasis on three sciences: chemistry, physics, and mathematics.
- Chemical Engineers are involved in the
    - research and development,
    - manufacture,
    - sales, and use of chemicals,
    - pharmaceuticals,
    - electronic components,
    - food and consumer goods,
    - petroleum products,
    - synthetic fibers and films,
    - pulp and paper etc
- They work on environmental remediation and pollution prevention, as well as in medical and health-related fields. Chemical engineers:

CHOOSING A SPECIFIC ENGINEERING FIELD

Chemical Engineering, ChE

Chemical Engineers are involved in the

- Conduct research and develop new products
- Develop and design new manufacturing processes
- Earn additional degrees to practice medicine or patent, environmental, or corporate law
- Sell and provide technical support for sophisticated chemical products to customers
- Solve environmental problems;
- Work in biotechnology
- Troubleshoot and solve problems in chemical manufacturing facilities

CHOOSING A SPECIFIC ENGINEERING FIELD

Chemical Engineering, ChE

Chemical Engineers typical job profile

- Project manager for new product development.
    - oversee and coordinate the various activities that need to be completed in order to get a new product approved and manufactured, and ultimately in the hands of our consumers.

CHOOSING A SPECIFIC ENGINEERING FIELD

Civil Engineering, CE

- Civil Engineering (CE) involves the
  - planning,
  - design,
  - construction,
  - maintenance, and
  - operation of facilities and systems to
  - control and improve the environment for modern civilisations.

CHOOSING A SPECIFIC ENGINEERING FIELD

Civil Engineering, CE

- This includes projects of major importance such as
  - bridges,
  - transportation systems,
  - buildings,
  - ports,
  - water distribution systems, and
  - disaster planning.

CHOOSING A SPECIFIC ENGINEERING FIELD

Civil Engineering, CE

- The Civil Engineer
  - Design and analyse structures ranging from small buildings to skyscrapers to off- shore oil platforms
  - Design dams and building foundations
  - Develop new materials for pavements, buildings, and bridges
  - Design improved transportation systems
  - Design water distribution and removal systems
  - Develop new methods to improve safety, reduce cost, speed construction, and reduce environmental impact
  - Provide construction and project management services for large engineered projects

CHOOSING A SPECIFIC ENGINEERING FIELD

Civil Engineering, CE

- The Civil Engineer job profile
  - I am responsible for assisting in the management of commercial and healthcare projects for Chavco Nigeria ltd
  - Working closely with the owner and architect, I maintain open lines of communication and aim to provide exceptional service to the entire project team from the preconstruction phase of the project through construction
  - I assist in establishing and monitoring procedures for controlling the cost, schedule, and quality of the work in accordance with the construction contract

CHOOSING A SPECIFIC ENGINEERING FIELD

Computer Engineering, CpE

- Spans the fields of computer science and engineering
- giving a balanced view of hardware, software, hardware-software trade-offs, and
- basic modeling techniques that represent the computing process
- The Computer Engineer is engaged in
    - Communication system design
    - Computer interface design
    - Computer networking
    - Digital signal processing applications
    - Digital system design
    - Embedded computer design
    - Process instrumentation and control
    - Software design

CHOOSING A SPECIFIC ENGINEERING FIELD

Computer Engineering, CpE

- The Computer Engineer job profile
  - Tomiwa has exceptional interpersonal skills
  - She is a great team player and ensures everyone in the team is properly equipped to deliver as required
  - She is result oriented and ensures that whatever task she manages is done efficiently and in a timely fashion
  - She is always willing to go above and beyond for the success of any task and the team as a whole.

- I am a Test analyst and systems administrator
- I develop, manage, and support all software systems.
- I also deal with system scalability, customer satisfaction, and data management.

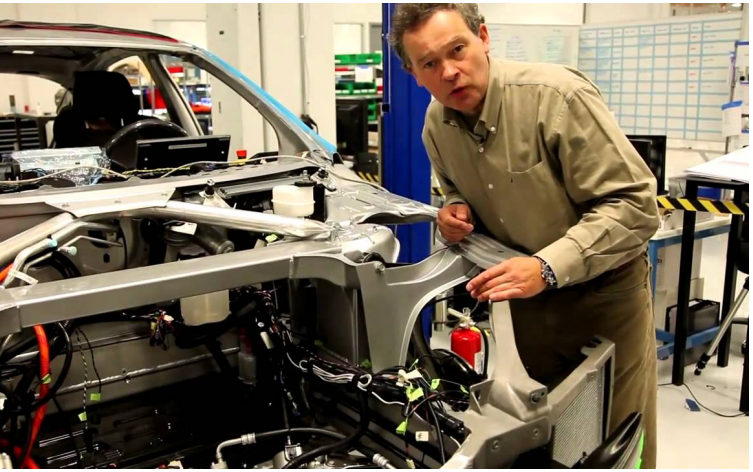
CHOOSING A SPECIFIC ENGINEERING FIELD

Electrical Engineering, EE

- Generation and delivery of electrical power
- Use of electricity in integrated circuits.
- Integrated circuit technology and devices, has enabled the pervasive use of computers in command, control, communication, and computer-aided design.
- Electrical Engineers work on include the following:
    - Communication system design
    - Control systems - from aircraft to automotive
    - Electrical power generation and distribution
    - Electromagnetic waves
    - Integrated circuit design
    - Process instrumentation and control
    - Robotic systems design
    - Telecommunications

CHOOSING A SPECIFIC ENGINEERING FIELD

Electrical Engineering, EE



The Electrical Engineer job profile

- I manage global programs that help develop leadership capabilities and skills of our current and future leaders.
- I am a consultant, a coach, a mentor, and a guide.
- If leaders are interested in improving how they lead and the impact they have on their employees and on company results, we work with them to identify the best ways for them to continue their development.

- My group supports [a major automotive manufacturer's] decisions pertaining to where to put new plants around the world, what products to build in them, and at what volumes
- In particular, my work involves understanding what the other auto manufacturers are planning for the future (foot- print, capacity, technology, processes, etc.), so that information can be used to affect decisions about how to compete around the globe.

CHOOSING A SPECIFIC ENGINEERING FIELD

Environmental Engineering, EnvE

- Is an interdisciplinary field of engineering that is focused on cleaning up environmental contamination
- Designing sustainable approaches to prevent future contamination
- Apply concepts from basic sciences (including chemistry, biology, mathematics, and physics) to develop engineered solutions to complex environmental problems
- Environmental engineers
    - design, operate, and manage both engineered and natural systems
    - to protect the public from exposure to environmental contamination and
    - to develop a more sustainable use of our natural resources.

CHOOSING A SPECIFIC ENGINEERING FIELD

Environmental Engineering, EnvE

- These activities include the following:
  - Production of safe, potable drinking water
  - Treatment of wastewater so that it is safe to discharge to surface water or reuse in applications such as landscape irrigation
  - Treatment of air pollutants from mobile (e.g., automobiles) and stationary (e.g., power plants) sources
  - Characterisation and remediation of sites contaminated with hazardous wastes (e.g., polychlorinated biphenyls, or PCBs)
  - Disposal of municipal solid wastes

CHOOSING A SPECIFIC ENGINEERING FIELD

Environmental Engineering, EnvE

- These activities include the following:
  - Management of radioactive wastes, including characterisation of how radioactive materials move through the environment and the risks they pose to human health
  - Evaluation of methods to minimise or prevent waste production and inefficient use of energy by manufacturing facilities
  - Reduce human health risks by tracking contaminants as they move through the environment
  - Design a more sustainable future by understanding our use of resources

CHOOSING A SPECIFIC ENGINEERING FIELD

Environmental Engineering, EnvE

- With a degree in EnvE, students will find employment with
  - consulting engineering firms,
  - government agencies involved in environmental protection, and
  - manufacturing industries.

CHOOSING A SPECIFIC ENGINEERING FIELD

Industrial Engineering, IE

- Design and improvement of systems
- Involvement of people in these systems–from the people involved in the design and production to the people who are ultimate end users
- Testing and evaluation of alternatives that may depend on random events
- Industrial engineers use
    - mathematical, physical, social sciences, and engineering
    - combined with the analytical and design methods to
- design, install, and improve complex systems that provide goods and services to our society

CHOOSING A SPECIFIC ENGINEERING FIELD

Industrial Engineering, IE

- Industrial engineers are called upon to:
  - Analyse and model complex work processes to evaluate potential system improvements
  - Analyse how combinations of people and machines work together
  - Analyse how the surroundings affect the worker, and design to reduce the negative effects of this environment
  - Develop mathematical and computer models of how systems operate and interact
  - Improve production and service processes from the perspectives of quality, productivity, and cost
  - Work on teams with other professionals in manufacturing, service industries, government agencies

CHOOSING A SPECIFIC ENGINEERING FIELD

Industrial Engineering, IE

- The Industrial Engineer job profile
  - My primary job responsibilities include maintaining, upgrading, and designing all the computer systems and IT infrastructure for the Vermont Railroad
  - I handle all the servers and take care of network equipment
  - When needed, I also program customised applications and websites for customers or our own internal use
  - I also serve as a spare conductor and locomotive engineer when business needs demand.

CHOOSING A SPECIFIC ENGINEERING FIELD

Materials or Metallurgical Engineering

- Focuses on the properties and production of materials
    - Nature supplied only 92 naturally occurring elements to serve as building blocks to construct all modern conveniences
- Unlocks the relationship between atomic, molecular, and larger-scale structures and the resultant properties
    - Ceramic Engineering
    - Metallurgical Engineering, and
    - Polymer Science and Engineering

CHOOSING A SPECIFIC ENGINEERING FIELD

Materials or Metallurgical Engineering

- Products designed and manufactured by Material Engineers:
  - Brick, tile, and whitewares research and manufacturing for the home and workplace
  - Ceramic spark plugs, oxygen sensors, and catalytic converters that optimise engine performance
  - Metal and ceramic materials that enable biomedical implants and prosthetics
  - Microwave responsive ceramics that stabilize and filter cellular phone reception
  - Nanotechnology, including silver nanoparticles used as antibacterial agents in socks and t-shirts and carbon nanotubes used to reinforce the fork of racing bicycles
  - Plastics found in bulletproof vests, replacement heart valves, and high tension wires
  - Superconducting metals that are used in medical imaging devices like Magnetic Resonance Imaging (MRI)
  - Ultrapure glass optical fibers that carry telephone conversations and Internet communications

CHOOSING A SPECIFIC ENGINEERING FIELD

Metallurgical Engineering, IE

As a Metallurgical Engineer, my duties include

- Consulting firm management/administration
- Failure analysis
- Subcontracted metals testing services
- Metallurgical quality systems design/auditing
- Metallurgical expert in litigation cases
- Materials selection and design consultant, in-process and final inspection and testing services

CHOOSING A SPECIFIC ENGINEERING FIELD

Mechanical Engineering

- Involves areas related to machine design, manufacturing, energy production and control, materials, and transportation
- Areas supported by Mechanical Engineers include:
    - Construction
    - Energy production and control
    - Environmental systems
    - Food production
    - Management
    - Materials processing
    - Medicine
    - Military service
    - Propulsion and transportation systems
    - Technical sales

CHOOSING A SPECIFIC ENGINEERING FIELD

Mechanical Engineering

As a Mechanical Engineer:

- In my job as a management consultant, I address CEO-level management decisions as part of a project team by helping clients identify, analyze, and solve business-related problems
- My responsibilities include
    - generating hypotheses,
    - gathering and analyzing data,
    - conducting benchmarking and best practices assessments,
    - recommending actions, and
    - working with clients to develop implementation plans.

CHOOSING A SPECIFIC ENGINEERING FIELD

Mechanical Engineering

As a Mechanical Engineer:

- I am an Aerospace Engineering Manager responsible for
  - developing unique astronaut tools and
  - spacewalk procedures and for testing and training for NASA's Hubble Space Telescope servicing missions.
- My job ranges from
  - tool and procedure design and development to
  - underwater scuba testing to
  - real-time, on-console support of Space Shuttle missions.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Coffee Break

ENGINEERING TECHNOLOGY

Introduction

- Engineering Technology is related to engineering
- The two fields use different requirements for accreditation
- In Nigeria, they are both registered by the Council for the Regulation of Engineering in Nigeria
- The academic accreditation are done by Nigeria Universities Commission and National Board for Technical Education for Engineering and Technical courses respectively
- The student outcomes required of accredited Engineering Technology programs are shown in the table below alongside those required of accredited Engineering programs

ENGINEERING TECHNOLOGY

Introduction

Engineering Technology (1)	Engineering (2)
a. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly defined engineering technology activities;	(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
b. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;	(a) an ability to apply knowledge of mathematics, science, and engineering
c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;	(b) an ability to design and conduct experiments, as well as to analyze and interpret data
d. an ability to design systems, components, or processes for broadly defined engineering technology problems appropriate to program educational objectives;	(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e. an ability to function effectively as a member or leader on a technical team;	(d) an ability to function on multidisciplinary teams
f. an ability to identify, analyze, and solve broadly defined engineering technology problems;	(e) an ability to identify, formulate, and solve engineering problems
g. an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature;	(g) an ability to communicate effectively
j. a knowledge of the impact of engineering technology solutions in a societal and global context;	(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

ENGINEERING TECHNOLOGY

Differences in academic Curricula

- Engineering program curricula are more academic, focusing more on theory and concepts, whereas
    - Engineering Technology program curricula are more practical, focusing on applications and skills
- Engineering graduates are able to design and conduct experiments
    - while Engineering Technology graduates were not required to do so to be able to design experiments
- Engineering requires the more theory-oriented ability to “formulate” problems,
    - an outcome that is missing from ET
- More general treatment in engineering curricula compared to a more specific treatment in engineering technology curricula
- Engineering graduates must learn to face a wide variety of design constraints,
    - Engineering Technology graduates have the more application-oriented option

ENGINEERING TECHNOLOGY

Differences in Academic Curricula

- Engineering Technology addresses societal and global impact,
    - Engineering additionally includes economic and environmental impact
- Whereas engineering graduates must function on "multidisciplinary" teams,
    - Engineering Technology graduates are required to function on "technical" teams that need not be multidisciplinary
- Engineering Technology students must figure out how to act on things that
    - Engineering Students must only understand
- Engineering graduates understand professional and ethical responsibility,
    - Engineering Technology additionally requires that engineering technology graduates have a commitment to address those issues, including a respect for diversity
- Whereas Engineering students are required to be able to design and conduct experiments, Engineering
    - Technology graduates are expected to be able to apply the results of experiments

ENGINEERING TECHNOLOGY

Differences in Career Pathways

- Engineering graduates have wide-ranging jobs ranging from design to analysis, office work to field work, from companies that make things to companies that design things that are made by others
- Graduates of four-year Engineering Technology programs
    - are more often found in jobs where things are made or sold, and
    - are more often engaged in field work.
- Four-year Technology graduates are called Technologists -
    - the term "technician" is appropriate for two-year Engineering Technology graduates.
- Thus, generally, engineering careers are more flexible
    - whereas engineering technology careers tend to result in more tangible accomplishments (rather than accomplishments on paper)


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Coffee Break

PURSUING STUDENT OPPORTUNITIES

Introduction

- In addition to the traditional educational experience, many students seek experience outside of the classroom
- Many engineering colleges and universities have special departments
    - that help place students in programs to gain real engineering work experience or
    - provide them with a culturally rich study environment
- Ask a professor or advisor if your university provides such facilities

PURSUING STUDENT OPPORTUNITIES

Internship

- Internships offer the unique opportunity to gain career-related experience in a variety of settings
- Employers look to hire college graduates with internship experience in their field.
- Employers indicate that good grades and participation in student activities are not always enough to help students land a good, full-time job.
- In today's competitive job market
    - the students with career-related work experience are the students getting the best interviews and job offers.
- Many companies report that over 70% of full-time hires come directly from their internship program.

PURSUING STUDENT OPPORTUNITIES

Internship - Figure Out What You are Looking For

- Before you start looking for an internship, answer the following questions:
    - What are my interests, abilities, and values?
    - What type of organisation or work environment am I looking for?
    - Are there any geographical constraints, or am I willing to travel anywhere?

PURSUING STUDENT OPPORTUNITIES

Introduction - Why Choose an Internship?

- Bridge classroom applications to the professional world
- Build a better résumé
- Possibly receive higher full-time salary offers upon graduation
- Gain experience and exposure to an occupation or industry
- Network and increase marketability
- Potentially fulfil academic requirements and earn money

PURSUING STUDENT OPPORTUNITIES

Internship - Search For Opportunities

- Start researching internship opportunities
    - Start looking one to two semesters before your desired start date
    - Utilize as many resources as possible in order to have the broadest range of options.
- Visit your campus's career center office to do the following: meet with a career counselor; attend a workshop on internships; find out what positions and resources are available; and look for internship postings through the career center's recruit- ing system and website resources
- Attend a career fair on your campus or in your area. Career fairs typically are not just for full-time jobs, but are open to internship applicants as well. In addition, if there are specific companies where you would like to work, contact them directly and find out if they offer internships
- Network. Network. Network. Only about a quarter of internship opportunities are actually posted. Talk to friends, family, and professors and let them know that you are interested in an internship. Networking sites like LinkedIn and Facebook are also beginning to see more use by employers and students. However, be conscious what images and text are associated with your profile.

Why do you want to be an Engineer?

What is an Engineer?


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Coffee Break

ANY QUESTION?


Thank You!

NEXT TOPIC

IS

Engineering Ethics