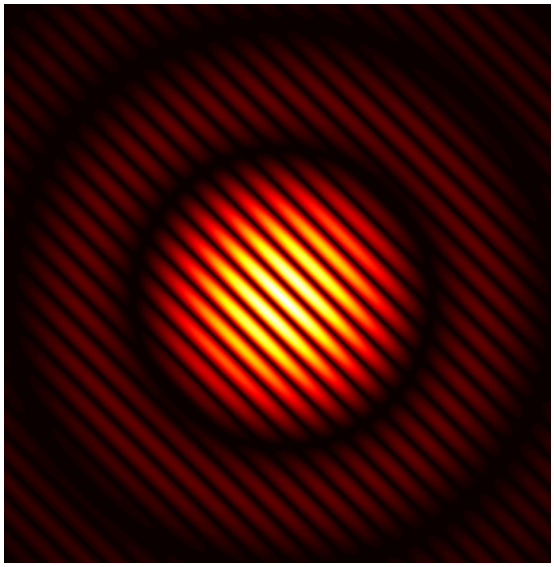
Fourier Optics



— OBJECTIVES

The aim of this course is to provide the basics of Fourier optics for astronomers. The theory of diffraction and image formation makes an extensive use of tools related to Fourier analysis and signal processing, such as the Fourier transform, convolution and frequency filtering. During this course we present the mathematical formalism as well as applications to image formation, long baseline interferometry, Abbe-Porter optical filtering and Lyot coronography.
The course is completed by laboratory sessions, using optical benches with lasers, lenses and cameras. We also give a small introduction to a scientific computing language (python) and use it for numerical exercises and processing of data obtained during lab sessions.

— EVALUATION

Type of examinations:

- Short tests, weight 1/3 (two 30-mn tests without documents, 1/6 each),
- Lab reports, weight 1/3,
- Written exam, weight 1/3

— MAIN PROGRESSION STEPS

- Weeks 1-7 : theoretical courses and exercises
- Weeks 3 and 5 : short tests
- Weeks 4 and 6 : lab sessions
- Last week : final exam

— BIBLIOGRAPHY & RESOURCES

- E. Aristidi, Fourier Optics Course
- Goodman J.W., "Introduction To Fourier Optics"
- Modern optics (university of Edinburgh)

— CONTACT

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Content

— Theory (24h)

1. Reminders on Fourier analysis
2. Fresnel and Fraunhofer diffraction
3. Fourier properties of lenses
4. Optical coherent filtering.
5. Image formation in incoherent light.

— Lab experiments (6h)

1. Fraunhofer diffraction
2. Optical filtering