Course Syllabus

OSE 4951 Senior Design 1

Fall 2017

M, W 1:30 PM – 2:45 PM ENG2 102

Instructor: Dr. David Hagan
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Office CREOL 209
407-823-6817
Office Hours: M, W, 3:00 PM – 3:50 PM or by appointment

Catalog Description: 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.

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, but if there is a strong difference in the level of the photonics vs. the electrical/computer aspects of the projects, there may be a difference in the final grades of the group members. 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, photonics students must meet weekly as a group 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

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.

Attendance in class is required. 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 a 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.

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 subject the students to an environment unlike the majority of their previous curriculum.** Students will encounter aspects of engineering design not found in prior coursework. Students will be responsible for their own learning as a team. In other classes, students are given homework, quizzes, labs and tests in a structured and scheduled manner, but in Senior Design it is the team's responsibility to schedule their project, assign responsibilities, build the functioning device or system that meets specifications, document the results of the team's efforts in written reports.

Summary of primary activities in the semester:

Week (Approximate)	Topic
1	Introduction and formation of groups. Initial project idea (individual)
2-4	**LECTURES:** Developing ideas, requirement specification, engineering management, engineering education, design constraints, standards.
4	Initial project documentation (group)
5	Meeting with professors to discuss initial project document.
6-12	Design Testing. Weekly design meeting, collecting data, recording in journal.
6	Submission of revised project documentation.
6	LECTURE: Engineering economics
7	LECTURE: Ethics
8-12	Quizzes on lecture materials. No new lectures.
12	60 page draft of Senior Design I report.
13-16	Design Testing continues. Weekly design meeting, collecting data, recording in journal.
13	Meeting with professors to discuss report and progress.
14	100 page draft of Senior Design I report.
16	Final exam week. Final report due (120 pages)

Assessments:

The final grade will be primarily based on the final project documentation. However, overall course grade may be modified by attendance and by performance in other elements that are turned in for

grading, including the initial project idea, initial project documentation, several draft reports, and quizzes given on the course material will be graded. However, these elements 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.

Process for determining subject, specifications and constraints for the engineering design project

The engineering design project is jointly agreed upon by the instructor and a student team of 3 or 4 students, comprised of 1 or two photonics students with 2 or three electrical or computer engineering students. The 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 project should utilize the students' advanced knowledge of photonics, electrical and computer engineering, as appropriate to the particular composition of the team.

The student team may come up with their own ideas, or may choose to work on a problem set bay a faculty or industrial sponsor. Through writing of reports and discussions with the instructors in the first few weeks of the senior design 1 semester, the project may be changed in scope until the goals and specifications of the project are agreed upon jointly between the team and the photonics and ECE instructors.

Students are expected to acquire and test critical components of the project during senior design 1 and provide evidence of this in the draft and final reports. Failure to do so will result in students' having to retake senior design ins a future semester. This testing is required in senior design 1 so that the team is ready to build a functioning device or system that preforms correctly and meets specifications during senior design 2.

List of Topics covered in lectures:

- 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

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.

Learning Outcomes

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

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

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

Course notes

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 university 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.

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.

Machine shop course Photonics senior design students must complete a short machine shop course offered by the college of Optics and Photonics before the end of senior design 1 semester.

Safety 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.

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.

Important: The grading in the OSE 4952 (senior design 2) course will require that your prototype ***work as specified***. The final device or system must be a robust, engineered system. Optical components mounted on a breadboard are no acceptable. The machine shop course that students must take will help them learn how to make a robust mechanical system to house optical components, etc. Failure to meet this requirement will result in a grade of F or I depending upon the circumstances as dictated by the course instructor.

Final reports for photonics projects MUST contain a section at the end which contains results of testing of the final device or system. Where appropriate, this section should describe any explanation of why specifications or constraints were not met.

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 August 25. 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) August 25, 2017.**