Physics 4211, 4112
Laboratory Physics I & II - Spring 2015

Course Information

- **Lecturer:** Professor Randall J. Scalise
- **Lecture meeting time and place:** Tuesday 1:00-1:50pm in room 60 Fondren Science.
- **Laboratory meeting place:** Room 2 Fondren Science Building.
- **Supervised lab times** You MUST show up for one of these:
  - Tuesday 2:00-4:00PM
  - Thursday 2:00-4:00PM
  - Friday 1:00-3:00PM
- **Unsupervised lab times:** any time you wish.
- **Office hours:** in room 107 Fondren Science by appointment.
- **Contact:**
  - Call or leave a message at 768-2504, or
  - Leave a note in the Physics Department Office - 102 Fondren Science, or
  - send me e-mail: <scalise@smu.edu>
- **Texts:**
  - One or more laboratory notebooks of the kind used in PHYS 1105 and 1106.
- **Grading:** 70% Lab reports, 20% Midterm exam, 10% Homework. Late work is given half credit if it is received before the solutions are posted; late work is given no credit if it is received after the solutions are posted.

Lab reports for the modern physics experiments are graded on:

  - physics content including error analysis (50%)
  - grammar, spelling, punctuation, etc. (20%)
  - Quality of reference sources and appropriateness of citations in the report (20%)
  - Format and readability (10%)

- **Syllabus**
- **Homework solutions**
- **Lab rules** from PHYS 1105 and 1106 (some do not apply).
- **Goals/Objectives/Learning Outcomes**
- **Official University Calendar**
- **Students with disabilities, medically-excused absences, absences in general**
Physics 4211/4112  
Syllabus - Spring 2015

Week 1  
20-24 Jan  
**Lecture #1**: DC circuits, *resistors*, voltage divider, meter errors, *Thévenin* and Norton equivalents, passive linear devices, *oscilloscope*.  
Read HH Text:p1-20, Appendix A; HH Manual:p1-31 (skim quickly over familiar parts).  
Homework: HH 1.7, 1.8*, 1.9, 1.10, additional 1, 2 (p58); *scalise01*  
* if you miss this one, I know you did not read the assigned pages  
Lab exercises: 1-1 -- 1-6 (not pages). Due the day before your supervised lab meeting.

Week 2  
27-31 Jan  
**Lecture #2**: AC circuits, capacitors, inductors, impedance, phasors, filters, diodes, passive non-linear devices.  
Homework: HH 1.13, 1.14, 1.23, 1.24, additional 3, 7; *scalise02*. Due Friday 6 February 2015.  
Lab exercises: 2-1 -- 2-6; 3-2 -- 3-5, 3-7. Due the day before your supervised lab meeting.

Week 3  
3-7 Feb  
**Lecture #3**: *Transistors*, active devices, switch, emitter follower, common-emitter amplifier, negative feedback.  
Read HH Text:p61-72 (skip 2.06), 76-87; HH Manual:p82-108, 133-119.  
Homework: HH 2.2, 2.5; *scalise03*. Due Friday 13 February 2015 at 5:00pm.  
Lab exercises: *Scalise L1 - Part 2 only*, 4-1 -- 4-5, 4-7; 5-2, 5-5. Due the day before your supervised lab meeting.

Week 4  
10-14 Feb  
**Lecture #4**: Operational amplifiers (op-amps) I, amplifiers: invert.  
Homework: HH 4.1*, 4.2**, 4.3, derive $V_{out}$ in figure 4.18 page 185.  
* for a pnp transistor, $V_E-V_B=0.6V$, the opposite for the npn trar  
** Howland Current Source animation.  
Lab exercises: 8-1 -- 8-4, 8-6. Use the photodiode or the photottr a compact fluorescent lamp (CFL), and an incandescent lamp; find t  
Due the day before your supervised lab meeting.

Week 5  
17-21 Feb  
**Lecture #5**: Operational amplifiers (op-amps) II, nightlight feedba  
ring oscillator; Chua's circuit and chaos.  
Homework: HH 4.6, Explain in crisp, specific language why the circ acts as an active clamp. Suppose you wanted the clamp voltage to b (or so) and not 10 V. What would you change? Due Friday 27 February 2015 at 5:00pm.  
Lab exercises: All except 9.4. Due the day before your supervised lab meeting.
Week 6  Lab: start **Franck-Hertz** (2 weeks)

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Spring Break

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Week 7  
17-21 Mar  
Midterm examination Tuesday 17 March. There will be both written 
You may use your notebook and homework, but neither the text nor t

Week 8  
24-28 Mar  
Lecture #7: 
Re-read Taylor chapter 4. 
Homework: Taylor 4.6, 4.7, tec0, tec1. Due Friday 27 March 2015 a 
Lab: **Franck-Hertz**

Week 9  
31 Mar - 4 Apr  
Lecture #8: 
Read Taylor chapter 5. 
Homework: Taylor 5.6 (be sure to draw it), tec2, tec3. Due Monday 
Lab: **Nuclear Magnetic Resonance** (3 weeks)

Week 10  
Lecture #9: 
Read Taylor chapters 6 and 7. 
Homework: Taylor 7.4, tec4, tec5. Due Friday 10 April 2015 at 5:0 
Lab: **Nuclear Magnetic Resonance** (continued)

Week 11  
Lecture #10: 
Read Taylor chapter 8. **Least Squares fitting, Vertical vs. perpen** 
Homework: Taylor 8.22, 8.24, tec6. Due Friday 17 April 2015 at 5: 
Lab: **Nuclear Magnetic Resonance** (continued)

Week 12  
Lecture #11: 
Read Taylor chapter 9. 
Homework: Taylor 9.16. Due Friday 24 April 2015 at 5:00pm. 
Lab: **Muon counter** (3 weeks) 
**Large muon data set**

Week 13  
Lecture #12: 
Read Taylor chapter 10. 
Homework: Taylor 10.20, 10.21. Due Friday 1 May 2015 at 5:00pm. 
Lab: **Muon counter** (3 weeks)
Week 14
Lecture #13:
Read Taylor chapter 11.
Homework: Taylor 11.3, 11.4, 11.19. Due before the Sun becomes a red giant star.
Lab: Muon counter (continued)

Week 15
Lecture #14:
Read Taylor chapter 12.
Homework: Taylor 12.3. Due before the heat death of the Universe.
Lab: Muon counter (continued).