San José State University
Department of Physics and Astronomy

Course Name, Section, Semester Code & Units:	**Physics 168-01, Lasers, Spring 2012 Code 24795, 3 Units**
Class location & Time:	SCI 242 MW 13:00-14:15
Instructor Name: **Contact:** **Website:**	Dr. Nayer Eradat Nayer.Eradat@sjsu.edu (best way to contact) http://www.erbion.com/academic.html
Office Location & Hours:	SCI 264 MW 14:30-15:30 & T 16:15-17:15
Required Textbook **Other Reference**	Laser Electronics by Joseph T. Verdeyene Principles of Lasers by Orazio Svelto Fifth Edition.
Pre-requisites: **Co-requisite:**	PHYS 122 (Modern Physics) & PHYS 158 (Modern Optics). PHYS 110B (E&M)

Faculty Web Page and MYSJSU Messaging

PDF of the course materials such as the syllabus, major assignment handouts, etc. may be found on my faculty web page accessible through the Quick Links>Faculty Web Page links on the SJSU home page or on the course website link or go to http://www.erbion.com/academic.html . The syllabus and website are live documents subject to changes as course progresses. **You are responsible for regularly (at least twice a week) checking the messaging system through MySJSU and the website to find out the latest assignments and most up-to-date postings.**

Course Description

Properties of lasers and Gaussian light beams. Principles of laser operation and design. Application of lasers.

Course Goals and Student Learning Objectives (SLOs)

Upon successful completion of this course, students will have basic understanding of the following concepts and will have some familiarity with real-life applications of them.

Light-Atom Interactions Properties of Light Energy Level Diagrams Absorption, Emission Einstein Coefficients Line shape, cross sections

Laser Fundamentals Absorption, Gain Saturation Laser Amplifiers Laser Pumping

Optical Cavities Ray-tracing, ABCD matrices Stable Cavities Gaussian Beams Complex Beam Parameter

Specific Lasers: Gas, liquid, solid state lasers Pulsed Lasers (Q Switch, modelocking)

Applications: Nonlinear effects Interferometry High energy / High Power Lasers

Research Project (Design of a laser for an specific application)

Other Readings

TBA

Classroom Protocol

Lecture:

The lectures are designed to discuss the course material, to work examples, and to answer the questions you may have. There will be small demonstrations during some lectures that are designed to help you with better understanding of the physical concepts. The lectures are interactive. **Students are expected to get involved in the discussions during the class. Reading**

in advance of the assigned material for each lecture is crucial for active participation in the class and doing well in the quizzes and exams.

Project

The goal is to teach all of the concepts leading to understanding of the laser action and its applications in context of a project. The project will constitute design of a laser for specified application. The goal is to design the laser on paper and select the commercially available components to build it. Subject to budget approval we will attempt to purchase the components and assemble the laser. Some of the needed components already exist in the department labs. We will discuss this in detail during the class.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. Information on add/drops are available at http://slisweb.sjsu.edu/enrollment/lateadd.htm **. Students should be aware of the current deadlines and penalties for adding and dropping classes.**

Assignments and Grading Policy

Exams:

The 2 midterm tests and final exam cover **all material encountered in both the lectures and the lab**. No test grades will be dropped. Exams will be **open book** or take home from the material listed in the syllabus. Tests are combination of short conceptual questions and longer problems that will test both basic understanding of the material and problem solving skills and possible design scenarios. Also ability to search for new material, organization and presentation of the findings will be tested.

Homework:

Homework questions and problems will be handed out in the class or posted on the website.

Grading:

Category	Contribution
Home Work	20 %
Midterm 1	20 %
Midterm 2	20 %
Final Exam	20 %
Project	20 %

Your grade will be determined by your performance on the homework, exams, and project. Plus and minus grading will be used. The letter grades will be roughly assigned based on the following list A: 90s, B: 80s, C: 70s, D: 60s, F: 50s and below.

Schedule for lectures, reading, exams and assignments (S for Svelto)

Date	Day	Reading	HW Assigned	Due
Week 1				
Jan 25	W	Ch0 & Introductory concepts (L1)		
Week 2				
Jan 30	M	Ch7 Atomic radiation (BBR)		
Feb 1	W	Ch7 Rate equations	HW1	
Week 3				
Feb 6	M	Ch7 Amplification, Broadening mechanisms		
Feb 8	W	Ch1 Review of the electromagnetic theory	HW2	HW1
Week 4				
Feb 13	M	Ch		
Feb 15	W	Ch	HW3	HW2
Week 5				
Feb 20	M	Ch		
Feb 22	W	Review and Problems		HW3
Week 6				
Feb 27	**M**	**Midterm1**		
Feb 29	W	Ch	HW4	
Week 7				
Mar 5	M	Ch		
Mar 7	W	Ch	HW5	HW4
Week 8				
Mar 12	M	Ch		
Mar 14	W	Ch	HW6	
Week 9				
Mar 19	M	Ch		
Mar 21	W	Review and problems of Ch		HW6
Week 10 Spring break				
M26-30	M-F	No class		
Week 11				
Apr 4	M	Ch CW laser behavior		
Apr 6	W	Ch	HW7	
Week 12				
Apr 2	M	Ch Transient laser behavior		
Apr 4	W	Ch	HW8	HW7
Week 13				
Apr 16	M	Ch Types of lasers		
Apr 18	W	Rev. & problems		HW8
Week 14				
Apr 23	**M**	**Midterm 2**		
Apr 25	W	Ch Types of lasers, Laser design 1 problem	Project assignment	
Week 15				
April 30	M	Ch Prperties of laser beams		
May 2	W	Ch		
Week 16				
May 7	M	Ch Laser beam transformation	Take-home final assigned	
May 9	W	Laser design 2 solving the problem		
Week 17				
May 14	M	Laser design 3 solving the problem & design		
May 17	**TH**	**Final: Presentations, return the take home**	**12:15-14:30**	

University Policies

Academic integrity

Students should know that the University's Academic Integrity Policy is available at http://www.sjsu.edu/senate/S07-2.htm . 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 Student Conduct and Ethical Development. The website for Student Conduct and Ethical Development is available at http://www.sjsu.edu/studentaffairs/ .

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include in your assignment any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy F06-1 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make 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 requesting accommodations must register with the DRC (Disability Resource Center) to establish a record of their disability.

Student Technology Resources

Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall and on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.

A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include digital and VHS camcorders, VHS and Beta video players, 16 mm, slide, overhead, DVD, CD, and audiotape players, sound systems, wireless microphones, projection screens and monitors.

Learning Assistance Resource Center

The Learning Assistance Resource Center (LARC) is located in Room 600 in the Student Services Center. It is designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. The center provides support services, such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development. The LARC website is located at http:/www.sjsu.edu/larc/ .

SJSU Writing Center

The Writing Center in Clark Hall 126 offers tutoring services to San Jose State students in all courses. Writing Specialists assist in all areas of the writing process, including grammar, organization, paragraph development, coherence, syntax, and documentation styles. For more information, visit the Writing Center website at http://www.sjsu.edu/writingcenter or call 408-924-2308.

Peer Mentor Center

The Peer Mentor Center is located on the 1st floor of Clark Hall in the Academic Success Center. The Peer Mentor Center is staffed with Peer Mentors who excel in helping students manage university life, tackling problems that range from academic challenges to interpersonal struggles. On the road to graduation, Peer Mentors are navigators, offering "roadside assistance" to peers who feel a bit lost or simply need help mapping out the locations of campus resources. Peer Mentor services are free and available on a drop –in basis, no reservation required. Website of Peer Mentor Center is located at http://www.sjsu.edu/muse/peermentor/ .

SPRING 2012

Monday	*January 2*	*New Year's Day Observed - Campus Closed **(N)***
Monday	*January 16*	*Dr. Martin Luther King, Jr. Day - Campus Closed **(K)***
Tuesday	January 24	Spring Semester Begins
Tuesday	January 24	Pre-Instruction Activities: Orientation, Advisement, Faculty Meetings and Conferences **(P)**
Wednesday	January 25	First Day of Instruction – Classes Begin
Monday	February 6	Last Day to Drop Courses Without an Entry on Student's Permanent Record **(D)**
Monday	February 13	Last Day to Add Courses & Register Late **(A)**
Tuesday	February 21	Enrollment Census Date **(CD)**
Monday-Friday	March 26-30	Spring Recess *(*SPRING RECESS*)*
Friday	*March 30*	*Cesar Chavez Day Observed - Campus Closed **(CC)***
Tuesday	May 15	Last Day of Instruction – Last Day of Classes
Wednesday	May 16	Study/Conference Day (no classes or exams) **(SC)**
Thursday-Friday	May 17-18	Final Examinations **(exams)**
Monday-Wednesday	May 21-23	Final Examinations **(exams)**
Thursday	May 24	Final Examinations Make-Up Day **(MU)**
Friday	May 25	Grade Evaluation Day **(E)**
Saturday	May 26	Commencement **(C)**
Monday	*May 28*	*Memorial Day - Campus Closed **(M)***
Tuesday	May 29	Grades Due From Faculty - End of Spring Semester **(G)**
Tuesday	May 29	End of Academic Year