Physics 268 Syllabus (green sheet)

Spring 2008

I. Course Information

- San José State University
- Physics 268 (MW 7:00-8:15 pm; SCI 321)
- Spring 2008
- Web site http://www.sjsu.edu/faculty/beyersdorf/
- Dr. Peter Beyersdorf,
  - Office: SCI 235
  - Phone: 924-5236
  - Email: peter.beyersdorf@sjsu.edu
- Office hours:
  - Monday, Wednesday 8:15-8:45 pm
  - Tuesday, Thursday 9:30-10:30 am in Sci 242

A. Course Description:

"Physics 268: Laser Spectroscopy."

This class will cover the theory of interaction of light and matter, methods of laser spectroscopy, common experimental techniques and applications of laser spectroscopy.

B. Student Learning Objectives:

On successful completion of this course students shall be able to:

- Understand the fundamental processes that occur during the interaction of light and matter.
- Recognize the role of the main components of laser spectroscopy experiments
- Design sensitive experiments for the detection and differentiation of chemical components in a sample.
- Be familiar with applications of laser spectroscopy in industry and in cutting edge research

C. Prerequisites: A passing grade in 110B (Electricity and Magnetism) and Physics 158 (Modern Optics) or equivalent or consent of the instructor

D. Textbook

The following textbooks will be useful in this class, though none are required. The first, by Demtröder, will be the one this class most closely follows, the other are useful references. All of these textbooks are on reserve at King library.

- Demtröder "Laser Spectroscopy"
  Good reference book, lots of theory, not easy to read
- Andrews and Demidov "An introduction to Laser Spectroscopy"
  Easiest read of the textbooks. Focused on spectroscopic techniques
- Siegmann "Lasers"
  Very useful reference for those working with laser systems.
- Fowles "Introduction to Modern Optics"
  An inexpensive and compact guide to a large range of optical effects.
  A useful read as a refresher for almost any aspect of optics.

E. Course Requirements, Percent of Grade

- Weekly Homework (25%)
- Midterm 1 (25%)
- Midterm 2 (25%)
- Final Exam (25%)

The raw scores for each exam will be adjusted to produce a curved score which will be combined with your homework score (a raw percentage, not curved) and weighted as described above to determine an overall class score. Scores of 93 and above will earn an A, 90-93 is an A-, 87-90 is a B+, 83-87 is a B, 80-83 is a B-, etc.

Extra credit may be announced in class. Every "point" of extra credit will add 0.5% to your overall grade.

F. Grading Method

It is your responsibility to convince me you have a conceptual understanding of the subject matter. When you solve problems, presenting your work in a clear, concise manner that shows the logical steps leading to the final answer will go along way towards this objective. Work will be graded on the quality of your solution, not just the correctness of your answer.

G. Late homework and missed exams

Late homework will not be accepted. Exams will occur in class at the scheduled time, and hence should not introduce scheduling conflicts. If you must miss an exam please talk to me beforehand to see if a make-up exam can be arranged.

H. Description of Assignments and Exams

Homework will be assigned on a (roughly) weekly basis. It will consist mostly of a few short proofs or derivations related to the current lecture topics. Exams will focus on experimental methods and understanding of the issues involved in the experiments being discussed in class.

I. Electronic Resources

The class has a web site, the link to which can be found at http://www.sjsu.edu/faculty/beyersdorf/. Once logged in please set your contact email. I will use this contact information for occasional important announcements. It is your responsibility to ensure that it is kept accurate and up-to-date. Electronic copies of class lecture notes will be available via this site, as well as all other class material that needs to be distributed. Additionally there is a discussion forum hosted at this site. Please use this forum to post questions relating to homework or class for the class and/or professor. Also, please offer responses to others inquiries when possible. Please show the same etiquette online that you would show in a face-to-face discussion with other classmates. Flames or other offensive postings will not be tolerated. Once logged into this web site you can view your entry in my grade-book to track your score in the class and ensure its accuracy.

J. Class Schedule (subject to change)

Fundamentals of laser spectroscopy

1-23	Intro/History of laser spectroscopy
1-28	Classical absorption of light
1-30	Quantum absorption of light
2-4	Optical Spectra
2-6	Quantum model of atoms and molecules
2-11	open/review
2-13	Light Source
2-18	Laser fundamentals
2-20	Laser Sources
2-25	Detectors
2-27	Wavelength Measurements
3-3	Profiles of spectral lines
3-5	Signals and Noise
3-10	Open/Review
3-12	Midterm #1

Methods of laser spectroscopy

3-17	Physical significance of energy levels
3-19	Basic methods of spectroscopy
--spring break--	
4-2	Pump-Probe Methods
4-7	Raman Spectroscopy
4-9	Time-Resolved Spectroscopy

Applications of laser spectroscopy

4-14	Laser Remote Sensing
4-16	Medical Applications
4-21	Ramsey Spectroscopy/Ramsey Experiment
4-23	Midterm #2

Advanced techniques related to laser spectroscopy

4-28	Frequency Stabilization
4-30	Optical Cooling and Trapping, Bose-Einstein Condensation
5-5	Atomic Laser and Interferometers
5-7	Squeezing
5-12	Open/Review
5-15	Final exam 2:45-5:00pm

II. University Policies

A. Academic Integrity Statement

"Your own commitment to learning, as evidenced by your enrollment at San Jose State University and the University's Integrity Policy, require you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Judicial Affairs." The policy on academic integrity can be found at:
http://sa.sjsu.edu/judicial_affairs/index.html
Summarized here: if you cheat and are caught you will face tangible consequences. If you cheat and are not caught you will have the hellish intangible consequence of roaming the earth for the rest of your life burdened by the soul of a cheater.

B. Campus policy in compliance with the Americans with Disabilities Act

"If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities register with the DRC to establish a record of their disability."

III. College and Departmental Policies

You are responsible for understanding the policies and procedures about add/drops, academic renewal, withdrawals, incompletes, classroom behavior, and other policies described in the catalog. Please read your catalog thoroughly.

IV. Class Rules

A. Place your personal electronics in quiet mode, and refrain from using them in the classroom for non-class related work.

B. I encourage you to work on homework assignments in groups. You are able to learn a tremendous amount from each other and you will find that if you take the time to help your classmates you will develop a better understanding of the material yourself.

C. It's my job to help you learn. Help me help you – attend class, participate in discussions, share with me problems you are having and give me lots of feedback so I can teach more effectively!