

## **OPTICS 599: Prof. Dallas' Digital Holography *Lite* with Laboratory**

Professor Dallas normally offers his Digital Holography class every other year, but this year he will be offering a 2-unit version along with a Laboratory. In the laboratory, students will use the Grayscale Maskless Lithography phototool in the Micro-optics research lab on the 5<sup>th</sup> floor (Lab 556) to create binary holograms from designs made in class. This is a 599-series independent study class, so the schedule will be flexible.

### ***For those of you who have taken Prof. Dallas' class:***

Here's an opportunity to refresh on the basics, and hone your experimental skills with a real mask-making phototool...and make some very cool personalized holograms.

### ***For those of you who haven't:***

Basic knowledge of Fourier Optics (Opti512) is a good prerequisite.

### ***The class (1 unit):***

Based on Prof. Dallas' notes:

- Review of Generalized Harmonic Decomposition
- Binarization of the Fourier Transform
- Encoding the FT into a binary hologram
- Idiosyncrasies of programming (We'll cover MATLAB)
- Analysis of Imperfections

### ***The Lab (1 unit):***

The Grayscale Maskless Lithography Phototool can create a maximum 12k x 12k CGH with 2 micron pixel spacing. Imaging time is about 20 seconds, and material can be exposed anywhere between 10 mJ/cm<sup>2</sup> and 500 mJ/cm<sup>2</sup>. The tool accepts grayscale BMP file formats.

Students will generate the CGH files. Lab staff will expose, develop, and etch photomasks.

Students will then evaluate their CGH and its reconstruction for performance.

- Laser Pattern Generator fundamentals
- Modelling a raster imaging engine transfer function
- Overview of fabrication methods and non-linear processes
- Chrome-on-glass binary transmission Computer Generated Hologram (CGH)
  - Fabrication method
  - Evaluation of the CGH
  - Evaluation of the CGH reconstruction
- Photoresist-on-glass binary phase CGH (Kinoform)
  - Fabrication method
  - Evaluation of the CGH
  - Evaluation of the CGH reconstruction