

Methods of Experimental Physics II

PHYS 538

Spring 2016

Dr. Carl Rau

TTh 4.00 - 5.15 pm

BRK103

Office Hours

TTh 3.00 - 4.00 pm

BRK 340

First meeting: Tuesday, January 12, 2016, room BRK103. The class is planned to be scheduled for Tuesday and Thursday, 4.00 pm – 5.15 pm in room BRK103. Upon request, these times can be rescheduled.

Texts:

Building Scientific Apparatus by Moore, Davis and Coplan

Introduction to Modern Optics by Fowles

The Art of Electronics by Horowitz and Hill

Organization: The class consists of lectures, homework, laboratory exercises and 2 short oral presentations by the student on selected topics on modern methods of experimental physics.

Course Learning Objectives

The students are expected to achieve a fundamental knowledge of many basic methods of experimental physics and their capabilities as well as their experimental requirements. At the end of the course the students will be able to use the main concepts of these methods in their future research activities. The short oral presentations will give all students a brief snapshot on cutting-edge methods and technologies in modern experimental physics with special emphasis on nano- and pico-scale spectroscopies and technologies. They will provide brief and concise information about the specific capabilities of these methods and technologies to make all students aware of the wealth of available present-day “tools”. A large part of these activities, including the laboratory exercises, are dedicated to advancing and sharpening critical thinking skills.

COURSE OUTLINE and Topics Covered

1. Modern Computer Interfacing, Analog to Digital and Digital to Analog Conversion, Ultra-Fast Data Acquisition
2. Charged Particle Optics, Particle Sources and Modern Energy Analysis
3. High-Precision Temperature Measurement, Control, Calibration, Thermostat Designs and Cryogenics
4. Optics, Linear and Circular Polarization, Optical Components, Materials and related Devices,
5. Light Sources and Detectors
6. Imaging and Microscopy

Course Learning Outcomes

By the end of the course, the students will have achieved a deeper and more fundamental understanding of basic concepts of experimental physics, which will open for them many ways to explore and discover new phenomena on their own. They will be able to design and carry out new experiments in the areas covered in the course outline. Furthermore, they have learned fresh and inspiring perspectives in modern research areas which they are able to use as a potent source for future transformative research in any area of science

Grade Policies

The course grade will be based on homework, oral presentations and lab exercises.

Students with Disabilities: Any student with a disability requiring accommodations in this course is encouraged to contact me after class or during office hours. Additionally, you will need to register with the Disability Support Services Office in the AllenCenter.

February 6, 2015