OPTI 600E: Diffractive Optical Elements – Fabrication and Testing
Effective Fall Semester 2015

Course Description:
This course is a hands-on fabrication and testing course in which students will learn characteristics of fabricating and testing different types of computer-generated diffractive optical elements (DOEs). Elements include binary amplitude, binary phase and gray-scale phase structures. Gratings, diffractive Fresnel lenses (DFLs) and computer-generated holograms (CGHs) will be fabricated. The primary fabrication tool will be the College of Optical Sciences Maskless Lithography Tool (MLT) and Holoeye LCOS spatial light modulators. Design techniques using Zemax ray-tracing software and an open-source Matlab program called OptiScan learned in the previous course will be used. Students will work in pairs.

Pre-requisites:
OPTI 505R and/or previous OPTI 600D Diffractive Optical Elements – Theory and Design class, Access to a computer with Matlab

Number of Units/ component:
1 Unit – Limited to 16 on-campus students.

Locations and Times:
Location: Lab 753. Times TBA – Semester-length lab class

Instructor Information:
Prof. Tom D. Milster
Office 729, Optical Sciences
520-621-8280
milster@optics.arizona.edu
Office hours: M and F 1-3pm.

Expected Learning Outcomes:
- Practical understanding of technology used to fabricate DOEs.
- Practical understanding of technology used to test DOEs.
- Experience fabricating and testing various types of DOEs.
- Experience designing and implementing diffractive structures on an LCOS spatial light modulator.

Required Texts:
Course notes will be available on D2L and the MLT website.

Topics and/or general calendar:
PRELIMINARY SCHEDULE:

1. Grating Fabrication and Testing I – Binary amplitude; 
2. Grating Fabrication and Testing II – Binary phase
3. Grating Fabrication and Testing III - Gray-scale phase; 
4. Grating Fabrication and Testing IV – LCOS SLM; 
5. FZP Fabrication and Testing I – Binary amplitude; 
6. FZP Fabrication and Testing II – Binary phase 
7. FZP Fabrication and Testing III - Gray-scale phase; 
8. FZP Fabrication and Testing IV – LCOS SLM; 
9. Binary amplitude photon sieve – Binary amplitude and LCOS SLM; 
10. CGH Fabrication and Testing I – Binary phase; 
11. CGH Fabrication and Testing II – Gray-scale phase; 
12. CGH Fabrication and Testing III – LCOS SLM; 

Number of Exams and Papers:

Course grade is determined from 10 short lab reports (Students will choose 10 out of 12 lab periods to write reports).

Course Policies:

Grading Policy

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<tr>
<th>Lab Reports</th>
<th>100% (10% Each)</th>
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<td>Total</td>
<td>100%</td>
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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.

Rubric for grading lab reports:

2pts – Detailed design description

2pts – Description of fabrication process

2pts – Explanation of testing procedures

2pts – Presentation of testing data

2pts – Comparisons of test results to theoretical predications and explanations of discrepancies.

NOTE: Labs are done in a lab group of 2-3 students. Submit lab reports by the following schedule. Reports are submitted on D2L. Length should be 5 pages maximum. Follow the format of a journal manuscript, except you can make it single-spaced lines. Be sure to put the lab number and group member names in the file name. Only one copy of the report needs to be submitted. Choose one
member of your group to submit the reports. Lab reports are due on midnight seven days after the scheduled lab time. Late submissions will not be graded.

**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. Misappropriation of exams before or after they are given will be considered academics misconduct.

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.

**Attendance Policy**

It is important to attend all classes, as what is discussed in class is pertinent to adequate performance on assignments and exams. If you must be absent, it is your responsibility to obtain and review the information you missed. This is especially important in this course where a substantial amount of course material will emerge through class discussion.

"All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored."

**Classroom Behavior**

The Arizona Board of Regents’ Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one’s self. See: [http://policy.web.arizona.edu/threatening-behavior-students](http://policy.web.arizona.edu/threatening-behavior-students).

**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](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.*