

# Optics and Instruments

## Introduction to the Course

Christoph U. Keller, Matthew A. Kenworthy, Martin van Exter

## Outline

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# Why Build Optical Instruments?

## Prime Reasons

- Instrument will do exactly what you want it to do
- Be the first to make breakthrough observations
- Superb instrument knowledge leads to better science

## Why not Engineers?

- need astronomers and physicists who can talk to engineers
- lack of engineers with broad knowledge
- instrumentation research is experimental physics

## Job Prospects

- astronomy spends a lot on telescopes and instruments
- excellent experience for industry jobs

## Goal (6 ECTS)

**Understand how to build  
optical instruments  
as an astronomer/physicist**

## People

- Christoph Keller ([keller@strw.leidenuniv.nl](mailto:keller@strw.leidenuniv.nl))
- Matthew Kenworthy ([kenworthy@strw.leidenuniv.nl](mailto:kenworthy@strw.leidenuniv.nl))
- Martin van Exter ([exter@physics.leidenuniv.nl](mailto:exter@physics.leidenuniv.nl))
- Andrew Ridden-Harper ([arh@strw.leidenuniv.nl](mailto:arh@strw.leidenuniv.nl))
- more contact information on course web page

## Communication

- Email via BlackBoard from us to all of you
- Email from you to us and back to you

## Course URL

[home.strw.leidenuniv.nl/~keller/Teaching/OAI\\_2015/](http://home.strw.leidenuniv.nl/~keller/Teaching/OAI_2015/)

## Contents

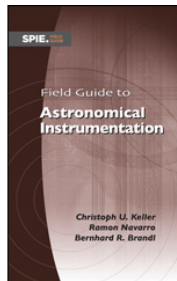
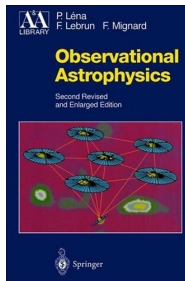
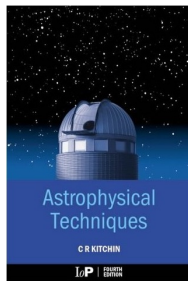
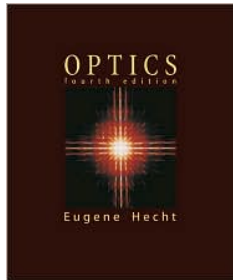
- contact information
- lecture presentations, exercises, exercise materials, practicum materials
- presentation topics and assignments including links to papers (only from UL computers)

# Lecture Notes and Books

## Lecture Notes

Some documents will be distributed during the course

## Recommended Books



BYU Physics of Light and Optics, free at [optics.byu.edu/textbook.aspx](http://optics.byu.edu/textbook.aspx)

## Weekly Schedule

<b>Day</b>	<b>Time</b>	<b>Location</b>	<b>Topic</b>
Wednesday	13:45 – 15:30	HL 414	Lectures
Wednesday	15:45 – 17:30	HL 411	Exercises etc.

## Exercises and Practicum

- homework, exercises, practicum, presentation are integral part of course
- written exercises and reports have to be submitted by deadline
- will be checked, returned, and discussed
- solutions will not be made available in writing

## Presentations

- select one original paper and present it to peers
- 20-minute presentation in English
- discussion of presentation
- grade is for level of understanding of paper



Title	Chapter	Instructor
Introduction to the Course, Foundations of Optics	Hecht 1-4	Keller
Geometrical Optics	Hecht 5, 6	Keller
Wave Optics: Diffraction and Interference	Hecht 10.1-10.3, 9.3; BYU 10, 11.2-11.5	van Exter
Polarization		Keller
Matrix description of beam propagation and Gaussian beams	Hecht 11, BYU 9, 10, 11.1, 11.6, 11.7	van Exter
Telescopes		Kenworthy
Thin Films and Coatings		Keller
Optical Design		Keller
Imagers		Kenworthy
Spectrographs		Kenworthy
Optical coherence and optical etendue	Hecht 12, BYU 8	van Exter
Interferometers		Kenworthy
Polarimeters		Keller
Microscopes	Hecht 13.2	van Exter

## Exams

- content
  - lectures, lecture notes
  - exercises, practicum, homework
  - paper presentations and questions
- written exam on 18 December 2014, 14:00-17:00 in HL414
- oral exams after that
- mock exam before end of lectures

## Grades

- 60% exam
- 20% exercises, homework, and practicum
- 20% presentation