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## **U of AZ College of Optical Sciences Computer Generated Holography (CGH) and Diffractive Optical Element (DOE) Workshop**

### **Introduction**

From the early work of Lohmann to present day, applications such as multi-spectral dispersers, chromatic compensators, aspheric testing, optical beam shaping and transformation, security marks, multiplexed optical detectors and laser pointers have used computer-generated holograms (CGHs) to perform otherwise difficult or impossible tasks. CGH design spans decades of applied and theoretical research. Diffractive Optical Elements (DOE) are CGHs used in optical systems. Fabrication of these devices has traditionally been time consuming, using binary photomasks and semiconductor foundry resources. The purpose of this workshop is to provide participants with a hands-on learning opportunity for design and fabrication of these devices using the Maskless Lithography Tool (MLT) at the College of Optical Sciences. Through a series of lectures, computer training and laboratory experiments, participants will be exposed to processes needed to design and build physical devices.

### **Learning objectives**

Participants who successfully complete this three day course will be able to:

- Specify, analyze, design and test properties of Diffractive Optical Elements (DOEs)
- Specify, analyze, design and test properties of CGH display holograms.
- Design and use DOEs for optical testing applications.
- Describe basic fabrication procedures used in fabricating CGHs and DOEs with maskless grayscale lithography.
- Fabricate several types of CGHs and DOEs using the MLT

### **Intended audience:**

This course is geared towards scientists, engineers, managers and researchers interested in exploring fundamentals of Computer Generated Holography, Diffractive Optical Elements and Maskless Grayscale Lithography who want to gain hands-on, working knowledge in this field. A strong undergraduate-level mathematical background and a basic knowledge of optics are helpful.

### **Program Overview**

Classes are divided into lecture and laboratory sessions each day, where each day covers a different topic. The laboratory involves hands-on training in fabrication and testing of CGHs. Software written in the Matlab© language is provided with a one-year license agreement as part of the course. Classes are held in the world famous College of Optical Sciences on the beautiful University of Arizona campus in Tucson, Arizona. See the accompanying sheet for detailed schedule and contact information. Class size is limited to provide a quality learning environment.

### **Instructors**

- William J. Dallas, <http://www.radiology.arizona.edu/Dallas>
- Tom Milster, <http://www.optics.arizona.edu/milster>
- Burge, <http://www.optics.arizona.edu/faculty/Resumes/Burge.htm>

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**MARCH 2009 CGH WORKSHOP  
REGISTRATION INFORMATION  
College of Optical Sciences  
Meinel Building/Room 821 (West Wing)**

Enrollment: Limited to 20 Participants  
Registration Begins: 11-6-08 until all openings are filled  
Includes: Lectures, Labs, Course Materials, Software, Coffee Breaks  
and a Variety of Lunches. Laptops will be Provided.

<b>PRIMARY</b>	<b>March 17-19 2009</b>	<b>CGH WORKSHOP</b>  A three-day course that includes classroom and laboratory instruction. Topics include training in design, fabrication and testing of diffractive optical elements (DOEs) and computer-generated holograms (CGHs) for applications in optical systems, display, and aspheric mirror testing.	<b>Tuition: \$1500</b>  SPIE Member: \$1350*  <b>*(10% Discount before 2-13-09)</b> <b>Payable to University of Arizona College of Optical Sciences</b>
<b>ADDITIONAL</b>	<b>March 16 2009</b>	<b>Matlab, Optiscan &amp; Zemax Basics</b>  This class is a computer-based introduction to Matlab <sup>®</sup> , OptiScan <sup>®</sup> , and Zemax <sup>®</sup> software that will prepare participants for more advanced topics presented in the workshop.  <b>Instructor: Tom D. Milster</b>	<b>Tuition: \$500</b>  SPIE Member: \$450*  <b>*(10% Discount before 2-13-09)</b> <b>Payable to University of Arizona College of Optical Sciences</b>
<b>ADDITIONAL</b>	<b>March 20 2009</b>	<b>Advanced DOE/CGH Design Using Optiscan</b>  This class is a continuation of the CGH Workshop that emphasizes practical design and fabrication issues of DOEs and CGHs. Advanced computer-based design using OptiScan <sup>®</sup> includes instruction for aberration compensators, harmonic DOEs, CGHs for testing, advanced CGHs, and other topics.  <b>Instructor: Tom D. Milster</b>	<b>Tuition: \$500</b>  SPIE Member: \$450*  <b>*(10% Discount before 2-13-09)</b> <b>Payable to University of Arizona College of Optical Sciences</b>

**Contact: Juliet Hughes (520) 626-7080 or  
[juliet@optics.arizona.edu](mailto:juliet@optics.arizona.edu) for further information**

Information about the College of Optical Sciences: <http://www.optics.arizona.edu/>

Virtual tours of the University of Arizona Campus: <http://www.arizona.edu/tours/>

Maps and directions: <http://www.optics.arizona.edu/Maps/Default.htm>

Students do not receive the OptiScan software license agreement.