The College of Optical Sciences has a long legacy of pushing the boundaries of scientific knowledge and translating that knowledge into industrial value. In celebration of our 50th anniversary, and in furtherance of our industrial collaboration, the college has launched a new program to allow for industrial participation in our collective mind-share.

Starting this fall, we will offer a series of four on-campus educational seminars on applied optical design and theory to our current students. For a fee, our Industrial Affiliates members can access these seminars via our distance learning platform on a non-credit basis via our new **Industry Access Program**. Taught by full professors highly respected in their field of expertise, the series will focus on applied optical theory related to lens design, computational photography, applied mathematics and diffractive element theory.

The courses, representing 40 hours of world-class instruction, will be available for the upcoming academic semester and be taken on an as-needed basis via distance learning.

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**J**im **S**chwiegerling, Ph.D  
The University of Arizona, 1995

**T**om **D**. Milster, Ph.D.  
The University of Arizona, 1987

**Y**uzuru **T**akashima, Ph.D.  
Stanford University, 2007

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For information on how to enroll, contact:

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**Course Descriptions**
Photonics in Lens Design
Launched 8/25-9/25, Tuesday & Thursday 8-9:15 a.m.

Understanding physical optics and implementing them in ray-trace-based optical design software are essential skills for optical engineers and lens designers. In this class, we focus on gratings — thin and thick holographic optical elements — as optical components used in modern complex optical systems. This course provides fundamental understanding of theories used in optics and photonics system design with gratings and holograms, as well as the skills to implement theories into software code.

During the five-week course, students will acquire an introductory knowledge of photonics and fundamental theories in gratings and hologram design and learn to implement gratings and holograms in optical systems.

Expected Learning Outcomes:
• Ability to design lens and hologram mixed optical systems.
• Ability to model lens and hologram mixed optical system with software.
• Ability to effectively bridge photonics design and classical lens design.

Linear Algebra for Optics
Launched 8/25-9/25, Monday & Wednesday 3:30-4:45 p.m.

Linear algebra techniques arise in many areas of optics. However, due to the diverse backgrounds, students taking optics coursework may have limited or no exposure to these techniques. This course reviews the fundamentals of linear algebra and illustrates these concepts with applications to various fields of optics. The goal of the course is to improve the student's linear algebra skills and connect the mathematical concepts to real-world applications.

Expected Learning Outcomes:
• Ability to mathematically manipulate matrices, including addition, multiplication and inversion.
• Apply matrix techniques to analysis of optical system properties, polarization optics and colorimetry.
• Analyze and fit data using matrix techniques such as least squares, principal component analysis and singular value decomposition.

Computational Photography
Launched 9/29-10/31, Monday & Wednesday 3:30-4:45 p.m.

The modern cell phone has enormous image-acquisition and computational power. Computational photography blends computer algorithms with traditional photography to create images that are not feasible with traditional digital imaging. This course examines several computational photography techniques to familiarize students with recent advances in the field.

Expected Learning Outcomes:
• Ability to manipulate digital images in software and to extract useful information from them.
• Apply computational techniques to create images that are infeasible with hardware alone.
• Understand algorithms used in imaging and their application towards, scientific, medical and creative applications.

Diffractive Optical Elements: Theory and Design
Launched 9/29-10/31, Fridays 10 a.m.-12:30 p.m.

This course includes a physical optics approach to understanding computer-generated diffractive optical elements 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 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.

Expected Learning Outcomes:
• Theoretical understanding of several types of computer-generated diffractive optical elements 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.