

# **Astronomical Observing Techniques**

## **Introduction to the Course**

Christoph U. Keller

[keller@strw.leidenuniv.nl](mailto:keller@strw.leidenuniv.nl)

# Outline

1. Course Overview
2. People and Communication
3. Web Page
4. Books
5. Schedule
6. Exam and Grades

# Course Goal

Know and be able to apply  
the most common techniques that are  
currently used  
to observe and understand the  
universe.

# Relation to Other Courses

- BSc
  - Radiative Processes (Rossi)
- MSc in Astronomical Instrumentation (see <http://www.astroinstrumentation.nl>)
  - Astronomical Telescopes and Instruments
  - Astronomical Systems Design
  - Detection of Light
  - Astronomy from Space
  - Radio Astronomy
  - High-Contrast Imaging

# Course Overview

## 1. Basics of Observational Astronomy:

- Properties of radiation (black body, radiometry)
- Atmospheric properties (transmission, emission, scattering, dispersion)
- Telescopes (reflector, refractor, mounts, foci, ground/space telescopes)

## 2. Theoretical Background/framework:

- Fourier transform (definition, properties, 1D/2D examples, theorems)
- Geometrical & diffraction optics (image formation, PSF, aberrations)
- Measurement properties (signal-to-noise, sensitivities, sampling)

## 3. Specific Techniques and Components:

- Radio Techniques (basics, antennae, receivers)
- Detectors (physical basis, photo-conductors, bolometers, heterodyne)
- Spectrometers (spectral information, dispersing elements, types)
- Adaptive Optics (principle, components, laser guide stars, types)
- Interferometry (speckle interferometry, visibility, types)

# People

## **Christoph Keller**

Professor of Experimental Astrophysics

Oort 569

keller@strw.leidenuniv.nl

## **Joshua Albert**

PhD student with Bernhard Brandl, Christoph Keller

Oort 551

albert@strw.leidenuniv.nl

## **Emiel Por**

MSc student in Astronomical Instrumentation

Oort 570

por@strw.leidenuniv.nl

# Communication

- **Emails to you:** via BlackBoard (sign up or miss important information)
- Non-UL students send email to Joshua and Emiel with copy to me
- **Emails to me:** best way to communicate with me
- Lectures and all materials in English
- Questions, exercise answers etc. in Dutch or English

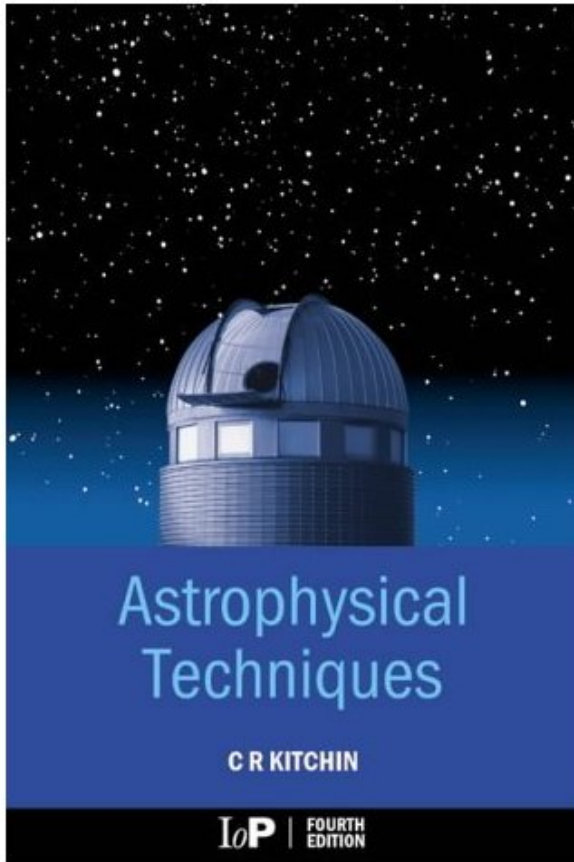
# Course Web Page

[www.strw.leidenuniv.nl/~keller/Teaching/AOT\\_2016](http://www.strw.leidenuniv.nl/~keller/Teaching/AOT_2016)

- contact information
- course schedule
- lecture presentations, exercises, exercise materials (no exercise solutions)

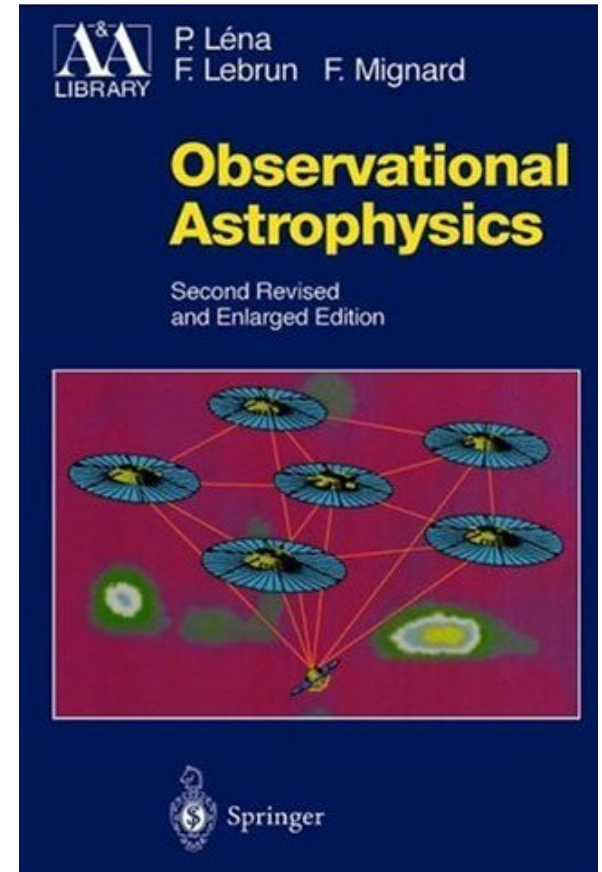


# Recommended (not required) Literature



Astrophysical Techniques, by C.R.Kitchin, 5th edition 2008, published by Institute of Physics Publishing, ISBN 978-1420082432

Observational Astrophysics, by Pierre Lena, 3rd edition, 2012, published by Springer, ISBN 978-3-642-21814-9



# Schedule

Day	Time	Room	Type
Monday	11:15-13:00	HL 226	Lecture
Tuesday	09:00-10:45	HL 226	Exercises

- Lecture on 8 February in HL106
- Frequently check for changes on course web page!
- Coffee break or not?

# Exercises

- Weekly exercises must be followed
- Apply and practice the newly acquired knowledge
- Improve your final grade by up to 1 point [if exercises are done well]
- If you skip the exercises, you are likely to fail the exam

# Exam & Grading

- Written exam at the end (6 June 2016) to test your knowledge and UNDERSTANDING of the subject matter
- Required knowledge: all lectures and exercises
- Open book (everything on paper is allowed; no laptops, tablets, smartphones etc.)
- Questions similar in style to exercises
- Mock exam towards the end of the course