ECE 2200/10 Lecture 1 Introduction to Electrical Engineering for non-majors

A. Stolp
12/30/11
8/24/15

2200 = 1/2 semester (Civil, Mining)

ECE 2200 Without the Physics is hard, Plan on it!

Decide today when you will take the **FINAL**:  
1st option: Final in your last lab session, Start labs this Thurs.

If you don’t take the later final you will have to start labs **Thursday, THIS WEEK**

2210 = Full semester (Mechanical, Chemical, Mat. Sci, etc.)

Labs start **next week**

2210 Final Thursday, April 25, 8:00am.

**BOTH**

Bring a lab notebook and a U-card loaded with $15 to 1st lab.

Homeworks are due by 5:00 pm in locker _______ (see map for location of lockers)

**WARNING: HWs are often due on non-class days.**

Problem sessions  
M, 9:40 in regular classroom  
W, _______________________

Copy packets are on class website, check your email and/or syllabus for links

**How to survive**

1. Easiest way to get through school is to actually learn and retain what you are asked to learn.
   Even if you’re too busy, don’t lose your good study practices.
   What you “just get by” on today will cost you later.

   Don’t fall for the “I'll never need to know this” trap. Sure, much of what you learn you may not use, but you will need some of it, some day, either in the current class, future classes, or maybe sometime in your career. Don’t waste time second-guessing the curriculum, It’ll still be easier to just do your best to learn and retain what is covered.

2. Don’t fall for the “traps”.
   Homework answers, Problem session solutions, Posted solutions, Lecture notes.

3. KEEP UP! Use calendar.

4. Make "permanent notes" after you've finished a subject or section and feel that you know it.

**Lecture**

<table>
<thead>
<tr>
<th>Basic electrical quantities</th>
<th>Letter used</th>
<th>Units</th>
<th>Fluid Analogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge, actually moves</td>
<td>Q</td>
<td>Coulomb (C)</td>
<td>m³</td>
</tr>
<tr>
<td>Current, like fluid flow</td>
<td>I = ( \frac{Q}{sec} )</td>
<td>Amp (A, mA, μA,...)</td>
<td>m³/ sec</td>
</tr>
<tr>
<td>Voltage, like pressure</td>
<td>V or E</td>
<td>volt (V, mV, kV,...)</td>
<td>Pa = ( 1 \cdot \frac{N}{m²} )</td>
</tr>
<tr>
<td>Resistance</td>
<td>R = ( \frac{V}{I} )</td>
<td>Ohm (Ω, kΩ, MΩ,...)</td>
<td></td>
</tr>
<tr>
<td>Conductance</td>
<td>G = ( \frac{1}{R} )</td>
<td>Siemens (S, also mho, old unit)</td>
<td></td>
</tr>
<tr>
<td>Power = energy/time</td>
<td>P = V·I</td>
<td>Watt (W, mW, kW, MW,...)</td>
<td>W</td>
</tr>
</tbody>
</table>

**Symbols (ideal)**

- **Node = All points connected by wire**
- **not connected**
- **Battery**
- **Variable Resistor**
- **Potentiometer**

ECE 2210 Lecture 1 notes p1
KCL, Kirchhoff's Current Law
\[ I_{\text{in}} = I_{\text{out}} \]
of any point, part, or section

\[ I_{\text{in}} = 2 \text{m}^3/\text{s} \]
\[ I_{\text{out}} = 2 \text{C}/\text{s} \]
\[ = 2 \text{A} \]

\[ I_{\text{in}} = 1 \text{m}^3/\text{s} \]
\[ I_{\text{out}} = 3 \text{m}^3/\text{s} \]

OK for fluids in pipes
NOT for charges in wires

Battery also obeys KCL
No accumulation of charge anywhere,
so it must circulate around.
Leads to the concept of a "Circuit"

Voltage is like pressure
KVL, Kirchhoff's Voltage Law

\[ V_{\text{gains}} = V_{\text{drops}} \]
around any loop

Conductors
Nonconductors
Massless fluid in our analogy
No gravity effects
Reasonable because:
Electron mass is \( 9.11 \times 10^{-31} \text{kg} \)
Electron charge is \( 1.6 \times 10^{-19} \text{C} \)
Negative charge flows
in negative direction