

## OPTI 421/521 – Introductory Opto-Mechanical Engineering

### Homework 9

#### 1.) Technical analysis

Choose one topic from the list below and provide a summary of the analysis. What are the assumptions? How is this type of analysis performed? Give at least one specific quantitative example, showing all steps. This should be written as a brief technical report.

- Strength of glass using Weibull statistics
- Fracture toughness of materials
- Derivation of beam bending relation
- Hertzian contact stress
- Compliance of rubber, including the bulge effect
- Shear stress due to adhesive bonding dissimilar materials, coupled with thermal changes.

#### 2. Adjustment stages

Choose a class of stages and compile information that would help to select which one to use. Choose from linear, rotational, or tilt stages. Also narrow down the class of stage:  
 fine positioning or long travel  
 small or large (you can define this.)  
 you can choose a particular application if you want (*i.e.* fiber optics alignment)

You should find at least 3 vendors and at least 6 different parts. Write up a *brief* memo that tabulates properties of the different stages. Include:

Range  
 Resolution  
 Accuracy  
 Stability  
 Size  
 Stiffness  
 Locking  
 Cost  
 Anything else that you think is important.

**Submit your work for #1 and #2 in electronic format.** These reports will be posted on the web site. You will find these very useful in the future.

#### 3) Rules of Thumb

**Provide three rules of thumb using the format provided in HW2.**