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PHYS 418-002: Fundamentals of Optical Imaging

Tao Zhou

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Syllabus of Physics 418

Fundamentals of Optical Imaging

A Short Introduction:

- This is a junior or senior undergraduate 3 credits course, 2 times per week, 1.5 hour each.

Lecture Faculty:

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Web: <http://physics.njit.edu/~taozhou>

Office hours: Monday 1 – 2:30 pm, Wednesday 1:00 – 2:30 pm.

Pre- and Co-requisite Courses:

Physics 121 and Physics 234. Students are encouraged to take **OPSE 301** first, though it is not a prerequisite course.

Course Textbooks:

Introduction to Geometrical Optics, Milton Katz, world scientific, 1994

Grade Decomposition:

Total course grade = 40% Home work and project report + 30% Midterm + 30% Final

Course material outline:

This course introduces the analysis and design of optical imaging systems based on the ray model of light. Topics include reflection, refraction, imaging with lenses, stops and pupils, prisms, magnification and optical system design using computer software.

Course Schedule:

- Week 1** Light source and color, human eye.
- Week 2** Reflection of light, refraction of light
- Week 3** Refraction by planes, plates and prisms, paraxial refraction at planes, plates and prisms
- Week 4** Reflection and refraction at spherical surface
- Week 5** Thin lens, rotationally symmetric system
- Week 6** Astigmatic lens, Thick lens
- Week 7** Stops, pupils and ports, f-number, numerical aperture, and resolution
- Week 8** Magnifier, microscope, and telescope
- Week 9** Camera, projector and ophthalmic instrument
- Week 10** Dispersion and chromatic aberration
- Week 11** Monochromatic aberration
- Week 12** Trigonometric ray tracing, optical ray tracing software
- Week 13** Group projects on system design and characterization