

Course Syllabus
OSE 4951 Senior Design 1
Spring 2017

T, R 9:00 AM –10:15 AM, HPA1 O116

Instructor: Dr. David Hagan hagan@creol.ucf.edu

Office CREOL 209

407-823-6817

Office Hours: T, R 10:30 AM – 11:50 AM or by appointment

Catalog description: Development of the technical, communication, and team skills for successful design of optical and photonic systems. Preparation of project proposals for Senior Design II.

Prerequisites OSE 3053 and OSE 4520; CR: OSE 4410 and OSE 4470 and C.I

Co-teaching with EEL 4914C Senior Design 1:

Photonic Science and Engineering students are expected to engage in interdisciplinary projects with electrical and computer engineering students. For this reason, student will attend all classes with the electrical and computer engineering students enrolled in EEL 4914C Senior Design 1. Most assignments will be common to both courses, however, Dr. Hagan will be responsible for assessment and grading of students enrolled in OSE 4951. The grading standards will be common to both courses' Projects that involve teams of OSE and EEL students and must be approved by the instructors of both OSE 4951 *and* EEL 4914C.

In addition to attending all EEL 4914C classes, students must meet regularly with Dr. Hagan. The schedule for these meetings will be set up in the first week of the semester.

The instructor for EEL 4914C is:

Dr. Lei Wei, HEC---418

Office Hours: T/R 10:00 am - 12:00pm

Texts:

1. DESIGN FOR ELECTRICAL AND COMPUTER ENGINEERS, McGraw---Hill (chapter 3)
2. SENIOR DESIGN FOR ELECTRICAL AND COMPUTER ENGINEERINGS STUDENTS, Pearson Custom Publishing (**3 chapters**,)

Software: Varies by Project, Circuit Simulation Software, Schematic Capture Software, PCB Software, Matlab, Zeemax, Light Tools, etc.

Computer Usage: This course requires the use of simulation, schematic capture, and PCB layout software.

Attendance in class is required. Assignments are due when collected by the instructor. All or only a part of the collected homework may be graded. All exams are mandatory. The final grade will be based on your performance on attendance, exam performance, presentation performance, and

final project documentation. In addition, failure to comply with course requirements or expectations may result in the lower grade as determined to be appropriate by the instructor.

Any act of academic dishonesty or unprofessional behavior will result in a failing grade on an exam or in the course.

Academic activity:

Students' academic activity is required by UCF to be recorded at the beginning of each course. In order to document that you began this course, please complete the following academic activity by the end of the first week of classes or as soon as possible after adding the course, but no later than May 20. Failure to do so may result in a delay in the disbursement of your financial aid. **The assignment to satisfy this requirement is for all students to submit a written description of an idea for a senior design project on or before 12:00 PM (noon) January 13 2017.**

Preliminary Course Information

The OSE 4951 and OSE 4952 Senior Design courses are intended to serve as capstone courses for the Photonic Science and Engineering Bachelor of Science Degree. These courses provide the opportunity to practice the engineering skills which you have accumulated to date and to learn certain concepts in engineering practice. In OSE 4951, skills and issues in engineering design are discussed. Specifically, topics of the course lecture include the history of engineering education, engineering as a profession, engineering management, realistic design constraints, standards based design, engineering research, engineering ethical responsibility, and engineering economics. Contemporary issues are integrated into content lectures and serve as case studies. An engineering design project is jointly agreed upon by the instructor and a student team. This project must incorporate sufficient open ended design content such that the students demonstrate the ability to identify, formulate, and solve engineering problems. The student team studies the problem, develops design alternatives, and selects an approach which can be implemented. The design prototype is then completed in OSE 4952 by performing the necessary parts acquisition, hardware and software realization, and debugging. During the two semesters students prepare written documentation and make group presentations as part of demonstration of their ability to communicate effectively. Students will develop the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. Once completed the students present the project design and prototype to a faculty review committee for evaluation.

These courses subject the students to an environment unlike the majority of their previous curriculum. Aspects of engineering design not found in classroom academic discussions are encountered. The need to assign responsibilities to team members and to rely on other individuals to perform necessary work for successful completion of team goals is encountered. These and other aspects of team member interactions are often cited as a valuable course experience.

The requirement to succeed to the point of a functioning prototype implies the need to go beyond the experiences which are common to previous electronics and photonics laboratories. The skills necessary for optical engineering design and layout and electronics design are just a some of the prototyping needs that are encountered. These skills along, with the knowledge required for optimal and economic component identification and acquisition are learned as a necessity for successful design completion.

Note that in order to complete Senior design 2 on schedule, it is usual to purchase and test all the components and to build and test some critical subsystems during the senior design 1 semester.

Catalog Data: OSE 4951 OPT-OPT 3(3,0) Senior Design I: PR: OSE 3053 and OSE 4520; CR: OSE 4410 and OSE 4470 and C.I. Development of the technical, communication, and team skills for successful design of optical and photonic systems. Preparation of project proposals for Senior Design II. Fall.

NOTE: All prerequisites will be strictly enforced. Students not having the required prerequisites will be dropped.

Detailed Description:

Students will prepare plans for a team-driven capstone project for an optical system driven by a real world customer (from industry, small business, utilities, government, a nonprofit agency or institution, or research laboratory) with consideration of economic, safety, reliability, ethical, aesthetic, and social impact factors. Preparation involves learning of design strategies, product specifications, information collection, modeling and optimization, cost assessment, failure and reliability, health and safety, manufacturability, and sustainability, ethical issues, and teamwork. Students will identify the customer and the project, form teams of 3 - 4 each, and prepare detailed proposals for implementation in OSE 4952, Senior Design II, which is offered in the following semester.

Course goals: To provide students a complete design experience, including the necessity to set design goals and objectives, integrate knowledge, exercise engineering judgement, plan to meet a budget and a schedule, to work as a team member, and to communicate in writing.

Specific Course objectives:

This class is a required course for Photonic Science and Engineering students and serves as the first part of the capstone design course sequence. The course objectives are to enable students to:

- Gain an introduction to Engineering Education and the Engineering Profession
- Learn fundamentals of Engineering Management
- Develop knowledge of realistic design constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Learn standards based design practices
- Gain knowledge of Product Life Cycles, Research and Development, and Intellectual property
- Incorporate appropriate human factors into designs
- Develop knowledge of Engineering Economics
- Recognize and address ethical issues related to design and engineering
- Develop an understanding of the Engineering Design Process, Engineering Teamwork and Project Documentation

Learning Outcomes

Upon completing this course, the students will be able to:

- Identify specific goals of the designed system, including specifications and realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.
- Collect information on available components and standards related to design needs,

- Develop appropriate models and using computer tools for system analysis,
- Perform testing and failure analysis
- Prepare written proposals and delivering technical information through oral presentations, reports and logbooks
- Work in a team environment
- Recognize and address ethical issues related to design and engineering
- Develop a customer relationship and mentality

List of Topics:

- Introduction
- The Engineering Design Process
- Goals, Objectives, Specifications and Requirements
- Realistic Design Constraints
- Standards Based Design Practices
- The History of Engineering Education
- The Engineering Profession
- Engineering Management
- Engineering Research and Development
- Intellectual Property Protection
- Engineering Economics
- Engineering Ethics
- Engineering Documentation and Technical Presentations

Relationship of Course to ABET Criteria

ABET Criteria	Level of Emphasis During Course (Low, Medium, High)
(a) An ability to apply knowledge of mathematics, science, and engineering.	M
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.	M
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	H
(d) An ability to function on multidisciplinary teams.	H
(e) An ability to identify, formulate, and solve engineering problems.	M
(f) An understanding of professional and ethical responsibility.	H
(g) An ability to communicate effectively.	M
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	M
(i) A recognition of the need for, and an ability to engage in life-long learning.	M
(j) A knowledge of contemporary issues.	M
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	H

Assessment

Initial project plans and class participation (15%), interaction with customer (10%), oral and written presentation (25%), final project proposal (50%).

Textbook

1. DESIGN FOR ELECTRICAL AND COMPUTER ENGINEERS, McGraw--Hill
2. SENIOR DESIGN FOR ELECTRICAL AND COMPUTER ENGINEERINGS STUDENTS, Pearson Custom Publishing

References

Depends upon the group's project. Consultation with appropriate faculty and professionals is encouraged. Consider all your sources for information.

Course Content

Homework

There may be regular homework assignments. Special assignments as appropriate will be made.

Computer Usage

There will be no specific computer assignments. However, word processing is required for all documentation. Most projects will utilize computer simulation during the design, while other projects may be based on embedded control, the use of a personal computer, or single board computer applications where software and/or hardware development will be required.

Exams

There will be two exams. Both exams must be complete at 90% or a deduction of one letter grade will occur in the student's final grade. Students will be given the opportunity to take make-up exams at normal class meetings up to five times. Failure to take a makeup exam counts as a failed attempt at the exam.

Project Topics

Projects can be in any area of Photonic science and engineering but must also have elements that are suitable for members of the group who are electrical and/or computer engineers. Projects are subject to the instructor's approval. The instructor may propose some projects, however, it is the student's responsibility to find a suitable project. All projects must be physically realized, documented, and demonstrated at the end of the term.

Project Teams

Each project will be designed and implemented by a project team or group with a size restricted to only groups of three or four members. The instructor may assist in the formation of the teams, but you are encouraged to form your own working teams. If necessary, the instructor may dictate the group members. Photonics students are expected to team with electrical and /or computer engineering students. A typical team would have one Photonics student, two electrical and one computer engineering student. It would be very unusual to have more than two photonics students on a team.

Expenses

The Department of Electrical Engineering and Computer Science will not provide project parts beyond what is available in school laboratories. The cost of the project may be exclusively yours, exclusively your sponsor's, or may be shared. The most common case is that the project is funded by the student group or by a sponsoring group, agency, or corporation.

NOTE: If project expenses are paid in part or in whole by UCF, then the project becomes the property of the school and it must remain at UCF.

Proposals

By the end of the third week, students should submit a project description indicating the group members, and a preliminary project idea or area of interest. Evaluation and acceptance of the project topic will take place during the fourth week. By the end of the first semester, a complete design of the project should be submitted. The format of the design documentation will be provided later. It should be a complete document including the proposed design and implementation of your project. All details necessary to begin the final prototype should be included.

Final Documentation

The required final documentation consists of a formal technical document consisting of research, design, theory of operation, construction and testing.

Laboratory No formal laboratory work is required. However, virtually all projects require hardware prototyping which will include construction and testing.

Laboratory space and facilities will be available for this purpose.

In order to protect project installations, only students that are registered in the class will be allowed in the lab. You can work in the EECS senior design laboratories during non-business hours and on weekends by using your college keycards, and if needed requesting entry to the engineering building from the UCF Police Department. Identification will be required. Due to the policy stated below, the police will not provide entry to a single student. A minimum of two students are required when working in the laboratory.

Permission to use the Photonics senior design lab will be obtained through Mr. Michael McKee.

WARNING University policy requires that for safety reasons, at least **two people must be present in the laboratory premises** at any time. Violators will be asked to leave the laboratory premises. Since it is not possible to police this policy at all times, violators will be working entirely at their own risk.

In-Class Presentations During the course of the two semesters, each group will make at least two presentations to the rest of the class during normal lecture or laboratory hours. This will serve as a critical design review for your project. The schedule for these presentations will be set just prior to this time.

Consultations Consulting on each project will be available either from the course instructor or from any other Optics or ECE Department faculty member who has expertise on the subject of your project. Each team is encouraged to find a faculty member who will act as a technical advisor for the project. Appointments should be made for consultation times.

Grading will be based on:

Initial Documentation

Midterm Exam

Final Exam

Final Documentation

Attendance

All elements, with the exception of the final document in OSE 4951, are treated as content in which the student must demonstrate mastery of the material. No grades are assigned, only indications of completion are recorded. If a student fails to demonstrate competency on an assignment, the assignment must be repeating until mastered. All required elements of the

course must be mastered in order to receive a passing final grade. All course elements are evaluated by the course instructor. Usually all team members are awarded the same grade, however under certain circumstances team members may receive different grades. In cases where group members do not adequately contribute to the project, members may be dropped from the group and those students will receive a grade of F for the course.

Important Warning The grading in the OSE 4952 (senior design 2) course requires that **your prototype work** as specified. Failure to meet this requirement will result in a grade of F or I depending upon the circumstances as dictated by the course instructor.