# EME150A + Discussion

Destiny Garcia

9/23/2016

# Announcement

- New office hour room: TB 207 Room 110
- Same Days: W 1-2, F 12-1

# Agenda

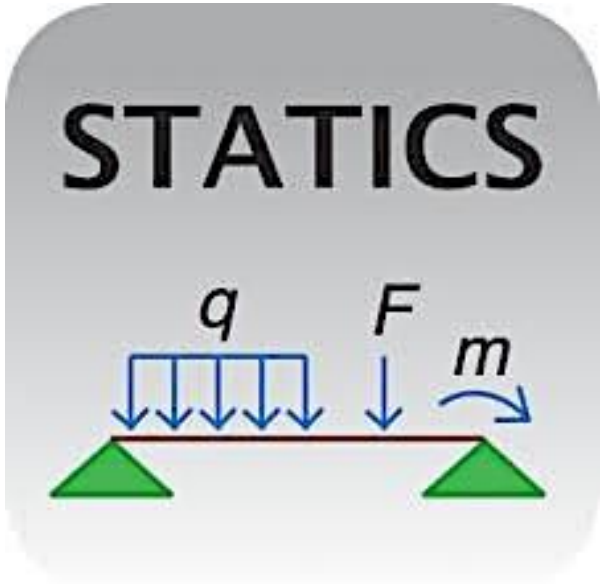
- Review Past Material
- Intro Project 1
- Design Teams
- Break
- Notebook Activity
- Wrap up!

# Review of Past Material

- ENG35 – Statics
- ENG45 – Material Properties
- ENG104 – Strength of Materials
- (EME50) – Manufacturing

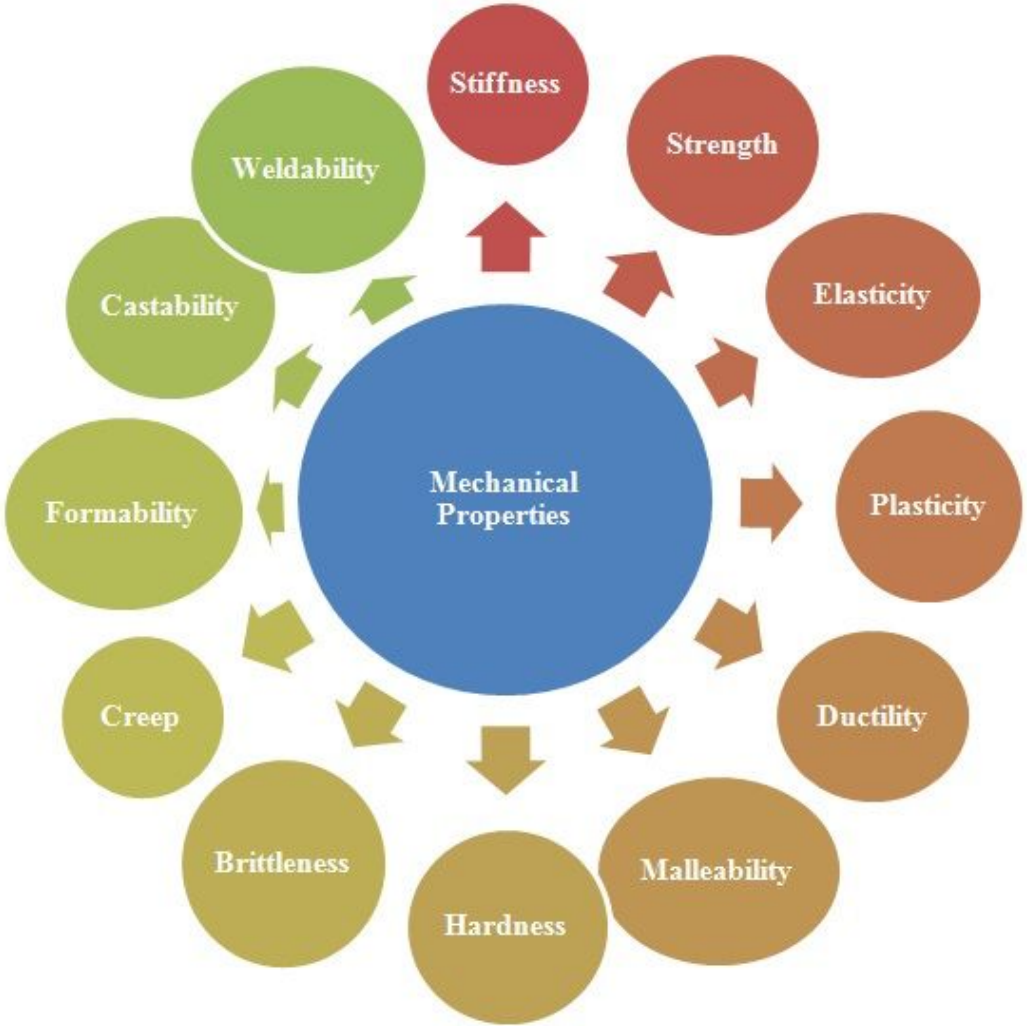
# Statics

- Force systems
- Equilibrium
- Trusses
- Frames & Machines
- Center of Mass, centroids
- Shear and Moment diagrams
- Area moments of inertia
- Friction



# Material Properties

- Bonding
- Crystalline structures
- Defects
- Diffusion
- Mechanical properties of materials
- Thermal properties
- Phase diagrams
- Kinetics
- Metals, ceramics, glasses, polymers, composites

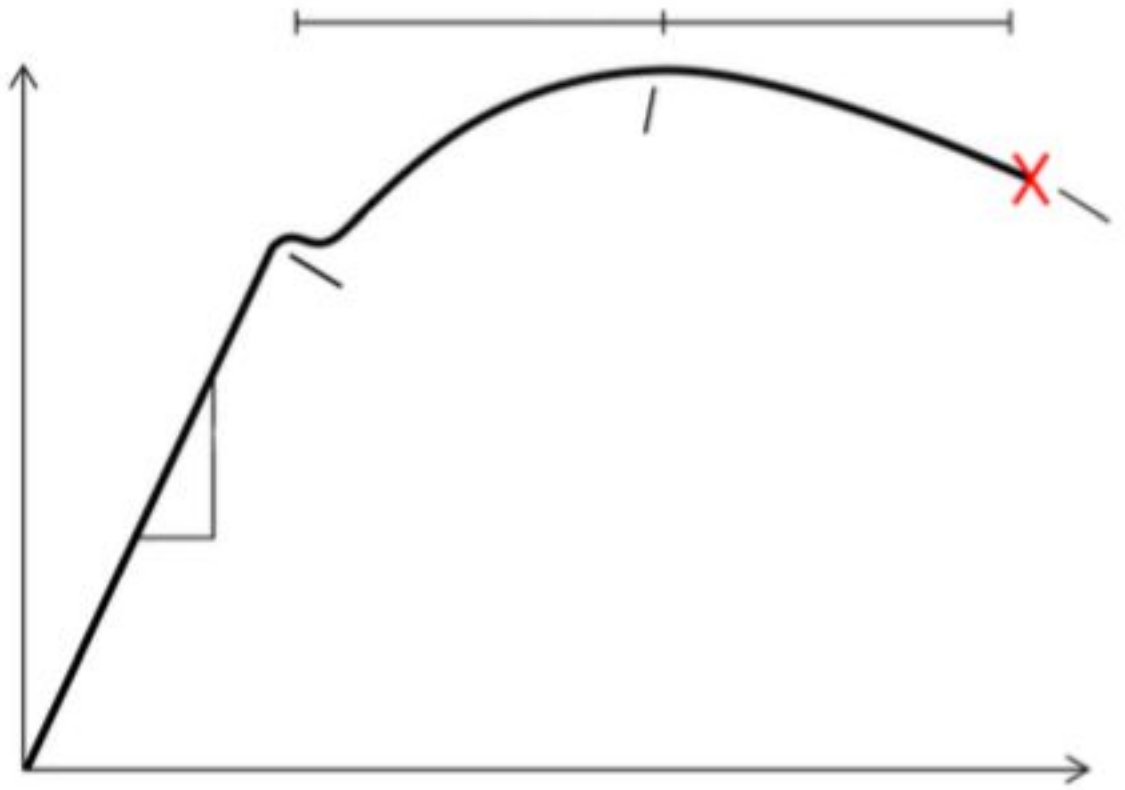


# Strength of Materials

- Axially loaded members
- Torsion
- Shear force, and bending diagrams
- Stresses in beams
- Stress & strain
- Plane stress
- Deflection of beams
- Buckling
- Combined loads

# Pop Quiz!

- Fill in as much information as you can on this material stress--strain curve.
- Add the most important features, axis labels, likely material, the differences in the two, etc.



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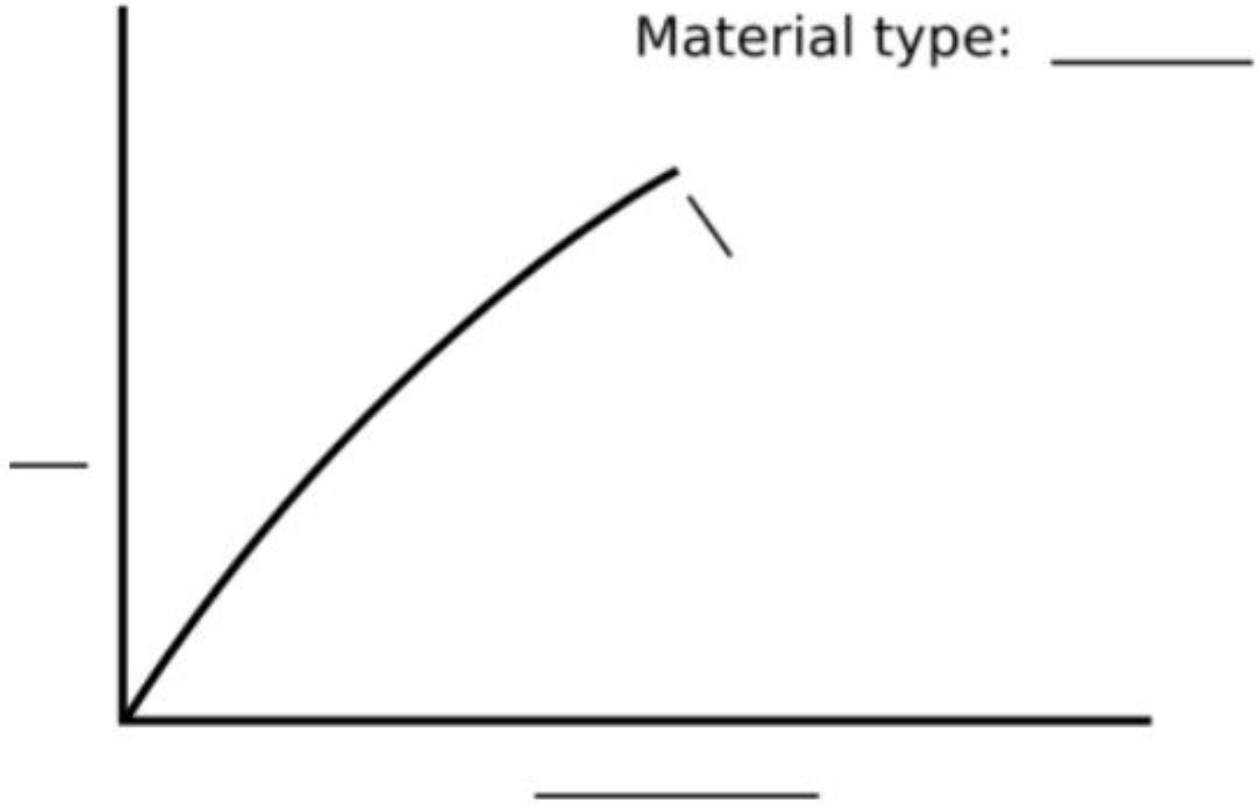
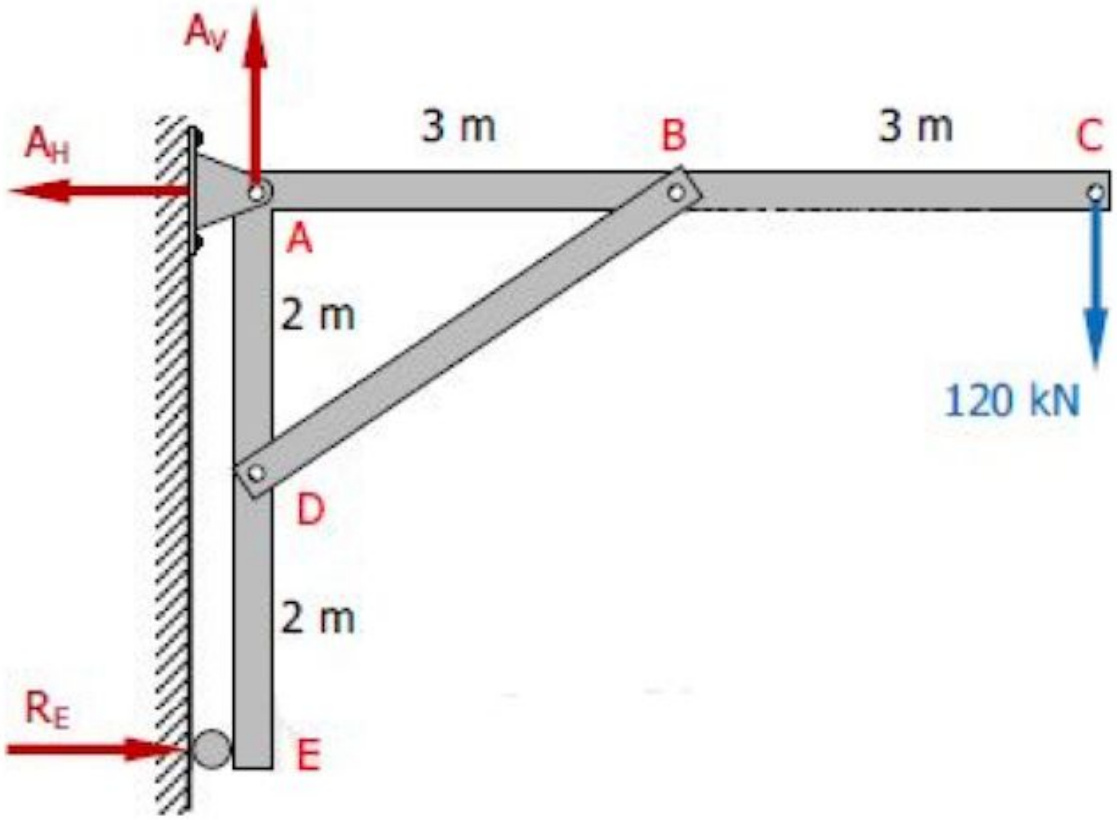


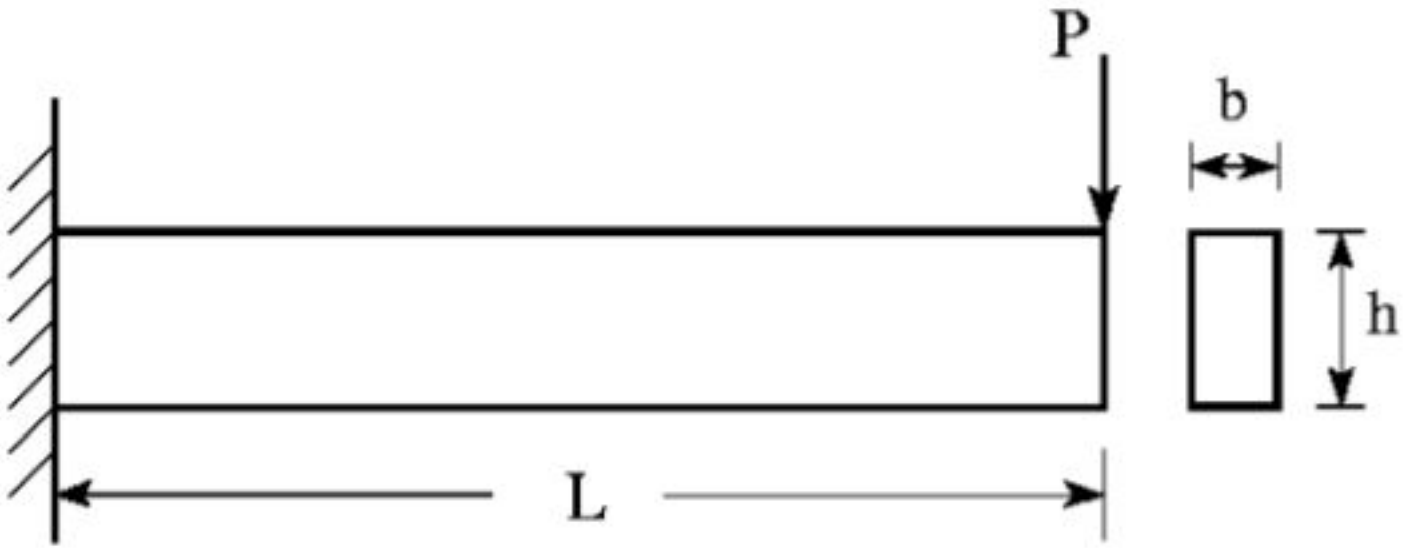
# Pop Quiz!

- Draw free body diagrams from elements ABC, AE, and DB. Write out the sum of the forces for each member.
- Solve for the three reaction forces.



# Pop Quiz!

- Where is the maximum stress due to bending in this cantilever beam? What is the value of the maximum stress?




b = 1 in
h = 4 in
L = 50 in

E = 20000 psi
$E_t = 0.1 \cdot E$
$\sigma_y = 500$ psi

# Introduction to Project 1

- http://moorepants.github.io/eme150a/pages/projects.html

**During this project you will:**

- identify engineered systems
- explain how an existing system functions
- identify materials and manufacturing processes
- identify engineering design reasoning and decisions
- peer review presentations and reports
- draft written technical documents about existing designs

# Break!

- 5-10 minute break!

# Reverse Engineering

“Reverse engineering, also called back engineering, is the process of extracting knowledge or design information from anything man-made and re-producing it or re-producing anything based on the extracted information”. (wikipedia.com)

“It is important for an engineer to develop the ability to observe existing products or systems and determine how they function and why they were designed they way they were”. (Jason Moore)

“Most, if not all, new ideas are generated after observing and experiencing existing engineering solutions”. (wikipedia.com)

# Reverse Engineering Example:

# Instructions

- Maintain a notebook with design information
- Carry the notebook with you regularly
- Detail the research you collect in a forn written report.
- The report draft will be peer reviewed by your teammates and then graded by the instructors.
- Your design notebook must be submitted with the final written report.

# Research

- Many transit systems (bus, rail, etc) allow passengers to bring their bicycles aboard.
- For example, Yolobus has front mounted bicycle racks, Amtrak's Capitol Corridor has bike hooks, Sacramento's light rail has bike hooks, the BART has designated spaces but no racks, etc.
- Your job for the first half of the course is to learn as much as you possibly can about existing bicycle rack technology to help inform your future design.
- You should investigate all types of bicycle racks: those for automobiles, buses, trains, and even stationary racks.

# Design Teams!

1. Helical Gear
2. Rivet
3. Camshaft
4. Transmission
5. Universal Joint
6. Roller Chain

# Notebook Activity

- What constitutes 1 item of the 30 in the notebook?
- Example from Destiny!

# Notebook Activity

- Remember: Front mounted bicycle rack for Unitrans.
- Individually: make 5 design aspects in the notebook that describe aspects of the bicycle rack designs
- Share designs with your team
- Now, pick 5 ways to enhance 5 of your teammate's designs
- Pick one design aspect to share with the whole class and draw on rolling whiteboard – As a group

# Wrap Up!

- Upcoming Due Dates:
- We will check for 30 designs in your design notebook on Friday Sep 23
- Homework #1 will be due Monday, October 3
- Reading for preparation on Monday will be posted on the website.