THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Optical Techniques in Fluid Flows

MECHENG 8514

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Fundamentals of lasers, optics, and diatomic spectroscopy, and their application to flow and combustion diagnostics.

Prerequisites and Co-requisites:
Prereq: Grad standing in Engineering or the Sciences, or permission of instructor.

Course Goals / Objectives:
- Provide comprehensive introduction to principles of lasers and optical instrumentation
- Gain an understanding of a variety of optical diagnostic methods for fluid and combustion research

Course Topics:

- Maxwell’s Equations and Electromagnetic Wave Propagation.
- Polarization, Electro-Optic and Verdey Effects.
- Introduction to Atomic and Diatomic Spectroscopy and Gas Phase Statistical Thermodynamics.
- Principles of Optics and Lasers: Gain and Loss – Three/Four Level Systems, Laser Resonators, Harmonic Generation, Optical Parametric Oscillation, Q-switching and Mode Locking, Intra-Cavity Line Narrowing, and Injection Seeding.
- Geometrical and Gaussian Optics.
- Optical Point and Imaging Detectors.
- Laboratory Optical Instrumentation (Interferometers and Wave Meters, Lock-In Amplifiers, Boxcar Integrators).
- Absorption and Fluorescence-based Flow and Combustion Diagnostics.
- Particle and Molecular Scattering-based Flow and Combustion diagnostics.
- Non-Linear Spectroscopy.
- Imaging Flow and Combustion Diagnostics
- Final Oral Project Presentations

Designation:

Elective