Engineering Profession (Jobs and Majors)

Chapter 2

Engineering Jobs

Ways to get information about careers:

- Conduct research online
- Speak to people who work in the field you studied
- Find out what graduates who studied a similar course have gone on to do
- Attend career events and job fairs

Research and Development

- The aim of research and development (R&D) is to improve the current technologies offered by an organization or to develop innovations that strengthen the organization's position in the marketplace.
- Applies research theories, principles, and models when conducting experiments and research activities.
- Summarizes research results and communicates findings to internal and external bodies.
- Develops technical documentation for all projects.
- It is required to hold a Ph. D or master's degree in the respective field of study. However, engineers are generally required to hold at least a bachelor's degree.
- Bridges the gap between the laboratory and the production facility
- Identify problems in a potential product

Design

- Design aspect is where largest number of engineers are employed
- Design engineers develop ideas for new products and the systems used to make them. They also modify existing products or processes to increase efficiency or improve performance
- Design engineers regularly use computer design software as well as computer aided drafting software in their jobs
- Design engineers must also verify that the part meets reliability and safety standards required for the product
- Design engineers are not only concerned with making products that look good and are easy and safe to use: they are also concerned with ensuring that the product can be made cost-effectively and efficiently.

Analysis and Testing

- Analysis and testing engineers use computational tools and mathematic models to enrich the work of design and research engineers, they typically have a Knowledge of: heat transfer, fluid flow, vibrations, dynamics, and many other system characteristics

- Analysis and testing engineers are responsible for testing the durability and reliability of a product, making sure that it performs how it is supposed to, every time. They simulate instances and environments in which a product would be used

- Some times there is a need for system engineer who's responsible on a larger scale for bringing together components of parts from design engineers to make a complete product

Manufacturing and Maintenance

- Work individually or in teams
- Responsible for “moulding” raw materials into finished product
- Maintain and keep records on equipment in plant
- Help with design process to keep costs low
- Improving health and safety policies and procedures
- Responsible for maintaining production line
- Dealing with emergencies, unplanned problems and repairs
- Must have technical know-how to deal with problems
- Responsible for inspecting facility and equipment, must be certified in various inspection methods

Sales and Customers support

- Sales and Customer Engineers search for new clients who could benefit from their products, travel to visit potential clients, establish new, and maintain existing, relationships with customers and managing and interpreting their requirements.
- Sales and Customer Engineers have technical background, but are also must be able to communicate effectively with customers
- Offering after-sales support services, administering client accounts and analysing costs and sales.
- Providing pre-sales technical assistance and product education
- Job market for sales and customer support engineers is growing, due to the fact that products are becoming more and more technically complex

Consulting

- Serves private and public clients in ways ranging from brief consultations to the complete design and coordination of a project.
- Many consulting engineering firms consist of multi-disciplinary teams of qualified engineers and other professionals and provide comprehensive services. Others specialise in a specific area of engineering, such as geotechnical, environmental, traffic or structural
- Supervising subcontractors who provide specialist assistance for parts of the project.
- Consulting engineers might be involved in design, installation, and upkeep of a product
- Sometimes required to be a registered professional engineer where he/she works

Aerospace Engineers

- Aerospace engineering is the primary field of engineering concerned with the development of aircraft and spacecraft.
- Flight vehicles are subjected to demanding conditions such as those produced by changes in atmospheric pressure and temperature, with structural loads applied upon vehicle components.
- Consequently, they are usually the products of various technological and engineering disciplines including aerodynamics, materials science, structural analysis and manufacturing.
- Aerospace engineering is considered a branch of mechanical engineering

Agricultural Engineers

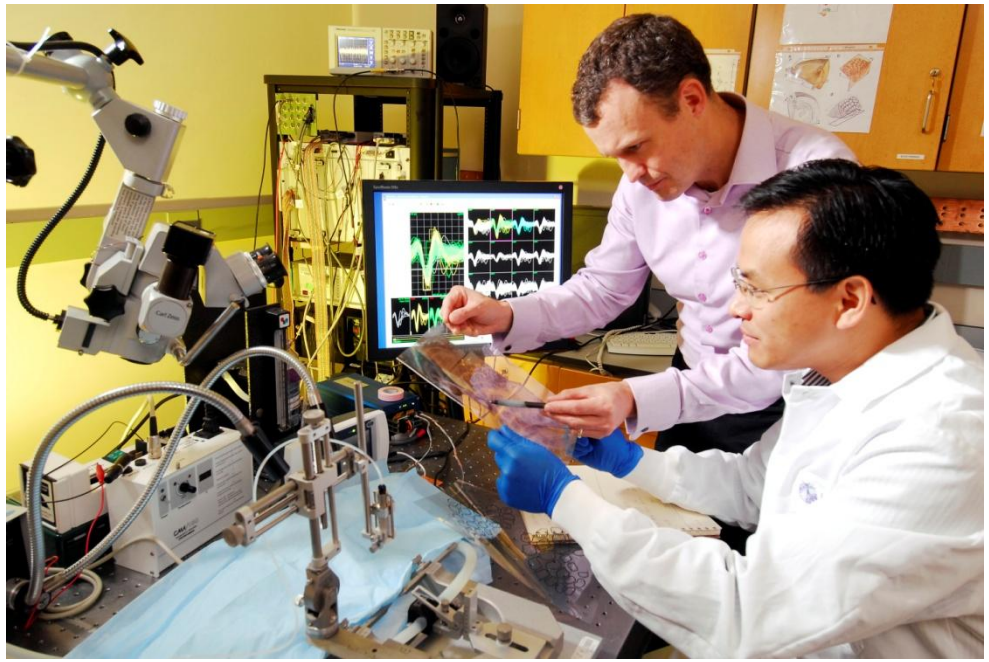
- Concerned with finding ways to produce food more efficiently
- Design of agricultural machinery, equipment, and agricultural structures
- Water/Soil management, conservation, and storage for crop irrigation and cows production
- Waste management, including animal waste, agricultural remains, and fertilizer runoff.
- Food engineering and the processing of agricultural products

Architectural Engineers

- **An engineer in the structural, mechanical, electrical, construction or other engineering fields of building design and construction**
- **Structural:** primarily concerned with the integrity of the building structure. Evaluates loads placed on buildings, and makes sure the building is structurally sound
- **Mechanical systems:** control climate of building, as well as humidity and air quality.

Biomedical Engineers

- Biomedical engineers combine engineering principles with medical and biological sciences to design and create equipment, devices, computer systems, and software used in healthcare.
- Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data. As an interdisciplinary field of science, bioinformatics combines computer science, statistics, mathematics, and engineering to analyse and interpret biological data.
- Bioengineering is application of engineering principles to biological systems
- Medical engineers develop instrumentation for medical uses
- Clinical engineers develop systems that help serve the needs of hospitals and clinics



Chemical Engineers

- Chemical engineering is a branch of engineering that applies physical sciences (physics and chemistry), life sciences (microbiology and biochemistry), together with applied mathematics and economics to produce, transform, transport, and properly use chemicals, materials and energy.
- A chemical engineer designs large-scale processes that convert chemicals, raw materials, living cells, microorganisms and energy into useful forms and products.
- Chemical engineers develop processes to extract and improve basic oil and gas resources
- Chemical engineers also develop circuit boards, and work in the pharmaceutical industry, where processes are designed to create new, affordable drugs

Civil Engineers

- Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings.
- Structural engineers most common type of civil engineer
- Transportation engineers concerned with design and construction of highways, and railroads.
- Surveyors start construction process by locating property lines and property areas
- Water and environmental

Computer Engineers

- Computer engineering is a discipline that integrates several fields of electrical engineering and computer science required to develop computer hardware and software.
- Computer engineers usually have training in electronic engineering (or electrical engineering), software design, and hardware–software integration instead of only software engineering or electronic engineering.
- Usual tasks involving computer engineers include writing software and firmware for embedded microcontrollers, designing VLSI chips, designing analogue sensors, designing mixed signal circuit boards, and designing operating systems. Computer engineers are also suited for robotics research, which relies heavily on using digital systems to control and monitor electrical systems like motors, communications, and sensors.

Electrical Engineers

- Electrical engineering is a field of engineering that generally deals with the study and application of electricity, electronics, and electromagnetism.
- Electrical engineering has now subdivided into a wide range of subfields including electronics, digital computers, computer engineering, power engineering, telecommunications, control systems, radio-frequency engineering, signal processing, instrumentation, and microelectronics.
- With an ever growing technological society, electrical engineers will ALWAYS have a job

Industrial Engineers

- Industrial engineering is a branch of engineering which deals with the optimization of complex processes, systems, or organizations. Industrial engineers work to eliminate waste of time, money, materials, person-hours, machine time, energy and other resources that do not generate value.
- Depending on the sub-specialties involved, industrial engineering may also overlap with: operations research, systems engineering, manufacturing engineering, production engineering, management science, management engineering, human factors engineering and safety engineering.
- Production focuses on plant layout, scheduling, and quality control
- Human Factors focuses on the efficient placement of human resources within a plant/facility

Material Engineers

- Materials engineers develop, process, and test materials used to create a wide range of products, from computer chips and aircraft wings to golf clubs and biomedical devices. They study the properties and structures of metals, ceramics, plastics, composites, nanomaterials (extremely small substances), and other substances to create new materials that meet certain mechanical, electrical, and chemical requirements.
- Study the structure, as well as other important properties of materials, I.e. strength, hardness, and durability
- Run tests to ensure the quality of the performance of the material
- Material Engineers also study metallurgy, and the development of composites and alloys

Mechanical Engineers

- Mechanical engineering is the discipline that applies engineering, physics, and materials science principles to design, analyse, manufacture, and maintain mechanical systems.
- Concerned with machines and mechanical devices
- Work in design, development, production, control, and operation of machines/devices
- One major part of it is the thermal sciences

Mechatronics Engineers

- Mechatronics is a multidisciplinary field of science that includes a combination of mechanical engineering, electronics, computer engineering and control engineering.
- Originally, mechatronics just included the combination of mechanics and electronics, therefore the word is a combination of mechanics and electronics; however, as technical systems have become more and more complex the definition has been broadened to include more technical areas.
- Robotics and Automation are common field for mechatronics engineer.

Mining Engineers

- Mining engineering is an engineering discipline that applies science and technology to the extraction of minerals from the earth.
- Mining engineering is associated with many other disciplines, such as geology, mineral processing and metallurgy, geotechnical engineering and surveying.
- A mining engineer may manage any phase of mining operations – from exploration and discovery of the mineral resource, through feasibility study, mine design, development of plans, production and operations.

Nuclear Engineers

- Nuclear engineering is the branch of engineering concerned with the application of the breakdown as well as the combination of atomic nuclei or the application of other sub-atomic physics, based on the principles of nuclear physics.
- It includes the interaction and maintenance of systems and components like nuclear reactors, nuclear power plants, or nuclear weapons.
- The field also includes the study of medical and other applications of radiation, nuclear safety, heat/thermodynamics transport, nuclear fuel or other related technology.