

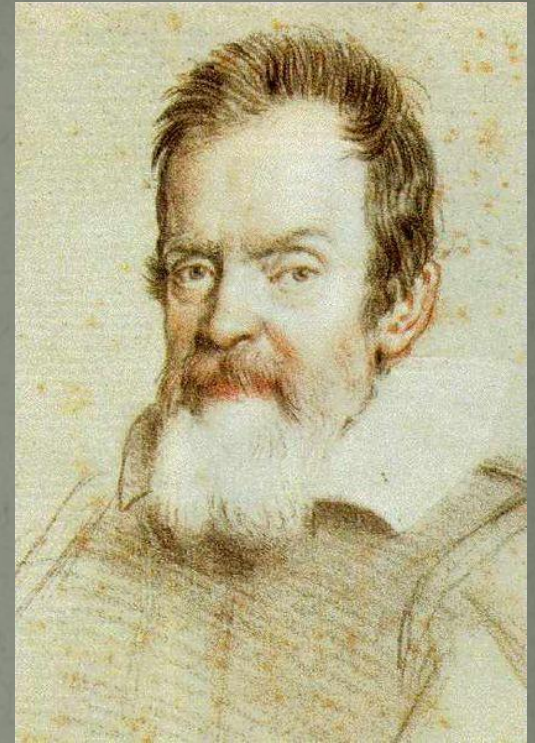
EGS 2310 - Engineering Analysis: Statics

Introduction



Overview

- Introduction
- What is Statics ?
- What to expect in this class.



Mechanics

- *Mechanics* is a branch of physics concerned with the behavior of objects that are at rest or in motion and subjected to the action of forces.
- Mechanics can be broadly subdivided into *Statics* and *Dynamics*
- *Dynamics* is a branch of mechanics that studies the motion of bodies subject to acceleration.

Statics

- *Statics* is a branch of mechanics that is concerned with the study of bodies that are in equilibrium, that is, either at rest or in motion with constant velocity.

Brief History of Mechanics/ Statics

Some major contributors include:

- 400 BC Archytus of Tarentum - Theory of Pulleys
- 287-212 BC Archimedes - Lever equilibrium, buoyancy principle
- 973 – 1048 Al-Biruni - Explained the phases of the moon
- 1452-1519 Leonardo da Vinci - Equilibrium, concept of moments
- 1473-1543 Copernicus - Proposed that the earth revolves around the sun
- 1548-1620 Stevinus - Inclined planes, parallelogram law for addition of forces
- 1564-1642 Stevinus, Galileo - Virtual work principles
- 1564-1642 Galileo - Dynamics of pendulums, falling bodies
- 1629-1695 Huygens - Accurate measurement of the acceleration due to gravity

Brief History of Mechanics/ Statics

- 1642-1727 Newton - Law of universal gravitation, laws of motion
- 1654-1722 Varignon - Work with moment and force relationships
- 1667-1748 Bernoulli - Application of virtual work to equilibrium
- 1707-1793 Euler - Rigid body systems, moments of inertia
- 1717-1783 D'Alembert - Concept of inertia force
- 1736-1813 Lagrange - Formalized generalized equations of motion
- 1792-1843 Coriolis - Work with moving frames of reference
- 1858-1947 Planck - Quantum mechanics
- 1879-1955 Einstein - Theory of relativity

Applications of Statics

- Architectural and Structural Engineering
- Analysis of Forces
- Design of Foundations
- Fluid Statics, Hydraulics
- And many other engineering problems that involve analyzing a system at rest.

Prerequisite Knowledge

- Success in grasping many of the methods and techniques is based on previous knowledge and experience in many fields including:
 - Algebra
 - Trigonometry
 - Geometry
 - Calculus (Differentiation, Integration)
 - Vectors
- See review topics in Appendix of textbook

How to Pass This Class

- Statics is an involving field of study, and requires critical thinking and a meticulous approach.
- The most effective way to study the course material is to *solve problems*.
- Reading course texts and problem solutions alone will be of limited value. You must work the problems on your own.
- Pay attention in class, ask questions. If you get stuck, ask for assistance. From home you may email me at any time.

Problem Solving 101

1. Read the problem thoroughly, and try to associate the information and scenario with a theory you have studied.
2. Draw any relevant diagrams or tables.
3. Establish a coordinate system and apply the relevant principle, in mathematical form.
4. Solve the relevant equation by algebra, and append the correct units to your answer.

Problem Solving 101

5. Study your answer, and ask yourself, “...is my answer reasonable?..”, “...does it make sense?...”
6. Review the problem and consider other ways the same solution could have been obtained.

Problem Solving

- **Caution!**: Yes, you will make errors, get mad, and frustrated, but it is what it is.
- Neat and organized presentation of your solutions is an indication of clear and organized thinking.
- You may use software applications you have learned in other classes, such to *Mathcad*, *Matlab* and others.

Assessment

The course assessment will include the following:

- Quizzes: Weekly. Open book open notes. Typically a practical problem, 10 – 15 minutes
- Homework Assignments: Term Project
- Tests: Monthly. Closed book. Formula sheet allowed, 45 mins – 1 hour. Covers work from that month
- Final : comprehensive exam, structured same as the tests
- Practice Problems : Problems will be assigned but you are not required to turn them in. Solutions will be posted on class webpage

How Did That Go ?

