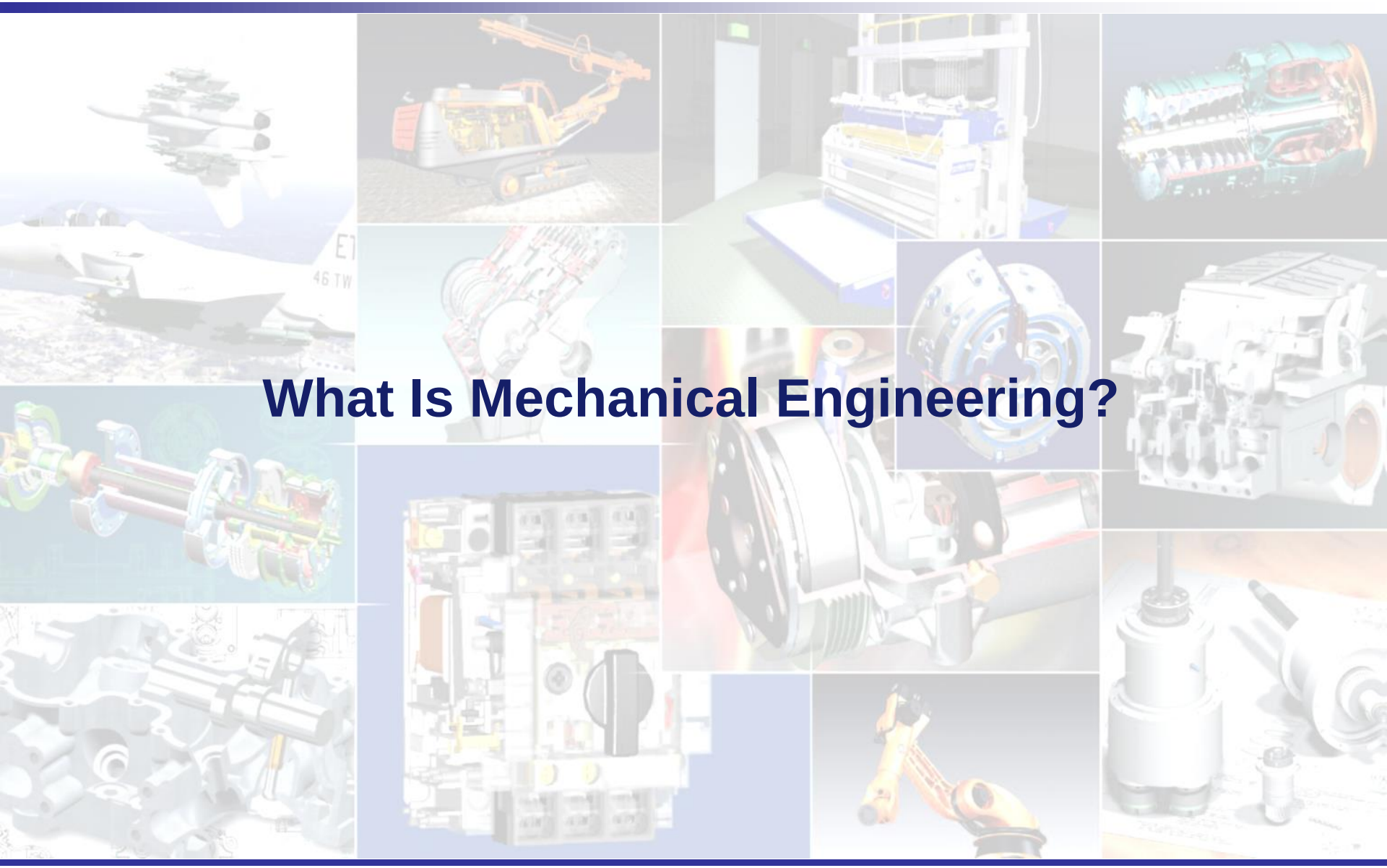
# Undergraduate Program in Mechanical Engineering at Western University



# What Is Mechanical Engineering?

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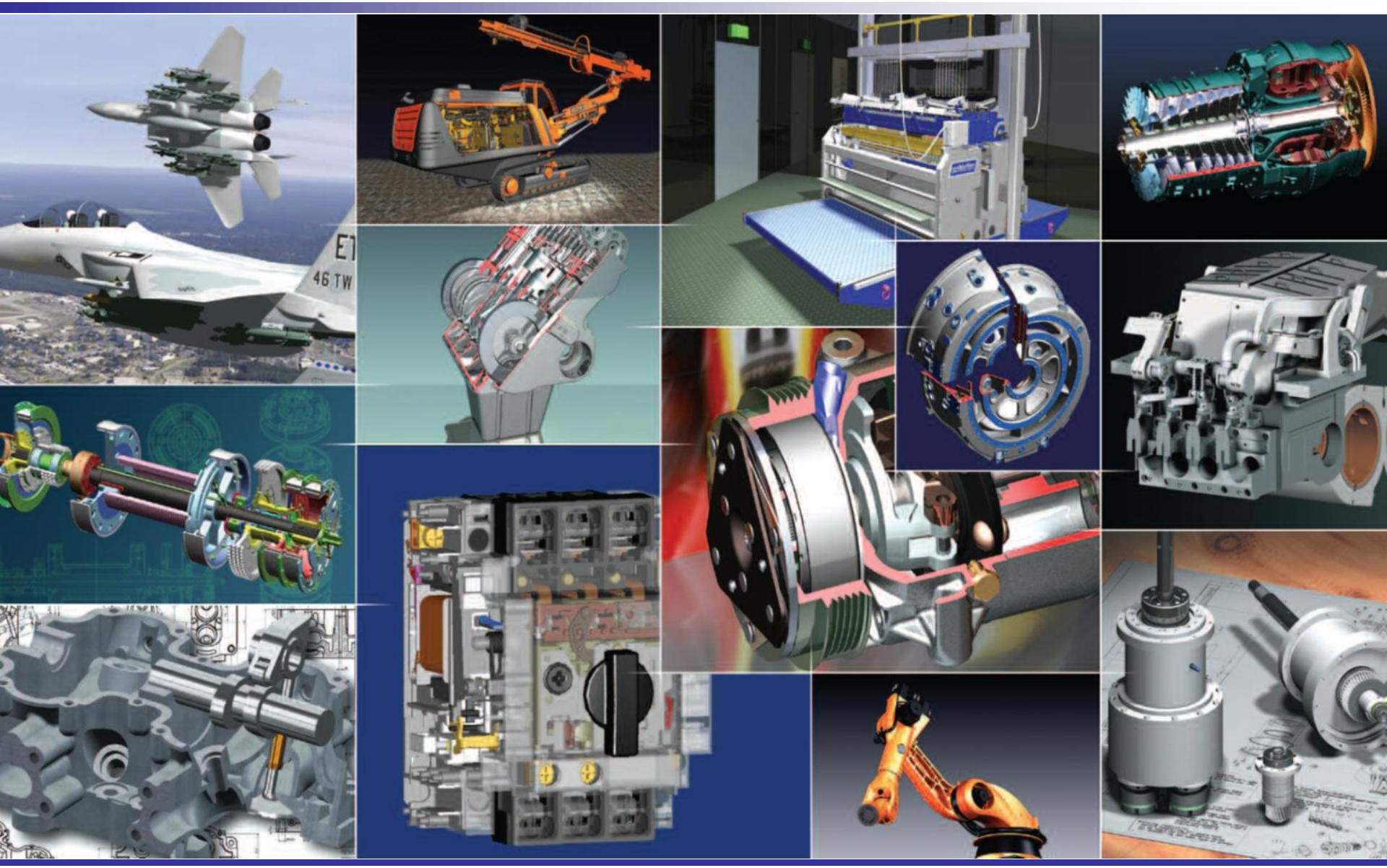

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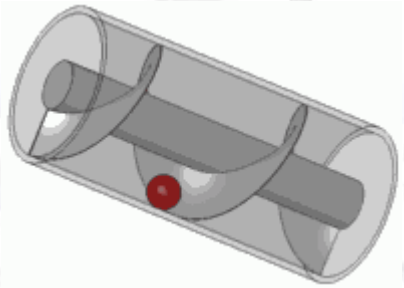
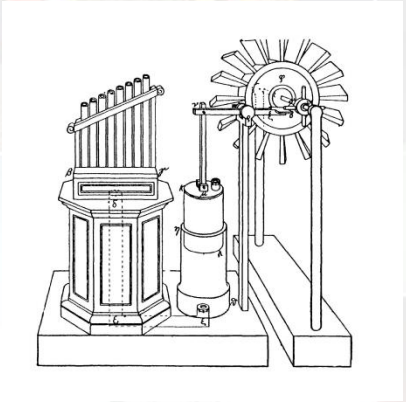
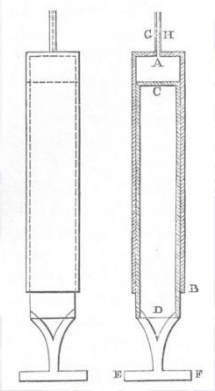
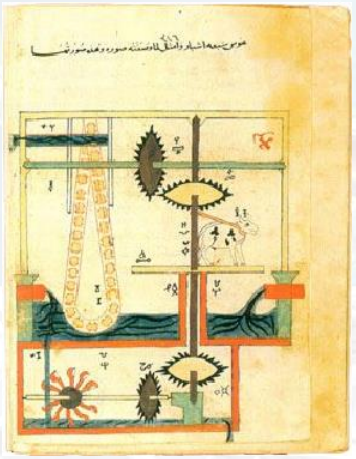
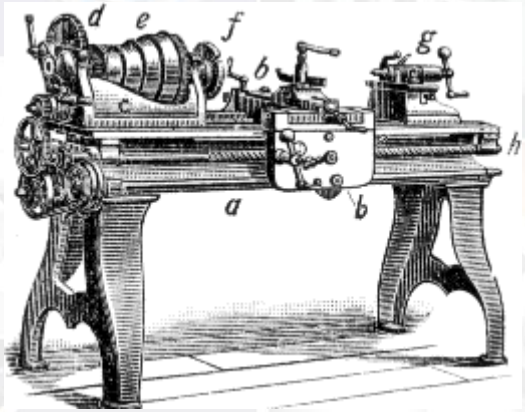
One of the oldest engineering disciplines…











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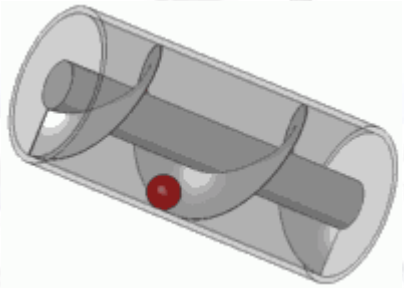

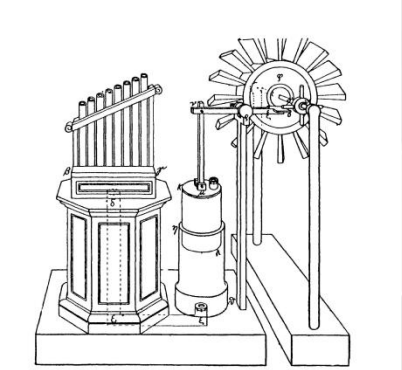

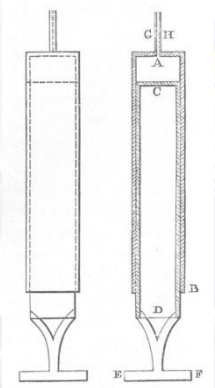

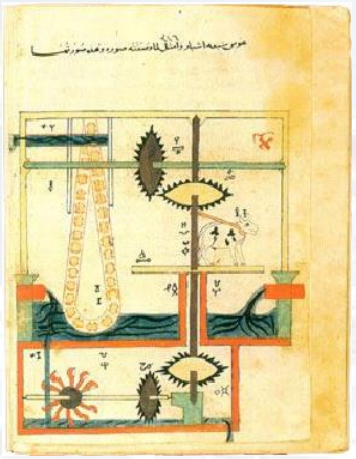

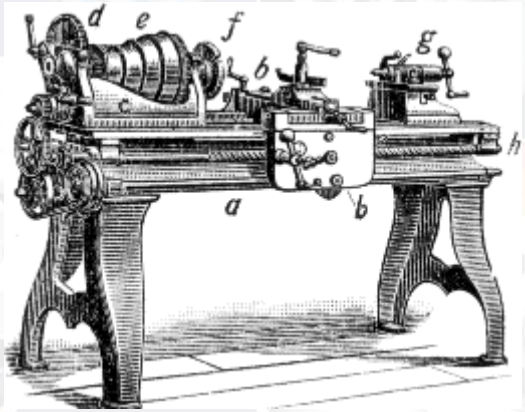

…with a large impact on the progress of mankind

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One of the broadest engineering disciplines…

- **Basic Engineering**
  - Applied mechanics

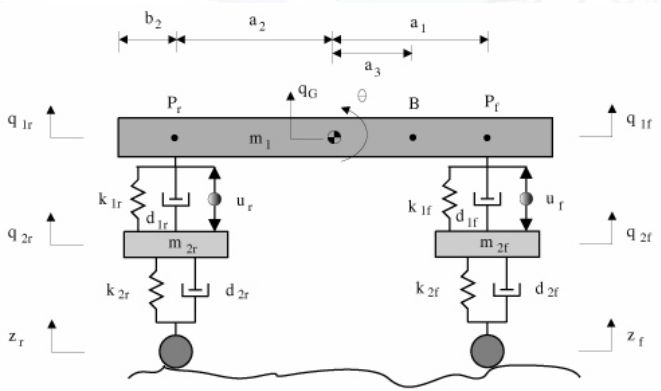
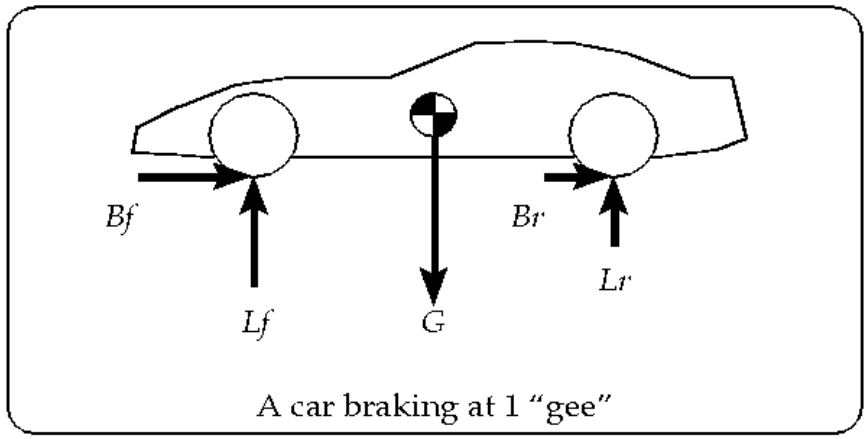
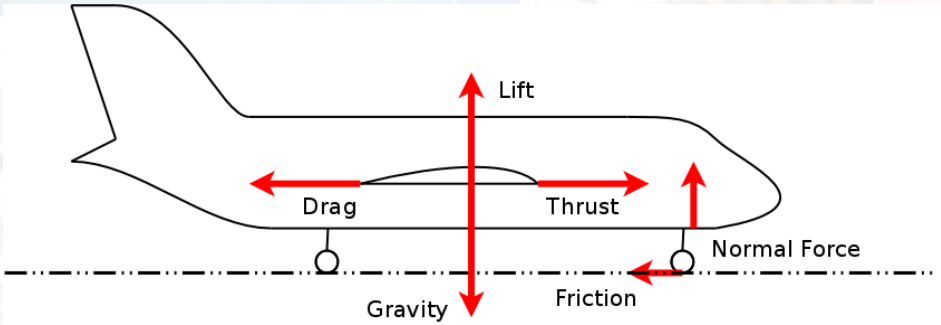
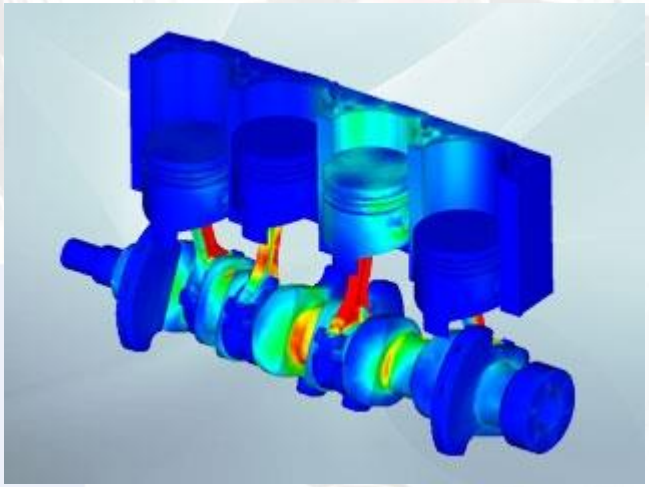



Figure 1. Half-vehicle model with rigid body.




A car braking at 1 "gee"



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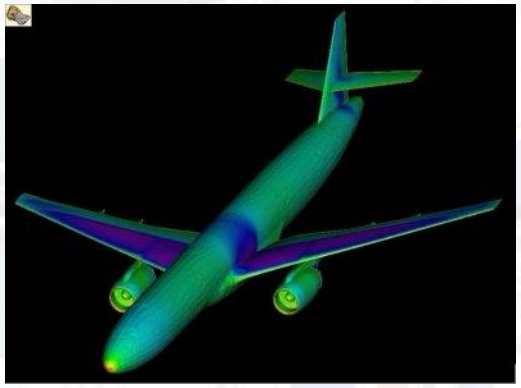
One of the broadest engineering disciplines…

- **Basic Engineering**
  - Applied mechanics
  - Fluids engineering



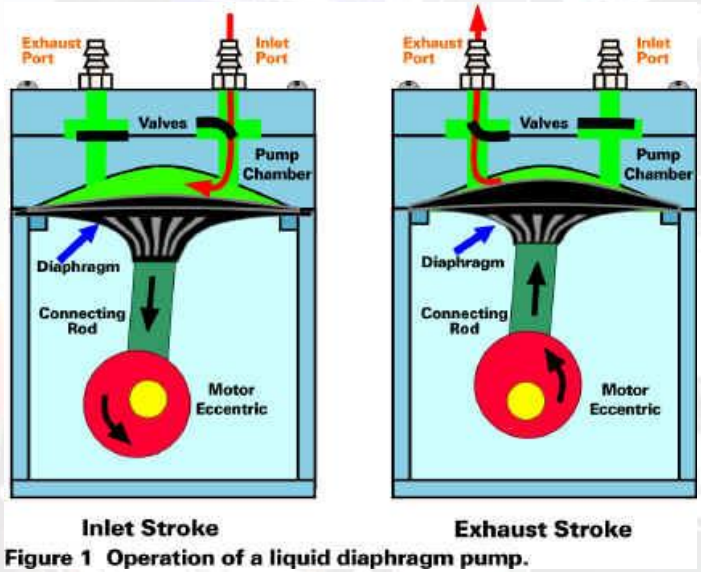
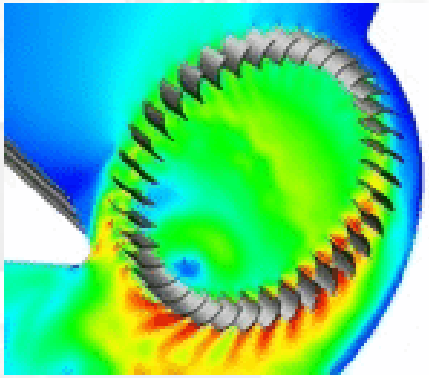


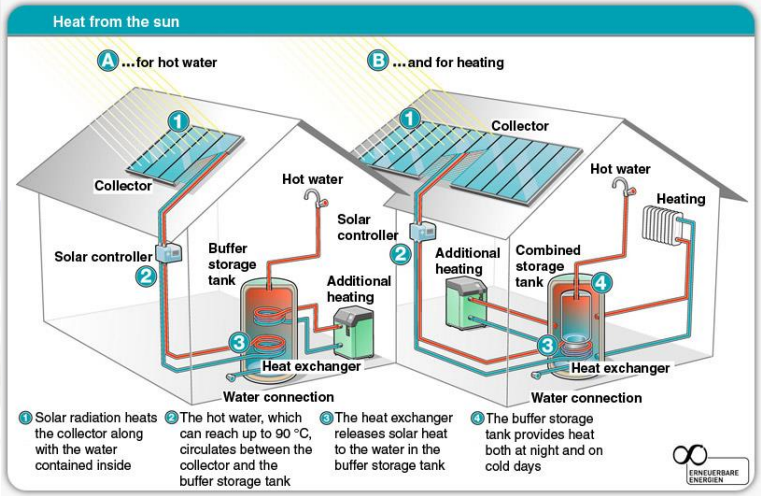

Figure 1 Operation of a liquid diaphragm pump.

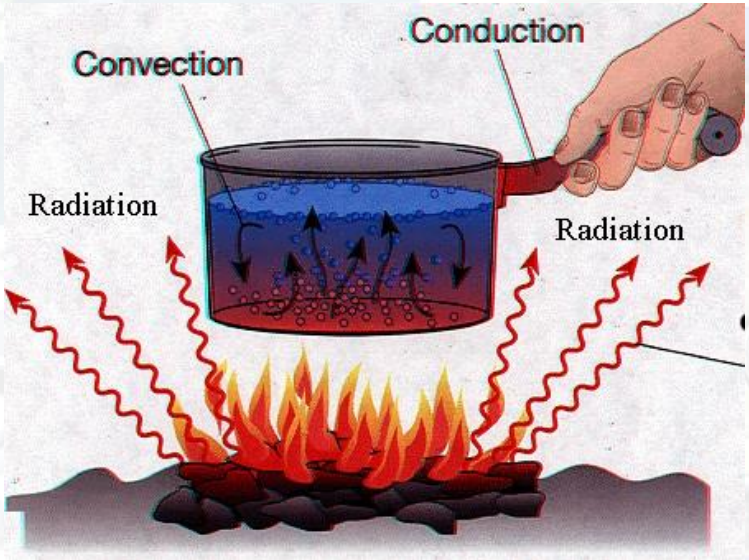


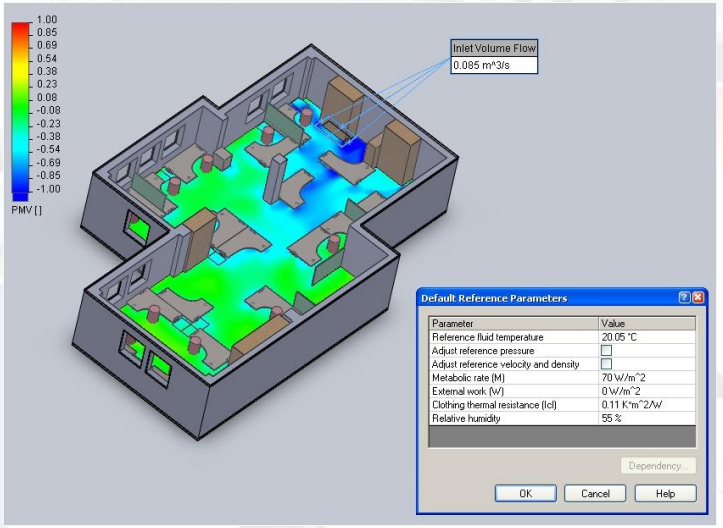
# What Is Mechanical Engineering?

One of the broadest engineering disciplines…

- **Basic Engineering**
  - Applied mechanics
  - Fluids engineering
  - Heat transfer



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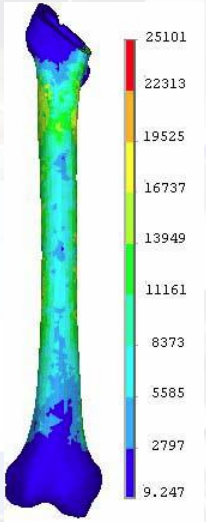
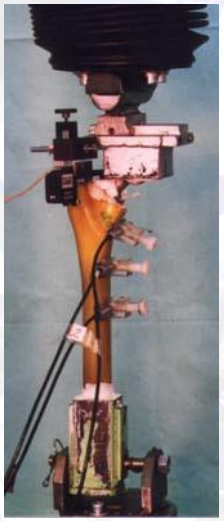
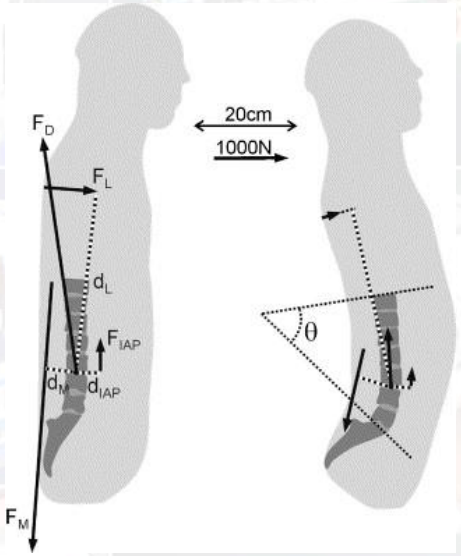
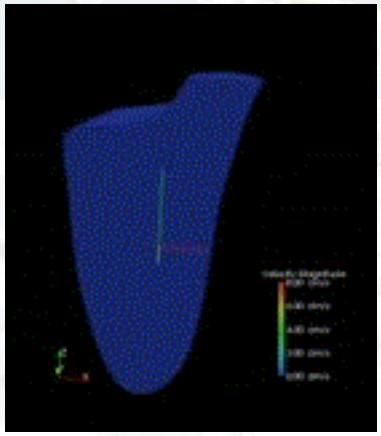
One of the broadest engineering disciplines…

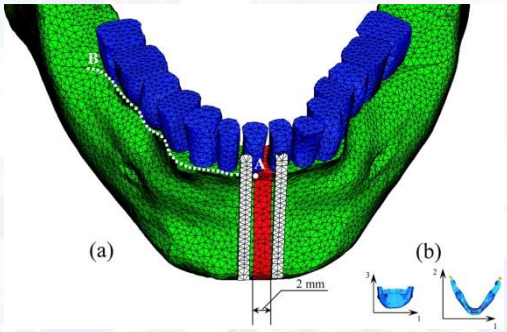
- **Basic Engineering**
  - Applied mechanics
  - Fluids engineering
  - Heat transfer
  - Bioengineering

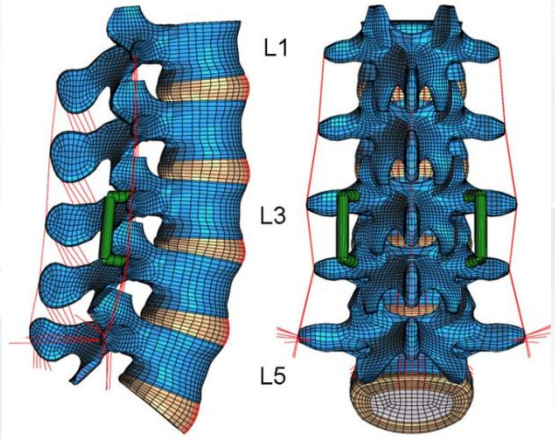


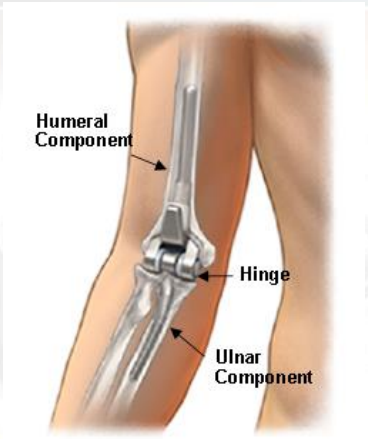







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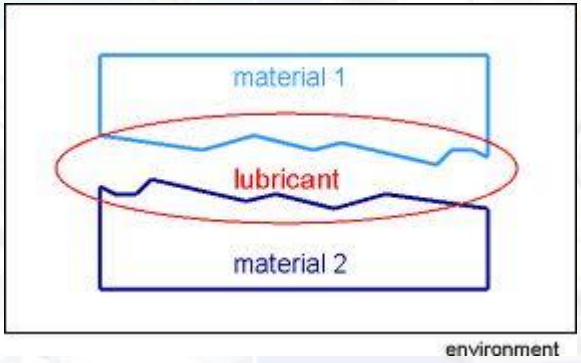
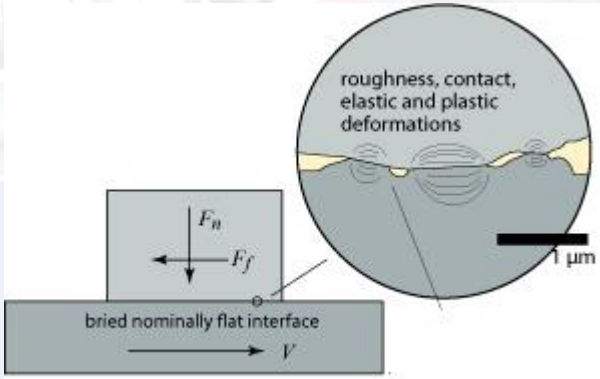
One of the broadest engineering disciplines…

- **Basic Engineering**
  - Applied mechanics
  - Fluids engineering
  - Heat transfer
  - Bioengineering
  - Tribology



# What Is Mechanical Engineering?



One of the broadest engineering disciplines…

- **Energy conversion**
  - Internal combustion engines

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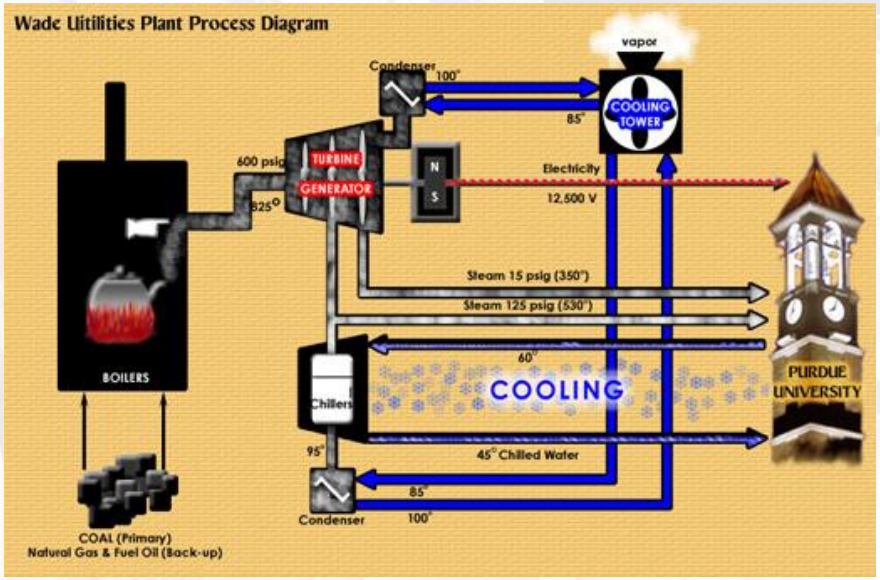
  - Internal combustion engines
  - Fuel and combustion technologies



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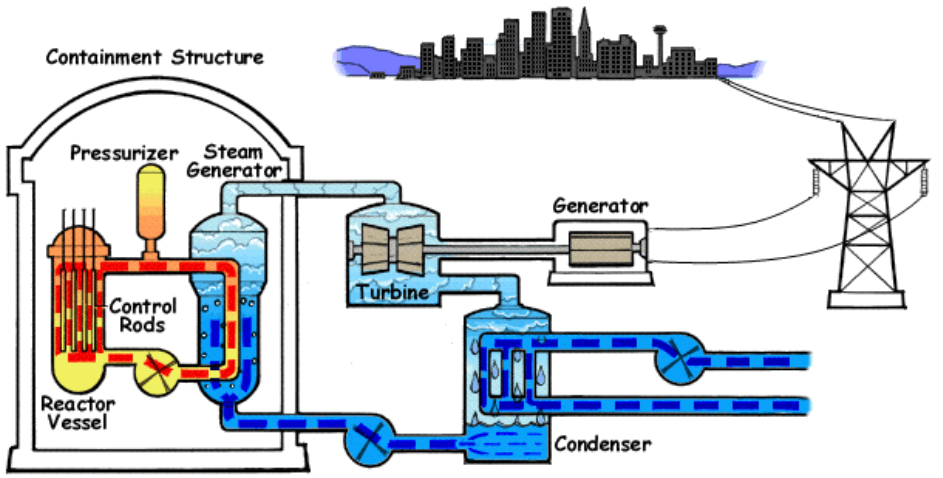
- **Energy conversion**
  - Internal combustion engines
  - Fuel and combustion technologies
  - Nuclear engineering
  - Power engineering



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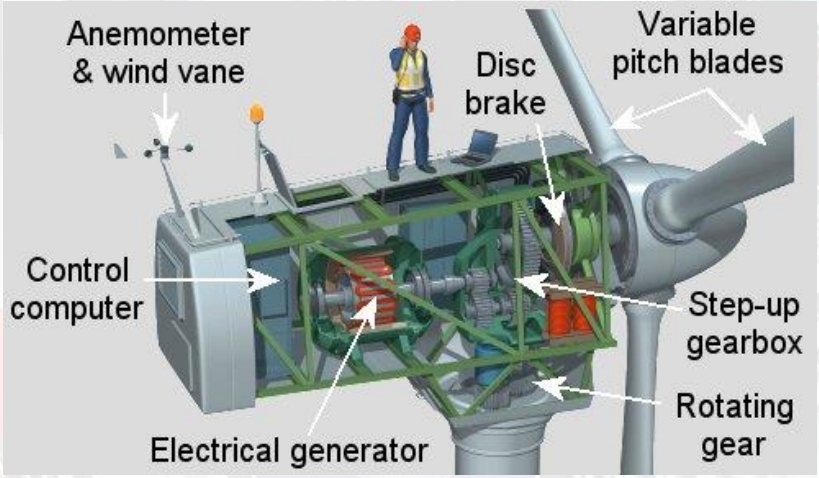
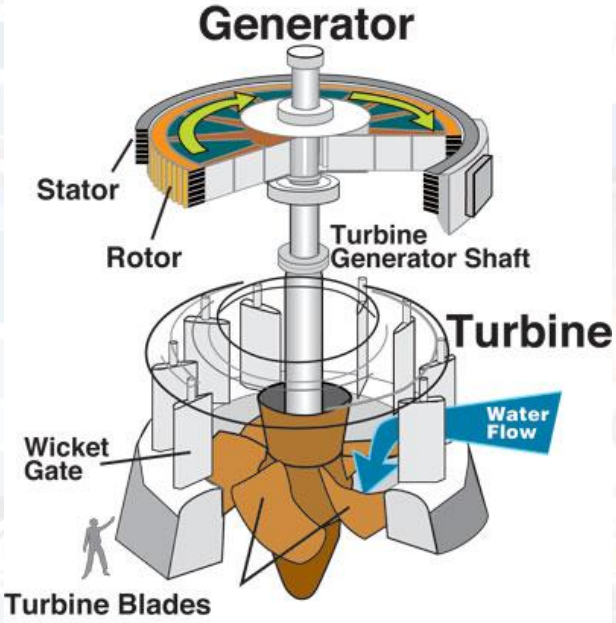
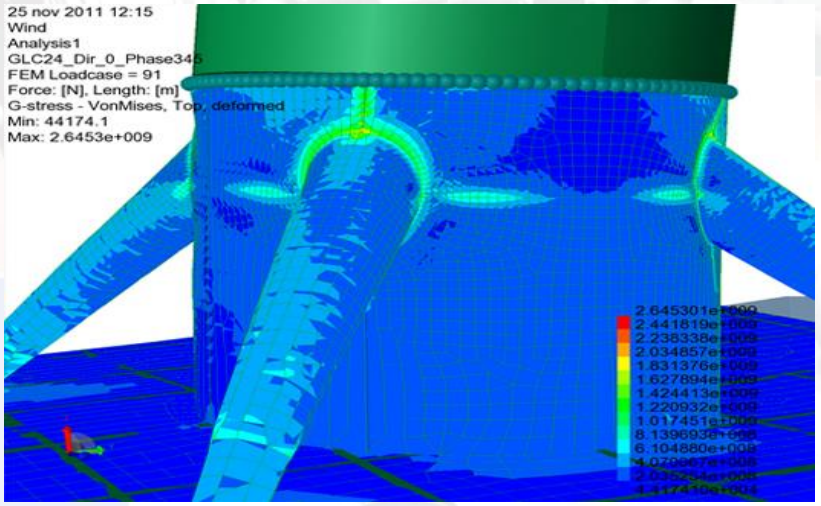
One of the broadest engineering disciplines…

- **Energy resources**
  - Advanced energy systems



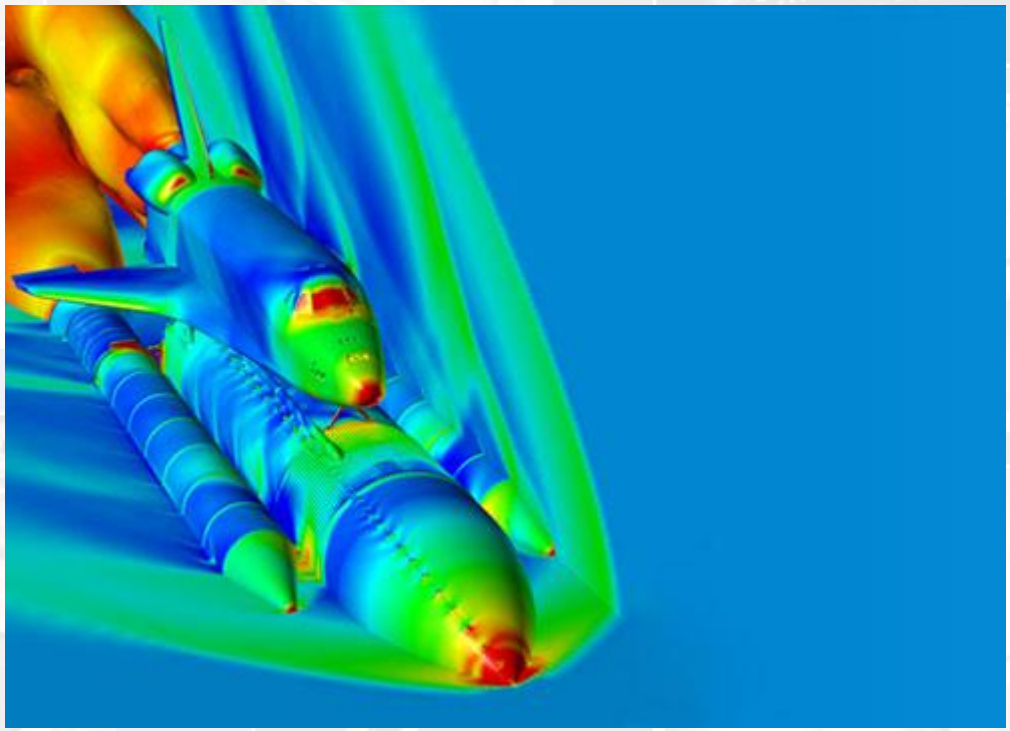



# What Is Mechanical Engineering?



One of the broadest engineering disciplines…

- **Environment and transportation**
  - Aerospace and automotive
  - Rail transportation
  - Noise, acoustics and vibration
  - Environment engineering
  - Solid waste processing



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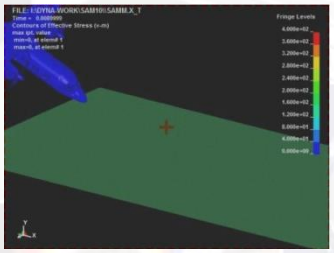

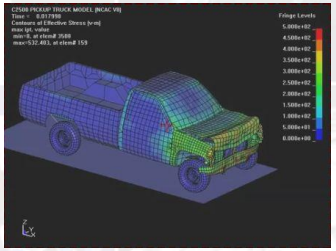

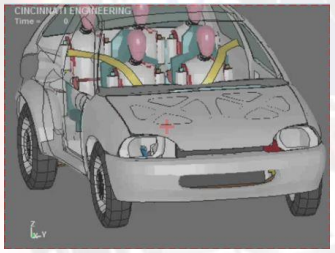


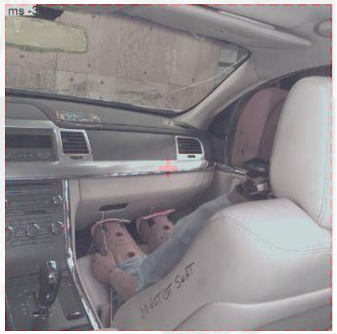

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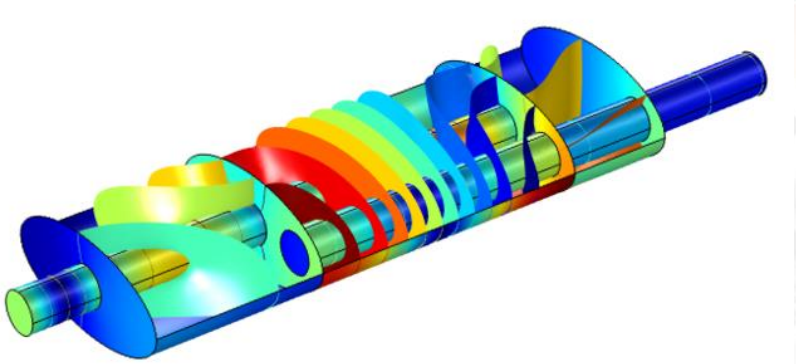

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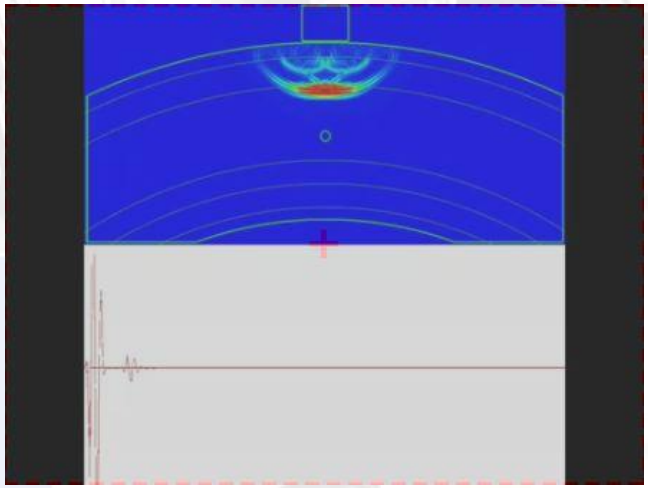

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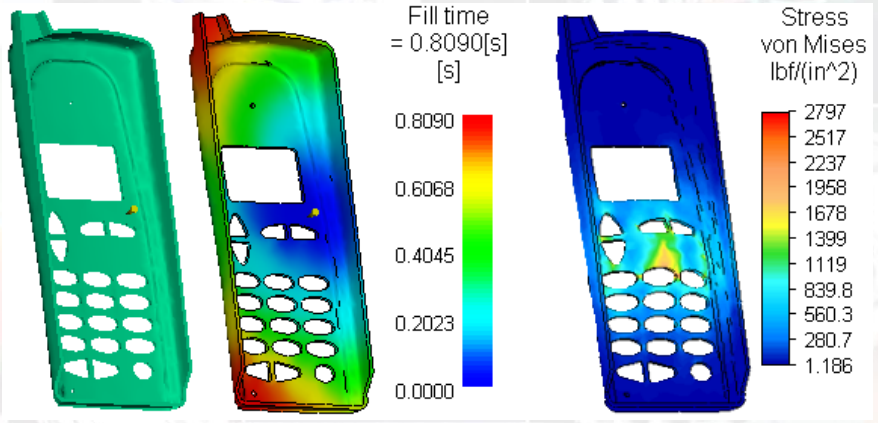
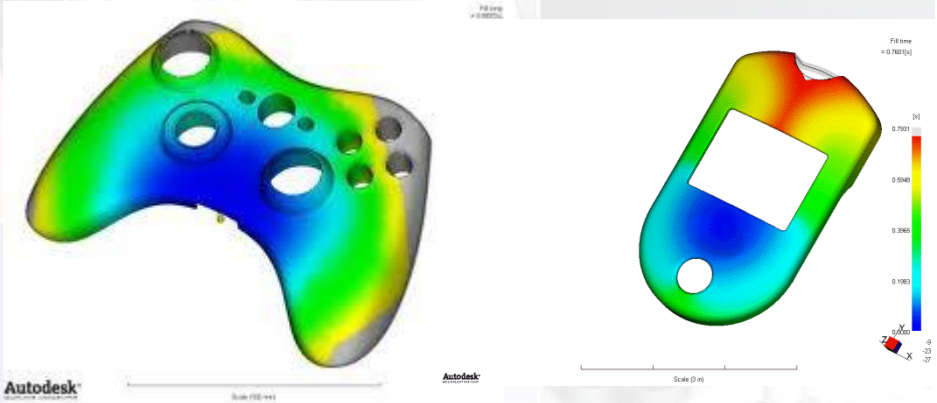
One of the broadest engineering disciplines…

- **Manufacturing**
  - Manufacturing engineering
  - Materials handling engineering
  - Plant engineering and maintenance
  - Process engineering
  - Textile engineering



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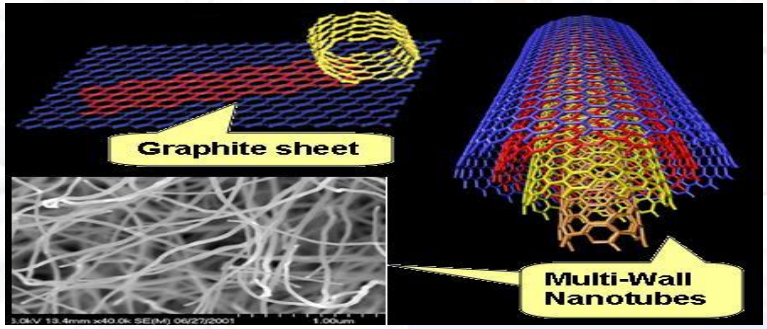
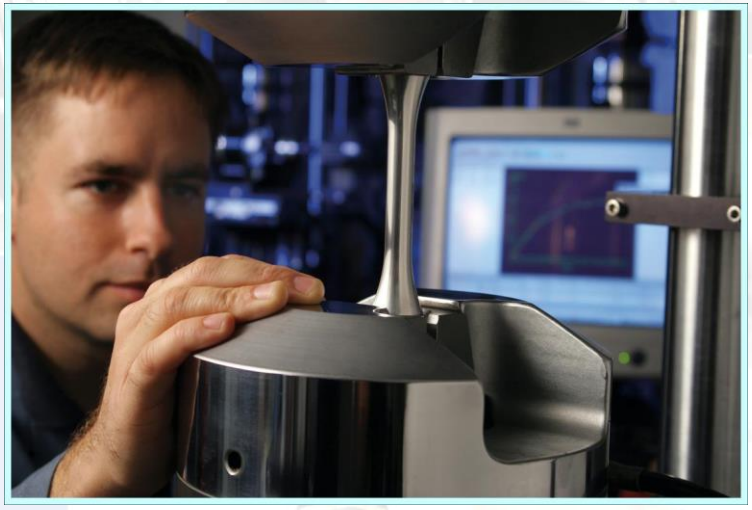
One of the broadest engineering disciplines…

- **Materials and structures**
  - Materials engineering
  - Nondestructive engineering
  - Pressure vessels and piping



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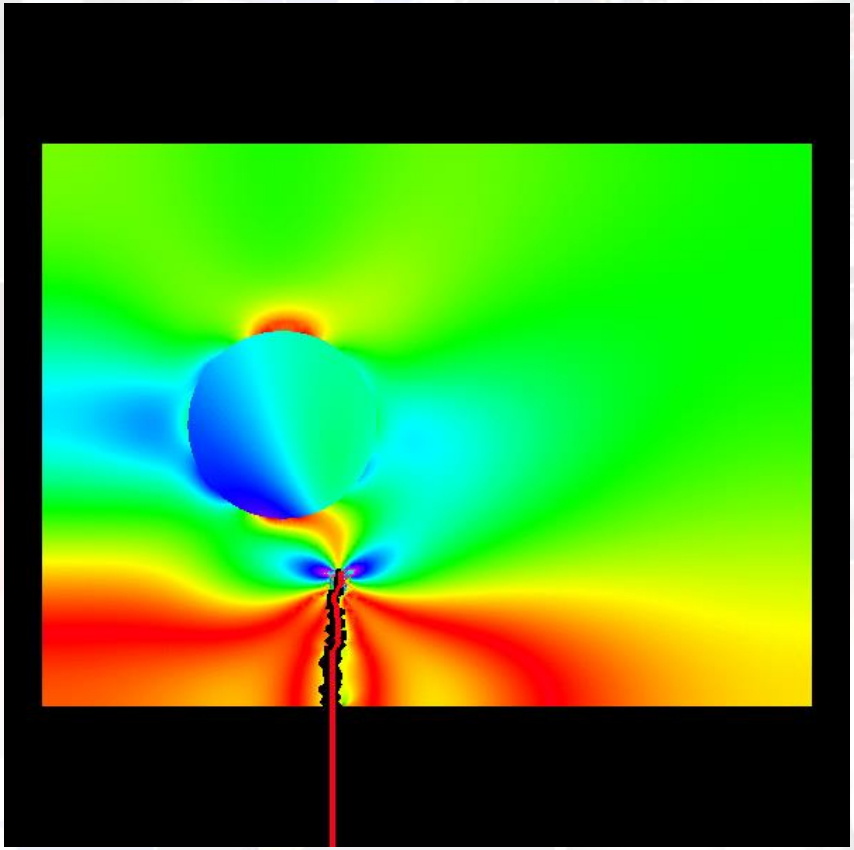

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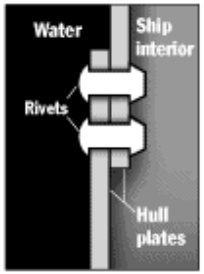



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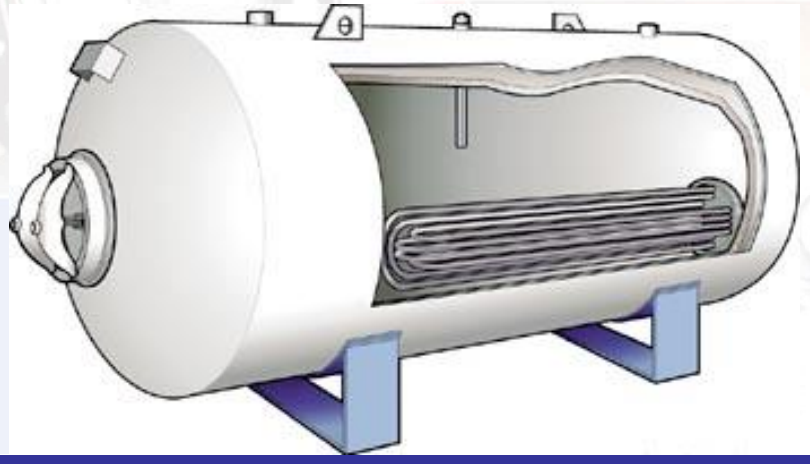


# What Economic Sectors Offer Employment to Mechanical Engineers?

- Well, the truth is *almost* all of them:
  - Automotive
  - Aerospace and defense
  - Manufacturing (nanotubes to ships, computers to oil/gas pipes, toys to weapons, consumer goods to implants, farming equipment to spaceships)
  - Robotics
  - Power generation and distribution
  - Oil and gas industry
  - Bioengineering
  - Nano technology
  - Consulting
  - Government
  - Academia

# Undergraduate Program in MME at Western

- Second, third and fourth year common courses (Y2, Y3, Y4)
- Specialization in desired areas through fourth year technical electives (Y4E); the requirement is five student-selected TEs (from a large list of TEs)
- **Fundamental courses in science:**
  - Applied Mathematics and Numerical Methods (Y2)
  - Applied Mathematics (Y2)
  - Applied Statistics and Data Analysis (Y2)
  - Computational Methods (Y2)
- **Fundamental courses in structures and dynamics:**
  - Mechanics of Materials (Y2)
  - Engineering Dynamics (Y2)
  - Engineering Experimentation (Y2)
  - Introduction to Computer Methods in ME (Y2)
  - Kinematics and Dynamics of Machines (Y3)
  - Mechanical Vibrations (Y3)

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in design:**
  - Product Design and Development (Y2)
  - Mechanical Component Design (Y3)
  - Finite Element Methods (Y3)
  - Mechanical Engineering Design Project (Y4)
  - Advanced CAE: Reverse Engineering (Y4E)
  - Advanced CAE: Simulation (Y4E)

Fabrication and assembly

Computer lab

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in materials:**
  - Industrial Materials (Y2)
  - Materials Selection (Y3)
  - Mechanical Properties of Materials (Y4E)
  - Composite Materials (Y4E)
  - Corrosion and Wear (Y4E)

Microscopy

Stress visualization

Tensile testing

# Undergraduate Program in MME at Western

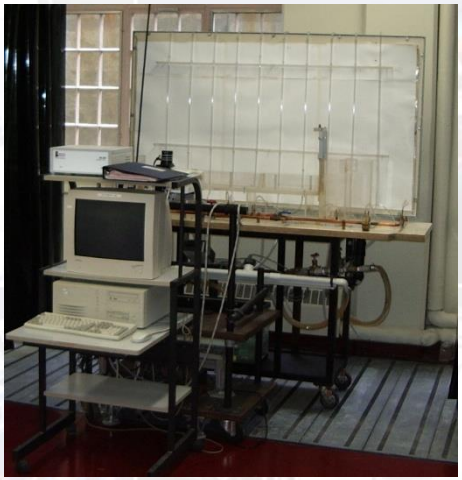
- **Fundamental and applied courses in transport processes:**
  - Thermodynamics I (Y2)
  - Introduction to Fluid Mechanics and Heat Transfer (Y2)
  - Fluid Mechanics II (Y3)
  - Heat Transfer (Y3)
  - Thermodynamics II (Y3)
  - Internal Combustion Engines (Y4E)
  - HVAC I (Y4E)
  - Fluid Machinery (Y4E)
  - HVAC II (Y4E)
  - Advanced CAE: Computational Heat and Fluid Flow (Y4E)

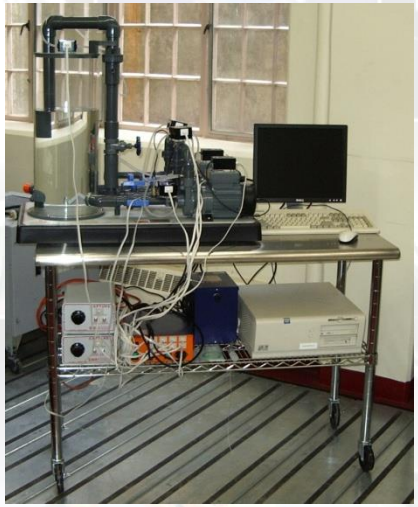
Steam Turbine

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in transport processes:**
  - Thermodynamics I (Y2)
  - Introduction to Fluid Mechanics and Heat Transfer (Y2)
  - Fluid Mechanics II (Y3)
  - Heat Transfer (Y3)
  - Thermodynamics II (Y3)
  - Internal Combustion Engines (Y4E)
  - HVAC I (Y4E)
  - Fluid Machinery (Y4E)
  - HVAC II (Y4E)
  - Advanced CAE: Computational Heat and Fluid Flow (Y4E)

Centrifugal pump


Hydraulic Jump


Pumps

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in transport processes:**
  - Thermodynamics I (Y2)
  - Introduction to Fluid Mechanics and Heat Transfer (Y2)
  - Fluid Mechanics II (Y3)
  - Heat Transfer (Y3)
  - Thermodynamics II (Y3)
  - Internal Combustion Engines (Y4E)
  - HVAC I (Y4E)
  - Fluid Machinery (Y4E)
  - HVAC II (Y4E)
  - Advanced CAE: Computational Heat and Fluid Flow (Y4E)


Smart Engine

# Undergraduate Program in MME at Western

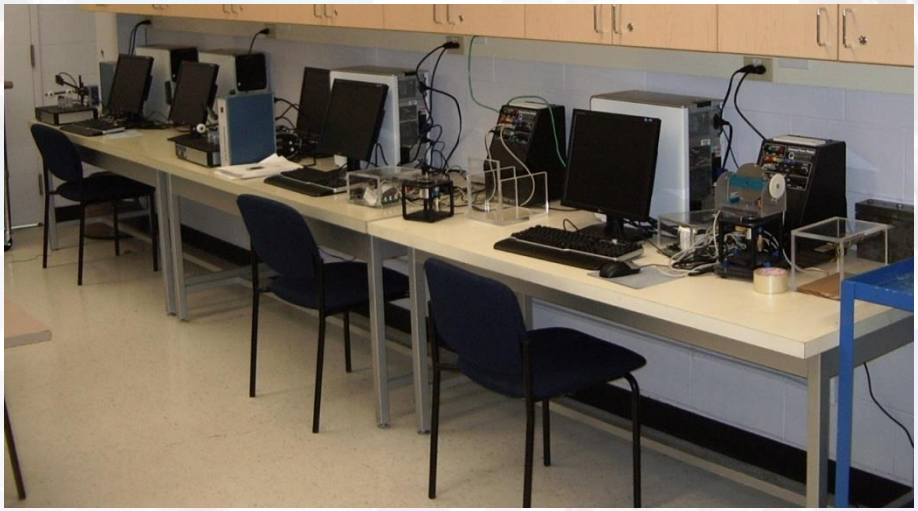
- **Fundamental and applied courses in automation and control:**
  - Electronics for Mechanical Engineers (Y3)
  - System Modeling and Control (Y3)
  - Robotics and Manufacturing Automation (Y4E)
  - Mechatronic System Design (Y4E)
  - Control Systems: Theory and Practice (Y4E)

Automation and robotics

PLC Trainers

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in automation and control:**
  - Electronics for Mechanical Engineers (Y3)
  - System Modeling and Control (Y3)
  - Robotics and Manufacturing Automation (Y4E)
  - Mechatronic System Design (Y4E)
  - Control Systems: Theory and Practice (Y4E)



Vibration Testing

Vibration Testing

# Undergraduate Program in MME at Western

- **Fundamental and applied courses in manufacturing:**
  - Engineering Shop Safety Training (Y2)
  - Advanced CAE: Manufacturing Technologies (Y4E)
  - Production Management (Y4E)
  - Engineering in a Global Context: Advanced Manufacturing (Y4E)

Multi-axis CNC Machine Tools

Coordinate Measurement Machine

# Undergraduate Program in MME at Western

- **Specialized elective courses:**
  - Medical engineering: Biomechanics of the Musculoskeletal System (Y4E), Medical Devices (Y4E)
  - Nuclear Engineering (Y4E)
  - Fundamentals of MEMS (Y4E)
  - Fundamentals of Nanoengineering Science (Y4E)

- **Other courses:**
  - Building Better (Communication) Bridges: Rhetoric and Professional Communication for Engineers (Y2)
  - Engineering Ethics, Sustainable Development and the Law (Y4)
  - 1.5 credits of non technical electives (Y4)

# Undergraduate Program in MME at Western

- **Academic options available while pursuing mechanical engineering degree:**

1. Mechanical engineering (4 years)
   - Summer Co-op (4 months after Y1, Y2, or Y3)

2. Mechanical engineering + Internship (5 years)
   - Internship (8 to 16 months after Y3)

3. Mechanical engineering + PEME (4 or 5 years)
   - Fanshawe modules can be taken either during regular academic year or during summers after Y2 and Y3
   - Other combinations between Co-op, Internship and PEME options are possible (6 years for both PEME modules and Internship)

# Undergraduate Program in MME at Western

- **Academic options available while pursuing mechanical engineering degree:**

4. Mechanical engineering + other Western programs

   - Combined degrees (accredited program options)
     - ❖ Mechanical Engineering with Business (BESc + HBA) = 5 years
     - ❖ Mechanical Engineering with Law (BESc + JD) = 6 years
     - ❖ Mechanical Engineering with Biomedical = 5 years

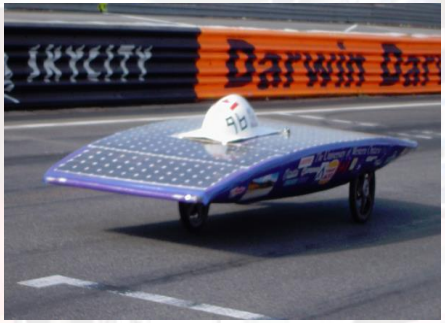
   - Concurrent degrees options (typically 5 years)
     - ❖ Past popular choices with: Computer Science, Physics, Medical Biophysics, Applied Mathematics,
     - ❖ Renewed interest is in **ME + Computer Science** due to the strong advent of artificial intelligence-based technologies with broad applications to advanced manufacturing
     - ❖ Other options available, including custom design

# Undergraduate Program in MME at Western

- **Optional extracurricular activities available:**
  - Student teams
    - Popular choices: Formula SAE, Baja SAE, SunStang, WEBots, Aero Design, Rocketry, Toboggan, etc.
  - Student clubs
    - Mechanical and Materials Engineering Society
  - Wood and metal machine shop training courses (advanced module) delivered by UMS (University Machine Services)

Formula SAE


Baja SAE



Sunstang


WEBots

Student Machine Shop

# Undergraduate Program in MME at Western



- **Options available after graduation:**
  - Employment in any of the previous mentioned areas of mechanical engineering
  - Graduate studies
    - Professional master program (MEng) with specialization in:
      - Mechanical Engineering (more specialized focus possible)
      - Medical Devices
      - More to come
    - Research-oriented graduate programs:
      - Master (MESc)
      - Doctoral (PhD)