Regardless of course type; e.g., traditional, media-enhanced, or Web, syllabi at UCF are required to include:

- **Course title and number**
- **Credit hours**
- **Name(s) of instructor(s)**
- **Office location**
- **Office or Web hours**
- **Course goals**
- **Course description**
- **Course requirements**
- **Methods of evaluation; grading system, including plus and minus grade policy, how grades will be posted**
- **Makeup exam policy**
- **Required and optional texts**
- **Final exam date and time**
- **Financial Aid Statement**
- **Other required course material**

PRIOR TO PRINTING, DELETE THIS LINE AND ABOVE
ALTER THE SYLLABUS BELOW TO YOUR LIKING

Course Syllabus

COURSE NUMBER AND TITLE, CREDIT HOURS

Instructor:	Shuo Pang	**Term:**	2016 Spring
Email:	pang@creol.ucf.edu	**Class Meeting Days:**	MW
Phone:		**Class Meeting Time:**	9:00-10:15
Office:	407-823-6869	**Class Location**	CROL A214
Office Hours:	Tuesday 17:00-18:00	**Website:**	

Additional Notes: I will be in my office at these times, but of course I will be happy to discuss the material with you anytime. Often, I get questions via e-mail that can be quickly answered.

Course Catalog Description:
Analysis and design of optical and photonic systems. Assessment of image quality using optical design software. Simulation of waveguides and integrated-optic systems using photonic design software.

Prerequisites:
OSE 3052 Introduction to photonics

Detailed Course Description and Learning Outcomes:

Detailed Description:
Analysis of optical systems consisting of lenses, mirrors, and apertures. Image plane, principal planes, and entrance and exit pupils. Magnification, field of view, F number, image-plane irradiance. Assessment of image quality resulting from diffraction and geometrical and chromatic aberrations, using optical design software. Analysis and design of photonic systems including systems consisting of waveguides and integrated-optic components. Numerical simulation using photonic design software.

Learning Outcomes:
Upon completing this course, the students will:

- Master the concept of ray-tracing and understand the aberration theory.
- Evaluate the performance for imaging optical system based on aberration theory.
- Design an imaging optical system using commercially available software (Zemax).
- Understand the finite difference time domain (FDTD) algorithm as the numerical simulation for photonics device.
- Determine the key design parameters in photonic components such as slab waveguide, ridge waveguides and interference filter.
- Use commercially available software tools (CST STUDIO) for simulation and design of photonic systems.

Topics: (A detailed schedule with dates follows at the end of this document.)

- Analysis of optical systems consisting of lenses, mirrors, and apertures.
- Image plane, principal planes, and entrance and exit pupils. Magnification, field of view, F number, image-plane irradiance.
- Ray tracing invariants. Ray tracing using a spread sheet and optical design software.
- Wave front aberration and assessment of image quality resulting from diffraction. Seidel's 3rd order aberration and chromatic aberrations.
- Introduction to FDTD (general formulation, stability criterion, boundary condition, frequency domain analysis)
- Analysis and design of photonic systems, including systems consisting of waveguides and integrated-optic components.
- Numerical simulation using photonic design software.

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.	High
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.	Medium
(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.	Medium
(d) An ability to function on multidisciplinary teams.	Medium
(e) An ability to identify, formulate, and solve engineering problems.	High
(f) An understanding of professional and ethical responsibility.	Medium
(g) An ability to communicate effectively.	High
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	Medium
(i) A recognition of the need for, and an ability to engage in life-long learning.	Medium
(j) A knowledge of contemporary issues.	Low

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	High

Textbook:

Recommended Reference:
Introduction to Lens Design: With Practical Zemax Examples, Willmann-Bell, 2002
Optical System Design, 2nd ed., Robert Fisher, MacGraw-Hill, 2008
Computational Photonics – An Introduction with MATLAB, Marek S. Wartak, Wiley, 2013

Other Reference Books:

Course Grading and Requirements for Success:

Homework: 5 problem sets.
Exams: Midterm exam on lens design
Quizzes: 5-6 quizzes
Participation:
Final Exam: Oral presentation on photonics design
Make up Exam Policy: If an emergency arises and a student cannot submit assigned work on or before the scheduled due date or cannot take an exam on the scheduled date, the student **must** give notification to the instructor **no less than 24 hours before** the scheduled date and **no more than 48 hours after the** scheduled
Attendance:

Criteria	Grade Weighting
Homework	50%
Quizzes	10%
Midterm Exam	20%
Final Oral Exam	20%
Total	100%

Final Exam Date:

Financial Aid and Attendance: As of Fall 2014, all faculty members are required to document students' academic activity 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 27. Failure to do so will result in a delay in the disbursement of your financial aid.

Grading Scale (%)	Rubric Description
100 ≥ A > 85	Excellent, has a strong understanding of all concepts and is able to apply the concepts in all and novel situations. Has full mastery of the content of the course.
85 > B ≥ 75	Good, has a strong understanding of most or all of the concepts and is able to apply them to stated and defined situations.
75 > C ≥ 65	Average, has a basic understanding of the major concepts of the course and is able to apply to basic situations.
65 > D ≥ 60	Below average, has a basic understanding of only the simple concepts and is able to apply to only a limited number of the most basic situations.
60 > F ≥ 0	Demonstrates no understanding of the course content.

Grade Objections:
All objections to grades should be made **in writing within one week** of the work in question. Objections made after this period has elapsed will **not** be considered – NO EXCEPTIONS.

Class Website:
Materials used for classes will be available on UCF Webcourses for download before each class. I

Professionalism and Ethics:
Per university policy and plain classroom etiquette, mobile phones, etc. must be silenced during all classroom lectures, unless you are specifically asked to make use of such devices for certain activities. Academic dishonesty in any form will not be tolerated! If you are uncertain as to what constitutes academic dishonesty, please consult The Golden Rule in the UCF Student Handbook (www.goldenrule.sdes.ucf.edu) for further details. As in all University courses, The Golden Rule Rules of Conduct will be applied. Violations of these rules will result in a record of the infraction being placed in your file and the student receiving a zero on the work in question AT A MINIMUM. At the instructor's discretion, you may also receive a failing grade for the course. Confirmation of such incidents can also result in expulsion from the University.

Students with Special Testing/Learning Needs:
Students with special needs and require special accommodations must be registered with UCF Student Disability Services prior to receiving those accommodations. Students must have documented disabilities requiring the special accommodations and must meet with the instructor to discuss the special needs as early as possible in the first week of classes. UCF Student Disability Services can be contacted at www.sds.sdes.ucf.edu or at (407)823-2371.

Dates:

First Day of Class	
Last Day to Drop Classes:	
Last Day to Add Classes:	
Final Exam:	

COURSE, TERM, INSTRUCTOR **Daily Schedule (subject to change)**			
Week	Date	Concepts Presented:	Textbook chapter
1	1/11	Introduction of optical design. Review of geometrical optics	Slide 1
		From Maxwell's equation to ray tracing. Snell's law/Fermat Principle.	Slide 1
2	1/18	No Class/MLK Day	
		Spherical surface expansion and paraxial ray tracing approximation. Thin Lenses. Newton's formula. Thin lens system.	Slide 2 HW1 /Send out spreadsheet
3	1/25	Key concept for ray tracing: stops and pupils, marginal and chief ray, cardinal point, principle plane	Slide 3
		Matrix representation. Invariants. Paraxial ray tracing using spread sheet.	Slide 4
4	2/1	Paraxial ray tracing calculation example.	Slide 4-2
		Finish using spread sheet	Slide 4/HW1 due
5	2/8	Zemax introduction.	Slide 5
		Non paraxial ray tracing. Wavefront/lateral aberration	Slide6/HW2
6	2/15	MTF PSF and starts to talk 3rd order aberrations I (Seidel's aberrations)	Slide7
		3rd order aberrations II (Seidel's aberrations)	Slide7
7	2/22	3rd order aberrations III Calculation (Seidel's aberrations using spreadsheet)	Slide8/Quiz3
		Lens Design I (lens bending and splitting)	Slide8-2/HW2 due/HW3
8	3/1	Lens Design examples	Slide9
		Lens Design examples	Slide9/HW4
9	3/8	Spring Break	
		Spring Break	
10	3/14	Chromatic aberration and lens material	Slide10
		Lens Design II (Achromatic doublets Zemax)	Slide10/HW3 due
11	3/21	Lens Design III (Double Gauss Lens 1)	Slide11
		Lens Design IV (Double Gauss Lens 2)	Slide11
12	3/28	Mid-term review	Slide12/Zemax Project
		Mid-term Exam	
13	4/4	Mid-term Exam Answers. Introduction to FDTD (general formula)	Slide 1
		Introduction to FDTD (boundary condition, frequency domain analysis)	Slide 1/HW 4
14	4/11	Introduction to FDTD (1d pulse simulation using Matlab FDTD)	Slide 2
		Pulse propagation using CST	Slide 1

15	4/18	Slab waveguide I (Review of Fundamental EM theory of waveguide)	
		Slab waveguide II using CST	HW4 Due