

OPTI 600D: Diffractive Optical Elements – Theory and Design

Effective Fall Semester 2018

Course Description:

This course includes a physical optics approach to understanding computer-generated diffractive optical elements (DOEs) and their differences with respect to refractive lens elements. Included in the discussion are gratings, focusing elements, aberration compensators, servo-signal generators, axicons, computer-generated holograms (CGHs) and other elements. Design techniques using Zemax ray-tracing software will be demonstrated, and an open-source Matlab program called OptiScan will be used for project assignments.

Pre-requisites:

OPTI 505R, Access to computer with Matlab and Zemax

Number of Units/ component:

1 Unit – Can be distance learning.

Locations and Times:

TBA, preferred as a component of a modular class schedule.

Instructor Information:

Prof. Tom D. Milster
Office 729, Optical Sciences
520-621-8280
milster@optics.arizona.edu
Office hours: Monday 1-3pm and other times by appointment.

Expected Learning Outcomes:

- Theoretical understanding of several types of computer-generated diffractive optical elements (DOEs) and how they can be used in optical systems.
- Ability to design gratings, focusing elements, aberration compensators, and other types of DOEs with Zemax and Matlab software.
- Understanding of how DOEs are used in optical systems and other applications.

Required Texts:

Course notes will be available on D2L.

Topics and/or general calendar:

PRELIMINARY LECTURE SCHEDULE:

1. Physical optical principles for computer-generated DOEs;
2. Gratings I – basic principles and configurations;
3. Gratings II – advanced configurations and spectrometers;
4. Gratings III – design and analysis;
5. Fresnel zone plate (FZP) and the diffractive Fresnel lens (DFL);
6. Design techniques and analysis for FZPs and DFLs;
7. Other types of DOEs and applications;
8. Computer-generated holograms (CGHs);
9. Design techniques and analysis for CGHs;
10. DOE fabrication.
11. DOEs generated from Spatial Light Modulators

NOTE: Lectures were recorded in a previous year, so the homework and assignment information mentioned in the videos will not be accurate. Please use this syllabus as a guide.

Number of Exams and Papers:

Students are responsible for watching each lecture via video link. Instructions will be posted on D2L. After each lecture, there is an on-line miniquiz that must be completed that covers the lecture material. The first five miniquizzes (Lectures 1-5) must be completed by September 7, and the second five miniquizzes (Lectures 6-10) must be completed by September 21.

Additional lecture material may become available to the students during the semester. Announcements about this material will be made on D2L.

Course grade is determined from 10 miniquizzes, 2 homeworks and 1 design project. The design project is a written report.

The final design project is due by October 5 at 5pm and must be submitted on D2L. Students will be required to submit a plan for approval of their final project by September 21 at 5pm.

Summary of due dates:

- Finish MQ 1-5: September 7 by 5pm
- Turn in HW 1 on D2L: September 7 by 5pm
- Finish MQ 6-10: September 21 by 5pm
- Turn in HW 2 on D2L: September 21 by 5pm
- Turn in Project Proposal on D2L: September 21 by 5pm
- Turn in Final Project on D2L: October 5 by 5pm

Course Policies:

Grading Policy

Miniquizzes (10)	40%
Homeworks (2)	20% (10% each)
Design project	40%
Total	100%

The grade will be determined according to the cumulative percentage earned such that 85-100% = A, 70-84% = B, 60-69% = C, 50-59% = D, below 50% = E.

Academic Integrity (<http://web.arizona.edu/~studpubs/policies/cacaint.htm>)

According to the Arizona Code of Academic Integrity, “Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student’s submitted work must be the student’s own.” Unless otherwise noted by the instructor, work for all assignments in this course must be conducted independently by each student. Co-authored work of any kind is unacceptable. Misconduct of any kind will be prosecuted and may result in any or all of the following:

- Reduction of grade
- Failing grade
- Referral to the Dean of Students for consideration of additional penalty, i.e. notation on a student’s transcript re. academic integrity violation, etc.

Students with a Learning Disability

If a student is registered with the Disability Resource Center, he/she must submit appropriate documentation to the instructor if he/she is requesting reasonable accommodations. (<http://drc.arizona.edu/instructor/syllabus-statement.shtml>).

The information contained in this syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.