JOINT INSTITUTE
交大密西根学院

Standard Undergraduate Course Profile

COURSE NUMBER: Ve334	**COURSE TITLE:** Principles of Optics
CREDIT: 4	**PREREQUISITES:** Vp240 or Vp260
TEXTBOOKS/REQUIRED MATERIAL: Eugene Hecht, Optics, 4th edition, Addison Wesley, 2002, ISBN 0-321-18878-0	**PREPARED BY:** Jigang Wu **LAST UPDATED:** Nov. 24, 2020 **DATE OF DISCIPLINE GROUP APPROVAL:** **DATE OF UC APPROVAL:**
CATALOG DESCRIPTION (No more than 100 words): This course introduces basic principles of optics. Topics include light sources and propagation of light, geometrical optics, lenses and imaging, ray tracing and lens aberrations; interference of light waves, coherent and incoherent light beams, Fresnel and Fraunhofer diffraction, and other selected topics on modern optics.	**COURSE TOPICS:** 1. The nature of light 2. Geometrical optics: image formation, aperture and stops 3. Geometrical optics: lens system, ray tracing 4. Geometrical optics: aberrations 5. Geometrical optics: example optical systems 6. Wave motion, EM theory, photons, and light 7. The propagation of light 8. Superposition of waves, coherence 9. Polarization 10. Birefringence, propagation of light in crystal 11. Interference: general considerations 12. Interference: interferometer systems and applications 13. Diffraction: Huygen's principle, Fraunhofer and Fresnel diffraction, zone plates 14. Diffraction: diffraction gratings, holography 15. Introduction to Fourier optics Selected topics on modern optics
COURSE STRUCTURE and CONTACT HOUR: 48 hours of Lecture / 12 hours of Discussion	
COURSE OUTCOMES [Student Outcomes* in brackets]	1. Ability to use ray tracing to compute the location and magnification of an image. [1] 2. Ability to compute simple diffraction patterns (fringe profile and localization; periodicity). [1] 3. Ability to measure spectra using diffraction gratings or interferometers. [1] 4. Ability to measure polarization using polarizers. [1] 5. Ability to determine coherence of a light beam. [1]
COURSE OBJECTIVES [Course Outcomes in brackets].	1. To provide students with overviews of basic and modern optics. [1,2,3,4,5] 2. To teach students the basics of geometrical optics, microscopes, telescopes, magnifiers, ray tracing. [1] 3. To teach students basics of Fresnel & Fraunhofer diffraction & how to compute diffraction patterns. [2] 4. To teach students the basics of interferometers (Michelson, Mach-Zehnder and Fabry-Perot.). [3,4,5]
ASSESSMENT TOOLS [Course Outcomes in brackets]	1. Homework [1-5] 2. Midterm exam [1] 3. Final exam [1-5]

ABET Student Outcomes* —— Apply to Engineering, Math, and Science Courses Only

1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3) an ability to communicate effectively with a range of audiences

4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies