

PHY386K The Physics of Sensors
First Day Handout August 26, 2004

Unique # 60760 TTH 9:30-11:00 RLM 6.116

Instructor: Greg O. Sitz

Office: RLM 10.313, Office Hours: M 10:30-11:30, Tu 4:30-5:30

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Introduction: In this course, there will be 4 instructors who will introduce you to the sensors in their fields of expertise. Each of four major areas of physics is represented: plasma physics, particle and radiation detection, condensed matter physics, and atomic and molecular physics. A tentative list of lecture topics is provided on the next page. The spectrum of topics is designed provide students with an overview of the physics behind many types of measurements.

Scheduling: Class meets twice per week on T-Th 9:30 - 11:00 am, RLM 6.116. Rarely, because of the schedules of one of the instructors, we cannot meet at the originally scheduled time. A makeup time will then be found that is acceptable to everyone.

Homework etc.: Each instructor will assign approximately one problem set; these may include conventional problems, descriptive essays, and a question asking the student to make up his or her own problem, with solution, etc. Some instructors include in-class participation in their evaluation. You are encouraged to discuss homework with anyone you wish; however, all written homework must be prepared independently (by you).

Final Exam: There will be no final exam.

Quotes:

“You do not know anything until you have practiced” -R. P. Feynman

“90% of success is just showing up” - Woody Hayes

“How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth?” - Sherlock Holmes to Dr. Watson
(Sir Authur Conan Doyle)

Topics The instructors, schedule and topics covered will be:

Plasma Physics, August 26 - September 16

Prof. Roger Bengtson, bengtson@physics.utexas.edu

1. An introduction to plasma physics.
2. Magnetic diagnostics for plasmas.
3. Probes and sheaths.
4. Refractive index measurements.
5. Electromagnetic radiation (free electrons).
6. Plasma spectroscopy.
7. Scattering of radiation.

Condensed Matter Physics, September 21 - October 12

Prof. Alex de Lozanne, lozanne@physics.utexas.edu

1. Scanning Tunneling Microscopy
2. Atomic Force Microscopy, Fast and/or parallel scanning
3. Scanning Hall Probe and Scanning SQUID Microscopy
4. Poor Mans Magnetic Microscopy
5. Near Field Scanning Optical Microscopy (NSOM)
6. Single electron transistor and Capacitance Microscopy
7. Magnetic Resonance Force Microscopy (MRFM), and Electron Spin Resonance

Atoms and Molecules, October 14 - November 4

Prof. Greg Sitz, gositz@physics.utexas.edu

1. Pressure ranges and measurements.
2. Techniques in surface science.
3. Thin film sensors.
4. Mass spectroscopy.
5. Optical spectroscopy I: Detectors.
6. Optical spectroscopy II: Microwave. IR. Raman.
7. Optical spectroscopy III: UV. Visible.

Particle and Radiation Detectors, November 9 - December 2

Prof. Karol Lang, lang@hep.utexas.edu

1. Introduction to particle physics and radiation.
2. Measurement of ionization.
3. Measurement of time.
4. Measurement of position.
5. Measurement of energy and momentum.
6. Particle identification.
7. Medical applications.