

History of Engineering and Technology

Lecture 1: Introduction





Learning Outcomes

- Describe the differential terminologies used in the engineering branch.
- Outline and identify historical milestones in the development of engineering and its connections to social and cultural contexts.
- State the circumstances affecting engineering and technology development.
- List the different engineering specifications and their corresponding field of activity.
- Discuss the role of Egypt in developing the engineering civilization.
- Compare between the different engineering disciplines.





Grades

Contact Hours					CH	Assessment Scheme		
LCT	TUT	LAB	Total	SWL		CW	MT	FE
2	0	0	2	60	2	40	20	40





References

- Engineering in Time The Systematics of Engineering History and Its Contemporary Context
<https://doi.org/10.1142/p316> | June 2004
- Tom Jackson (Editor) and Tom Jackson (2016) Engineering: An Illustrated History from Ancient Craft to Modern Technology (100 Ponderables), Jenson Books Inc
- M. Solodky,(2006) The Technology of Ancient Egypt
- The Technology of the Ancient World, The Rosen Publishing Group, Inc.
- Paul T. Nicholson, Ian Shaw, (2009) Ancient Egyptian Materials and Technology
- Bryan H. Bunch (Author), Alexander Hellemans (Editor)The History of Science and Technology: A Browser's Guide to the Great Discoveries, Inventions, and the People Who Made Them from the Dawn of Time to Today
- Thomas S. Kuhn, (2012)The Structure of Scientific Revolutions, 4th ed. University of Chicago Press
George



Table of Contents

- **Introduction to engineering and its disciplines.**
- **History of Engineering**
 - Prehistoric Engineering (~106 BP→~104 BP)
 - Ancient Engineering (~8000 BCE→~500 CE)
 - Medieval Engineering (~500 CE→~1400)
 - Renascent Engineering (~1400→~1800)
 - Expansive Engineering (~1800→~1940)
 - Modern Engineering (~1940→~1990)
 - Contemporary Engineering (~1990→~2000+)



Introduction to engineering and its disciplines.



Introduction to engineering and its disciplines.

What is an Engineer?

- Uses science and math to solve people's problems
- Creates and invents new things
- Improves and makes things better



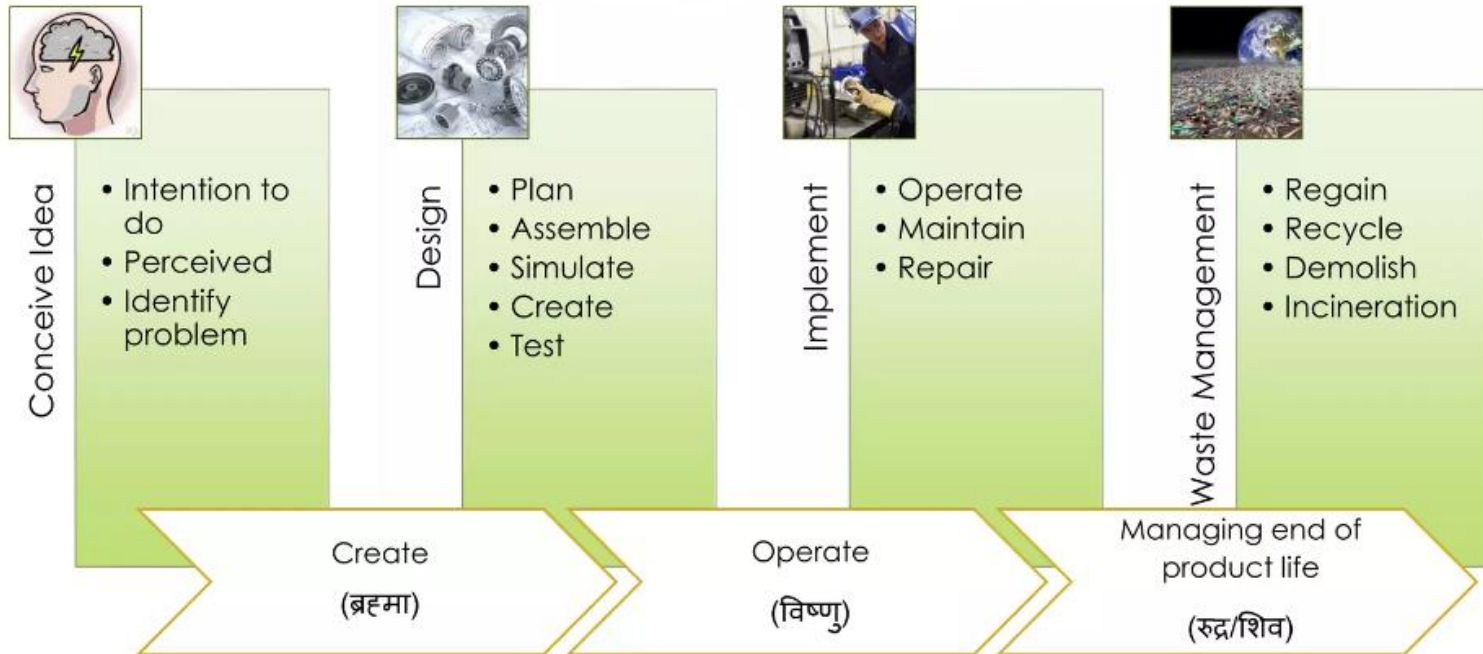
Introduction to engineering and its disciplines.

The main task of engineering is to find and deliver optimal solutions to real life problems, within the given material (components), technological, economic, social and environment constraints, through the application of scientific, technological, and engineering knowledge.



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What do engineers do?



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What are the attributes of good engineer?

- ▶ **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- ▶ **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.



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- ▶ **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- ▶ **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



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- ▶ **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- ▶ **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.



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- ▶ **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- ▶ **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- ▶ **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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- ▶ **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- ▶ **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.



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- ▶ **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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Major Types of Engineering

- Chemical
 - Bioengineering/Bio-medical Engineering
 - Nuclear
 - Agricultural
 - Plastics
- Civil
 - Environmental
 - Structural
- Electrical
 - Computer Science
 - Communications
- Mechanical
 - Aeronautical
 - Industrial/Materials



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Chemical Engineering



- Study chemical synthesis to make new materials, energy systems, and medicines.
- Industries that hire chemical engineers:
 - Energy companies- Oil, Natural Gas, Fuel Cell
 - Food producers
 - Pharmaceuticals
 - Plastics
 - Cosmetics



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Civil Engineering

- Design and construct buildings, bridges, tunnels and transportation systems.
- Work closely with architects and environmental engineers.
- Industries that hire civil engineers
 - Departments of transportation
 - Construction
 - Manufacturing



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Environmental Engineering

- Involved with projects that work on keeping the water, air and soil healthy.
- Industries that hire environmental engineers:
 - Waste management
 - Irrigation
 - Pollution control
 - Hazardous site management
 - Water treatment



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Electrical Engineering

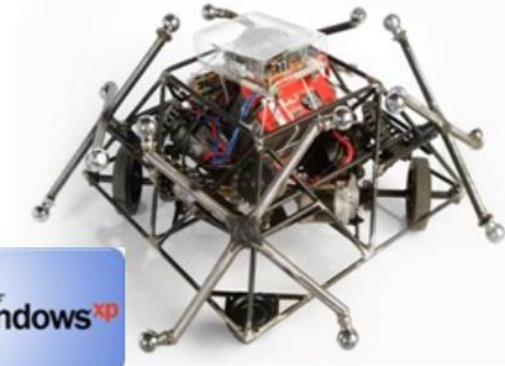
- EE's use science of electricity to make systems of circuits to do work.
- Simple circuits of switches-
 - Turning on a light switch
 - A digital clock
- Complex circuits
 - Personal Computer and PDAs
 - Video games, TVs, Sound Systems
 - Automotive sensors
 - Cell Phones



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Computer Science

- Develop software and programs to run electronics.
- Often connected with electrical engineering
- Industries that hire computer scientists:
 - Computer related systems (CD-ROMs, GPS, etc.)
 - Robotics
 - Virtual reality systems



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Mechanical Engineering

- ME's use the laws of physics for - mechanical design, manufacturing, or energy & power.
- Industries that hire mechanical engineers:
 - Automotive
 - Toys
 - Power plants



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Aerospace Engineering

- Specialize in design, testing, and production of aircrafts, missiles and spacecrafts.
- Industries that hire aerospace engineers:
 - Commercial aviation
 - Defense programs
 - Space programs



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Biomedical Engineering

- An interdisciplinary field that combines mechanical, electrical, and chemical engineering.
- Design artificial limbs/organs and medical instruments, new treatments for disease.
- Industries that hire biomedical engineers:
 - Medical devices
 - Assistive devices
 - Pharmaceutical companies



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What Does it Take to Become an Engineer?

- Curiosity
- Creativity
- Like to figure things out, solve problems
- Enjoy learning



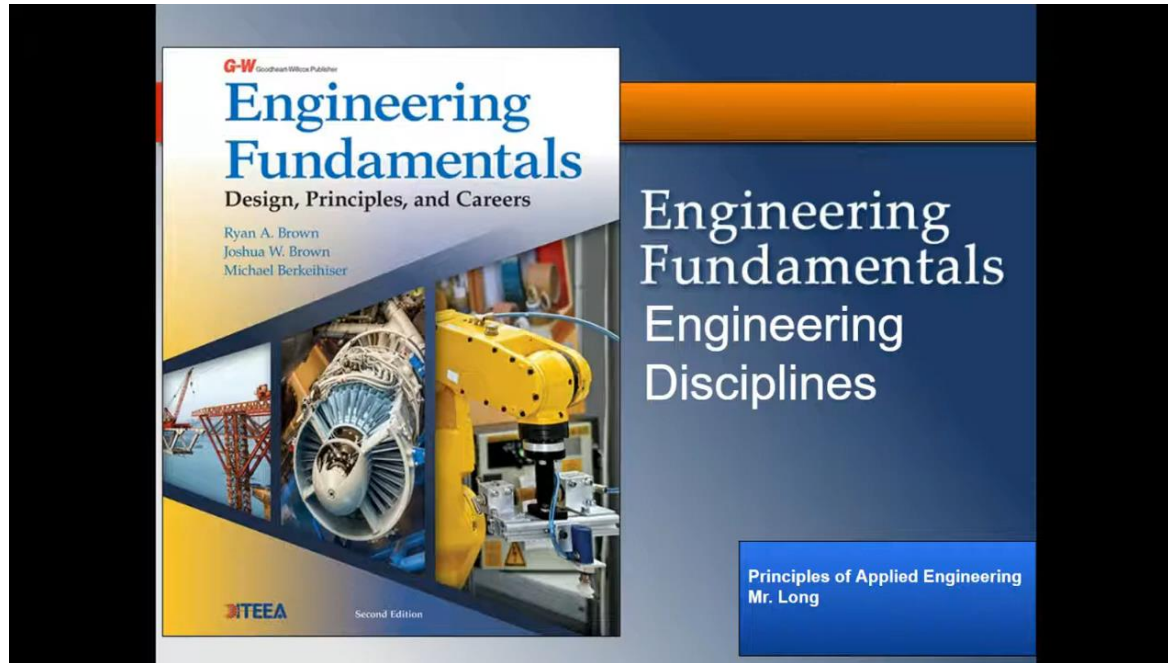
Introduction to engineering and its disciplines.

Why be an engineer?

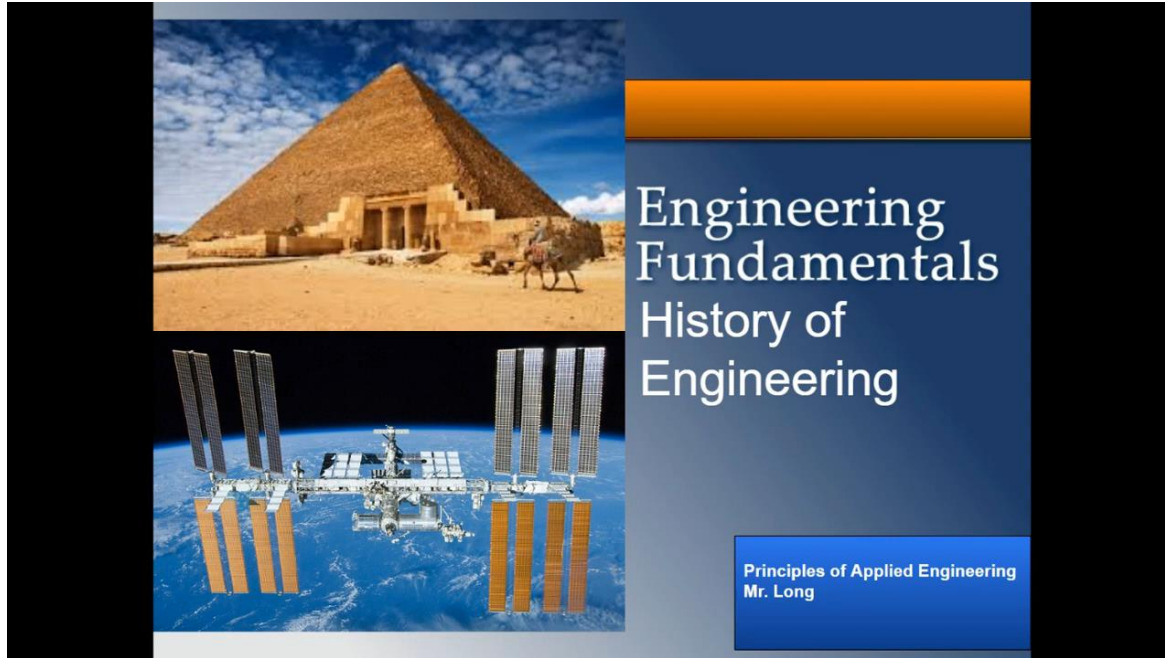
- Help people; improve lives
- Solve real world problems
- Variety of applications, projects
- Contribute to society
- Lots of opportunities
 - High demand for engineers
 - Large and small companies, universities, non profits
- Rewarding Career
 - Innovative thinking, and you get paid!
 - Provides a very strong background for other careers



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Thank you !

