**Optics I**

**PHYS 4650**

Credit: 3 credits

Room: SER122

Time of class: 1:30 pm – 2:45 pm, Tuesday and Thursday weekly basis

Instructor: Titus Yuan, Phone #: 797-2959, email: titus.yuan@usu.edu, Office: SER318D

Course description:

This class focuses on the basic principles of geometrical optics, including, thin lens, thick lens, optical systems and basic analytic ray-tracking. It will also introduce the E&M theory on the light and describe how the light propagates through the medium, reflection and refraction, etc. The textbook is OPTICS 5$^{th}$ edition by Eugene Hecht.

Goal and expectation:

The expectation is that students would gain the basic knowledge of optical system (paraxial optics), including the optical technologies involved in the performance of some optical instruments, such as telescope and FPI. The students are also expected to understand the E&M theory on light propagation in the medium, including reflection and refraction etc.

Course schedule:

Below is the proposed schedule. Please be aware that this list intents to show the estimated schedule and materials. Since the course is going to cover lots of ground within one semester, we may not be able to discuss every item in the list, and the schedule could be changed slightly.

8/28 – 9/1 Introduction of history and wave motion (Chapter 1 and Chapter 2.1-2.3)

9/4 – 9/8 Wave motion continue (Chapter 2.4 – Chapter 2.10)

9/11 – 9/15 Electromagnetic Theory on Photons and lights (Chapter 3)

9/18 – 9/22 Rayleigh scattering and reflection (Chapter 4.1-4.3)

9/25 – 9/29 Refraction and Fermat's principle (Chapter 4.4 -4.6)

Mid-term exam TBD

10/02 – 10/06 Total internal reflection, the electromagnetic Approach (Chapter 4.6-4.7)

10/09 – 10/13 Optical properties of metals and interaction of light and matter (Chapter 4.8-4.9)

10/16 – 10/20 The Stokes treatment of Reflection and refraction, Prism and fiber (Chapter 4.10, 5.5-5.6)

10/23 – 10/27 Geometric Optics: Lens, stops and mirror (Chapter 5.1-5.4)

10/30 – 11/03 Geometric Optics: Optics instruments & eyes. (Chapter 5.5-5.7)

Mid-term exam TBD

11/06 – 11/10 Geometric Optics: Wavefront shaping and Gravitational lensing (5.8-5.9) 11/13 – 11/17 Geometric Optics: Thick lenses and lens systems (Chapter 6.1)

11/20 – 11/22 Geometric Optics: Analytical Ray tracing (Chapter 6.2)

11/27 – 12/01 Geometric Optics: Analytical Ray tracing (continue) and Aberrations (Chapter 6.3)

12/04 – 12/08 Optical remote sensing at USU Physics

12/11 – 12/15 Final exams

Grade:

50% homework; 50% exams (two mid-term exams and one final exam). Homework will be handed out on weekly basis and due on each Tuesday, unless further noticed.

Note:

For Graduate students, this is not a core class and must be put on your plan of study with approval from your committee in order for tuition waiving. Student should have taken Physics for Science and Engineer I, II and E&M.

Student with Disability

Academic integrity: