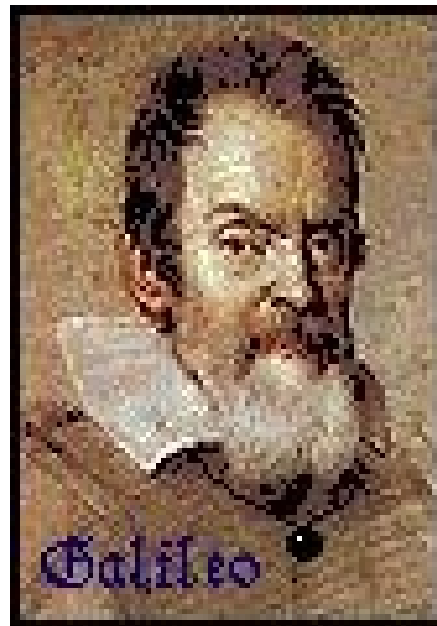


# MIT Mechanical Engineering PhD Qualifying Exam in Optics



# Class preparation

2.003

2.71 (U)  
2.710 (G)

Barbastathis/So

2.717 (G)

So/Barbastathis

**fall** **necessary**

## Optics

Basic (introductory, no background necessary; includes basic E&M) undergraduate/graduate optics

**spring** **optional**

## Optical Engineering

Advanced graduate class on optical sensing and imaging, emphasis on information & design

## Other optics subjects around MIT

6.161 (U)

6.631 (G)

6.634 (G)

6.637 (G)

8.421 (G)

8.422 (G)

# Optics: material covered

- **Geometrical Optics**
  - Ray theory, thick/thin lenses, ray propagation matrices
  - Optical systems: primate eye, telescope, microscope
  - Aberrations, simple aberration correction methods
- **Physical Optics**
  - Wave equation, plane & spherical wave solutions
  - Light propagation in matter, polarization
  - Optical resonators, optical gain, lasers
  - Fresnel & Fraunhofer diffraction
  - Interference/interferometers, diffraction gratings, holography
  - Coherent/incoherent image formation
- **Two-dimensional non-causal **signal processing****
  - Bandwidth, sampling, space-bandwidth product
  - Spatial filtering, convolutions & correlations
  - Inverse problems, resolution

# Optics: exam format

- 1) Written exam *standard department format* Duration: 1hr
- 2) Oral exam (*non-standard format*) Duration: 40 min/student

Part 1: (~25 min)

- student is given a collection of two-three research papers focused on a research topic, one week before the exam
- the topic and papers are decided by the exam committee in consultation with the student's research adviser and taking into consideration the student's research topic
- the student presents a 15 min long summary of the papers and then answers questions by the committee

Part 2: (~15 min)

- Free-form questions on the subject matter covered by 2.71/2.710 Optics as follow-up to previous questioning