Astronomical Observing Techniques 2018

Introduction to the Course

Christoph U. Keller
keller@strw.leidenuniv.nl

Content

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

Learning Outcome

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

Foundation for MSc Courses

- Astronomical Telescopes and Instruments
- Detection of Light
- Astronomy from Space
- Radio Astronomy
- High-Contrast Imaging
- MSc in Astronomical Instrumentation (see http://www.astroinstrumentation.nl)

Course Overview

Foundations of Observational Astronomy:

- Electromagnetic radiation properties (black body, radiometry)
- Earth atmosphere properties (transmission, emission, dispersion)
- Fourier transform (definition, properties, 1D/2D examples, theorems)
- Geometrical and physical optics (image formation, PSF, aberrations)
- Measurement statistics (signal-to-noise, sensitivities, sampling)

Telescopes, Instruments and Observing Techniques:

- Telescopes (reflector, refractor, mounts, foci, ground/space telescopes)
- Radio Techniques (basics, antennae, receivers)
- Interferometry (speckle interferometry, visibility, types)
- Detectors (physical basis, photo-conductors, bolometers, heterodyne)
- Spectrometers (spectral information, dispersing elements, types)
- Adaptive Optics (principle, components, laser guide stars, types)

People

Christoph Keller
Professor of Experimental Astrophysics
Huygens 1105, keller@strw.leidenuniv.nl

Emiel Por
PhD student in Astronomical Instrumentation
Huygens 1125, por@strw.leidenuniv.nl

Maaike van Kooten
PhD student in Astronomical Instrumentation
Huygens 1125, vkooten@strw.leidenuniv.nl

Rob van Holstein
PhD student in Astronomical Instrumentation
Huygens 1127, rvanholstein@strw.leidenuniv.nl

Communication

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

Course Web Page

www.strw.leidenuniv.nl/~keller/Teaching/AOT_2018

Recommended Books

Observational Astrophysics, 3rd edition, 2012, by Pierre Lena, published by Springer, ISBN 978-3-642-21814-9, available at book stores
Astrophysical Techniques, 5th edition, 2008, by C.R.Kitchin, published by Institute of Physics Publishing, ISBN 978-1420082432, available at book stores

Contact Information

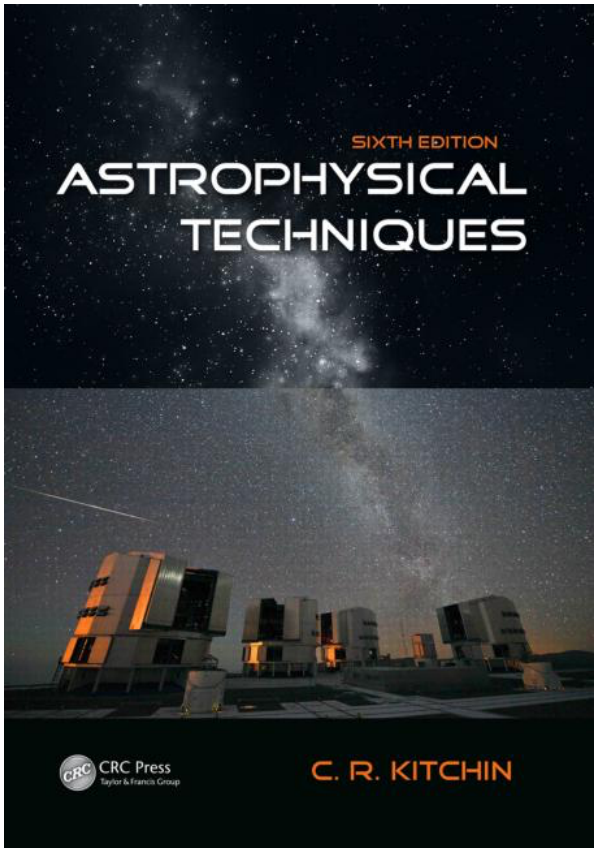
Name	Email	Phone	Room
Christoph Keller	keller -at- strw.leidenuniv.nl		Huygens 1126
Emiel Por	por -at- strw.leidenuniv.nl		Huygens 1105
Maaike van Kooten	vkooten -at- strw.leidenuniv.nl		Huygens 1125
Rob van Holstein	rvanholstein -at- strw.leidenuniv.nl		Huygens 1127

Course Outline

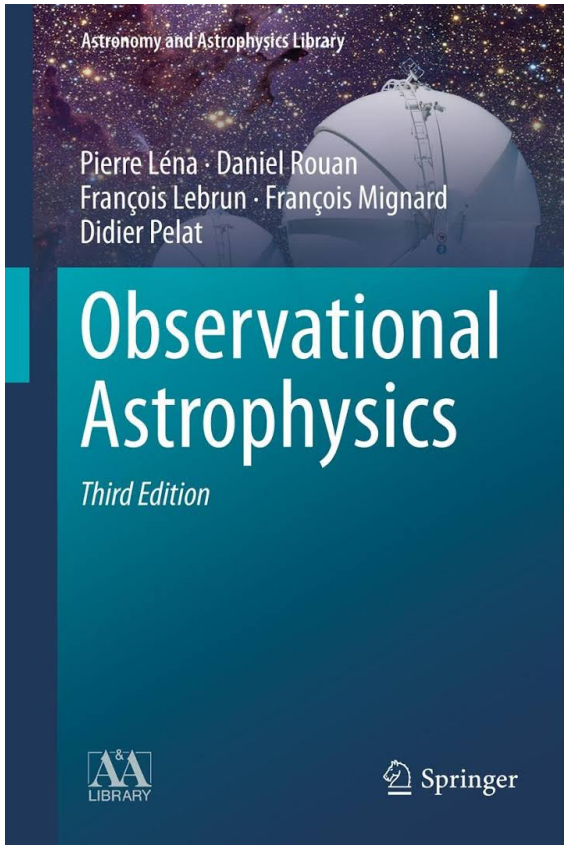
iCal version of this course schedule

Date	Time	Location	Topic	Chapters	Instructor	Download
22.1.2018	11:00-12:45	HL 106/107	Lecture: **Introduction to the Course, Black Bodies in Space**		Keller	
23.1.2018	15:30-17:15	HL 106/107	Exercises		Por	
29.1.2018	11:00-12:45	HL 106/107	Lecture: **Trouble is in the Air**		Keller	
30.1.2018	15:30-17:15	HL 106/107	Exercises		Por	
5.2.2018	11:00-12:45	HL 106/107	Lecture: **Monsieur Fourier and his Elegant Transform**		Keller	
6.2.2018	15:30-17:15	HL 106/107	Exercises		Por	
12.2.2018	11:00-12:45	HL 106/107	Lecture: **Everything You Always Wanted to Know About Optics**		Keller	
13.2.2018	15:30-17:15	HL 106/107	Exercises		Por	
19.2.2018	11:00-12:45	HL 106/107	Lecture: **Eyes to the Skies**		Keller	
20.2.2018	15:30-17:15	HL 106/107	Exercises		Por	
26.2.2018	11:00-12:45	HL 106/107	Lecture: **Your Noise is My Signal**		Keller	
27.2.2018	15:30-17:15	HL 106/107	Exercises		Por	

Recommended (not required) Literature



Astrophysical Techniques, by C.R.Kitchin, 6th edition 2013, published by CRC Press
ISBN 9781466511156



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

Schedule

Day	Time	Room	Type
Monday	11:00-12:45	HL 106/107	Lecture
Tuesday	15:45-17:15	HL 106/107	Exercises

- Frequently check for changes on course web page!
- Coffee break: 11:45-12:00

Exercises

- Weekly exercises must be followed
- Apply and practice newly acquired knowledge
- Improve your final course grade by up to 1 point if exercises are done well
- If you skip the exercises, you are likely to fail the exam
- 2017: exam grade = 3.1 + 4.2 * (homework %)

Exam & Grading

- Written exam:
  - 29 May 2018, 14:00-17:00, HL207/211/214
  - tests knowledge and UNDERSTANDING of subject
- 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
- Course grade = exam grade + homework bonus