

### Turn in Sketching 3 Homework

- Today:
- - Overview of Bike Labs
- - Bike Lab 1
  - Objectives
  - Video on Tools
  - Create Team Names
  - Lab Procedure Handout

## Introduction To Engineering Bike Lab #1 - 1

### Agenda

- Overview of the Bicycle Labs

### Goals of the Bicycle Labs

- Learn what engineering is.
- Show how different disciplines of engineering (mechanical, materials, electrical, industrial, and others) are associated with one product.
- Show how physics and mathematics are used in engineering.
- Develop communication skills.

### By the end of these labs you will be able to:

- Know about material properties such as specific weight, strength, elasticity, fatigue, and others.
- Know how to take measurements of structural components.
- Know how to take and record data using digital data acquisition system.
- Know about the design process.
- Gain experience in teamwork and report writing.

### Why Bicycles ?

- Bicycles are one of the most efficient modes of human transportation.
- Bicycles are widely used.
- Many competitive designs do effectively the same thing.
- Bicycles represent a thriving sector of the economy.

### Bike Labs

- **Bike Lab 1:** Learn about material properties, measurement instruments; estimation of the weight of a bicycle frame.
- **Bike Lab 2:** Materials as structural components; bending of beams.

## Bike Labs

- **Bike Lab 3:** static loads on bicycles. (how much stress do you put on the front fork?)  
Sensors, data acquisition, analog and digital data;
- **Bike Lab 4:** dynamic loads on bicycles.  
(how much stress do you put on the front fork when riding the bike?) Strength and reliability of engineering materials, failure, fatigue;

## Bike Design

- Consumers have many varied desires when buying a bicycle. Design goals depend on the kind of bike and targeted customers.
- **Types of bikes:**
  - Road bikes:
    - Racing, cruising, commuter, touring.
  - Mountain bikes:
    - Trail, downhill.

## Generally Desired Features:

- Lightweight
- Good handling
- Proper stiffness (some debate on exactly what's 'proper')
- Durability
- Reliability
- Low maintenance
- Low cost

Design trade-offs treated differently for varied applications.  
Example: Olympic racing bicycles can be much more expensive if weight can be reduced.

## Different Bicycle Designs

Attempts to meet design goals:

- Welded steel frames
- Brazed steel frames
- Different geometries of frames

## Different Bicycle Designs (continued)

- Aluminum frames (aluminum is lighter than steel, steel is cheaper)
- Titanium Frames (titanium is heavier than aluminum but lighter than steel and stronger than both)
- Composite frames, carbon fibers in epoxy matrix (light and strong but expensive to manufacture)

## Examples of Bicycle Design

Huffy - mountain bike, steel welded frame



### Examples of Bicycle Design

Giant - road bike



### Examples of Bicycle Design

Merlin - titanium frame  
(\$2399 only the frame)



### Examples of Bicycle Design

Cannondale - road bike,  
Aluminum frame, carbon fiber composite fork



### Examples of Nontraditional Bicycle Design



### Examples of Nontraditional Bicycle Design



### Examples of Nontraditional Bicycle Design



Examples of Recumbent Bicycle Design



For tomorrow...

- Read Bike Lab #1 procedure CAREFULLY!!!

- Bike Lab 1
- Objectives
- Video on Tools

Get to know one another.

- Learning Styles
- Contact Information (Phone, Email, Study Hall)

Pick Team Name

- school appropriate
- get teacher OK

**HOMEWORK:**

For tomorrow...

How to work as a team in LAB activities?

- Before Starting
  - Know what you're going to do (READ!)
  - Discuss
    - What does each team member WANT to do?
    - What is each team member GOOD at?
    - How will you find the volumes?
- Decide who does what
  - even distribution
  - do you want a team director/manager?
    - monitor participation
    - over workers / under workers