14.310 ENGINEERING MATERIALS
ASSIGNMENT GUIDELINES

As an engineer, your work will constantly be reviewed. At UMass Lowell, your Instructors and their teaching assistants review your work. In industry, your work will be reviewed by your coworkers, the Professional Engineer (PE) you work under, and others. You should present work that can be understood by your fellow engineers in a timely manner. In order to help the reviewers of your work as well as help you understand what you are doing, the following assignment guidelines are in effect for this course.

- All assignments involving calculations are to be labeled with numbers and be sequential (i.e. the first assignment is Assignment #1, the second Assignment is Assignment #2, etc.).
- All guest lecture review assignments are to be labeled with letters and be sequential (i.e. the first assignment is Assignment A, the second Assignment is Assignment B, etc.).
- Follow the GRS (Given – Required – Solution) Format. Answer only the question(s) asked. No extra credit will be given for additional information provided.
- All work is to be completed on 8½ inch by 11 inch engineering paper and/or printed white paper. **No white or colored lined paper will be accepted.** Do not use the back of pages.
- The following information should be listed on the top of each page: NAME COURSE NO. DATE ASSIGNMENT # PAGE X of Y
- All assumptions, references, and/or previous work must be clearly stated.
- All calculations **must be shown** in order to be awarded full credit.
- Work must be clear, legible, and presented in a logical order.
- Block lettering for handwritten work is preferred but not required.
- No free hand drawings will be accepted. Use of straight-edges, compasses, and elliptical guides are required on all non-computer generated figures and graphs.
- Table titles should be listed before the table, while figure titles should be listed after the figure (see Figure/Table Layout Examples on Page 2).
- Answers must be CLEARLY MARKED.
- Significant Digits matter.
- **SHOW UNITS!**
- Staple all pages together in the upper left corner.
An example assignment with calculations is provided on Page 3. Failure to follow any of these assignment guidelines will result in point deductions on your assignments.

FIGURE/TABLE LAYOUT EXAMPLES:

```plaintext
<table>
<thead>
<tr>
<th>J. Student</th>
<th>14.330</th>
<th>2/9/13</th>
<th>ASSN#4 1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strain</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.** Stress vs. Strain.

<p>| Table 1. Grain Size Summary. |
|------------------------------|----------------|</p>
<table>
<thead>
<tr>
<th>Sieve No.</th>
<th>% Finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>91</td>
</tr>
<tr>
<td>12</td>
<td>65</td>
</tr>
<tr>
<td>18</td>
<td>43</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>

**Figure 2.** Stress vs. Strain.

Formatting guidelines for guest lecture review assignments: use Arial size 12 font, 1.5 line spacing, no line between paragraphs, indent the first line of a paragraph, and 1-inch borders. Your name, course number, and assignment date should be placed in the upper right corner. Page 4 provides an example guest lecture assignment.
**Solution**

Given (N.T.S.):

**Diagram:**

- Point A
- Point B at (48 in)
- Point C at (148 in, 24 in above A)
- Point D at (64 in, 16 in above A)
- Vector V_{0x}

**Required:**

Determine range of \( V_x \) if nonzero units between pts B & C.

**Solution:**

**Vertical Motion:**

\[ Y = Y_0 + V_{0y}t + \frac{1}{2} a_y t^2 \]

\[ Y = 0 + 0(t) - \frac{1}{2}(380.4 \text{ m/s}^2)t^2 \]

**Horizontal Motion:**

\[ x = x_0 + V_{0x}t + \frac{1}{2} a_x t^2 \]

\[ x = V_{0x}t \]

**Case 1: B**

\[ Y = -40 \text{ in} = -\frac{1}{2}(380.4 \text{ m/s}^2)t^2 \]

\[ \therefore t = 0.455 \text{ s} \]

\[ x = 84 \text{ in} = V_{0x}t = V_{0x}(0.455 \text{ s}) \]

\[ \therefore V_{0x} = 184.6 \text{ in/s} = 15.39 \text{ ft/s} \]

**Case 2: C**

\[ Y = -24 \text{ in} = -\frac{1}{2}(380.4 \text{ m/s}^2)t^2 \]

\[ \therefore t = 0.352 \text{ s} \]

\[ x = 148 \text{ in} = V_{0x}t \]

\[ \therefore V_{0x} = 419.9 \text{ in/s} = 35.0 \text{ ft/s} \]

**Answer:**

\[ 15.4 \text{ ft/s} < V_{0x} < 35.0 \text{ ft/s} \]
Assignment A: Review of Karl Terzaghi Guest Lecture on 01/21/15.

Karl Terzaghi, the Father of Soil Mechanics, discussed one-dimensional (1D) theory of soil consolidation. 1D soil consolidation theory, the concept that is considered by many to be the birth of soil mechanics and the idea that led to geotechnical engineering being a separate discipline of civil engineering, explains changes in soil volume due to pore pressure changes from external loading and its subsequent dissipation. External loading may be due to changes in total stresses within a soil mass (e.g. foundation loading) or by changes in effective stresses due to water table fluctuations (e.g. dewatering or well pumping).

As shown by Mr. Terzaghi, Charleston, SC has many examples of soil settlement caused by soil consolidation. One of the prominent examples mentioned was the Hardee’s Fast Food Restaurant on the Crosstown (US Route 17). The building is founded on piles driven into the Cooper Marl formation. The surrounding parking lot is not founded on driven piles but rests over a large deposit of very soft marine silts and clays commonly called “pluff mud” in the Lowcountry. If you email Dr. Hajduk with the exact phrase “14.310 – I have read the Assignment Guidelines for Guest Lectures” in the subject header of your email before the 1st class assignment is due, you will receive two (2) extra credit points towards your assignment grade. Note that this email is separate from the email you were asked to send me regarding reading and understanding the course syllabus and assignment guidelines. The additional loading of the parking lot asphalt and associated sub-base and sub-grade materials has been causing consolidation settlement of these soft cohesive soils. The building, which passes its loading through these soft cohesive soils into the Cooper Marl via the piles, is not settling. The result is the drive-thru window ramp is steep, giving one the feeling of “shooting” into space when pulling up to the pick-up window.