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
Recommended Books


Contact Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Phone</th>
<th>Room</th>
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<tbody>
<tr>
<td>Christoph Keller</td>
<td>keller-at- strw.leidenuniv.nl</td>
<td></td>
<td>Huygens 1126</td>
</tr>
<tr>
<td>Emiel Por</td>
<td>por-at- strw.leidenuniv.nl</td>
<td></td>
<td>Huygens 1105</td>
</tr>
<tr>
<td>Maaike van Kooten</td>
<td>vkooten-at- strw.leidenuniv.nl</td>
<td></td>
<td>Huygens 1125</td>
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<tr>
<td>Rob van Holstein</td>
<td>rvanholstein-at- strw.leidenuniv.nl</td>
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<td>Huygens 1127</td>
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Course Outline

iCal version of this course schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Topic</th>
<th>Chapters</th>
<th>Instructor</th>
<th>Download</th>
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<tr>
<td>22.1.2018</td>
<td>11:00-12:45</td>
<td>HL 106/107</td>
<td>Lecture: <em>Introduction to the Course, Black Bodies in Space</em></td>
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<td>23.1.2018</td>
<td>15:30-17:15</td>
<td>HL 106/107</td>
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<td>29.1.2018</td>
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<td>HL 106/107</td>
<td>Lecture: <em>Monsieur Fourier and his Elegant Transform</em></td>
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<td>12.2.2018</td>
<td>11:00-12:45</td>
<td>HL 106/107</td>
<td>Lecture: <em>Everything You Always Wanted to Know About Optics</em></td>
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<td>15:30-17:15</td>
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<td>Lecture: <em>Eyes to the Skies</em></td>
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<td>26.2.2018</td>
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<td>Lecture: <em>Your Noise is My Signal</em></td>
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keller@strw.leidenuniv.nl

Astronomical Observing Techniques 2018: Introduction to the Course
Recommended (not required) Literature

ISBN 9781466511156

## Schedule

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<td>Monday</td>
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<td>Lecture</td>
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<td>Tuesday</td>
<td>15:45-17:15</td>
<td>HL 106/107</td>
<td>Exercises</td>
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- 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