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| **Study programme**: Astronomy and Astrophysics – PhD Studies |
| **Course**: Optical interferometry of extragalactic objects |
| **Teacher or teachers**: Andjelka Kovačević |
| **Status**: optional |
| **ECTS credits**: 9 |
| **Requirements**: none |
| **Course objective**: Modern interferometric facilities respond to a wide range of astronomical questions, typically acting like a microscope, and dissecting in great detail physical processes at work in prototypical objects of its class (brightest and nearest proto-planetary discs, evolved stars, active galactic nuclei (AGN) etc.). With telescope baselines of up to several hundred meters, interferometry is the only observing technique available to probe directly at visible-infrared wavelengths spatial scales at milli-arcsec (mas) angular resolution scales, and at microarc secs for extraglactic objects. Very high angular resolution has been identified at EU as top priority and key toward a revolution in understanding the formation of exo-planetary systems, the fundamental physics of stars, and the structure of AGN, including cosmological applications in the 2030 decade.The aim of the course is to train students to understand this technique and analyze the data obtained, which is considered to lead to significant progress in the study of the most compact objects in space during the 2030s - close double supermassive black holes. |
| **Course outcome**: At the end of the course, the student has mastered the principles of this modern technique and is trained to analyze and use data from optical and infrared interferometers. |
| **Course description**:<br>Basic principles of optical interferometry. The two element adding interferometer.Interferometric fringes. The van Cittert Zernike theorem and the Fourier plane.Visibility function, phase and differential phase. Gravity instrument. Principles of imaging. Generic limitations of interferometry.Fourier plane sampling.Spectral resolution and field of view.Limitations specific to the optical/IR domain.Atmospheric perturbations.Current status and prospects of optical interferometry. Practical classes Introduction and work with the interferometric module in the programming language Python_interftools_module_pyhdust: data format, parameter preparation. |

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| **Recommended literature**:<br>1. David F. Buscher, *Practical Optical Interferometry: Imaging at Visible and Infrared Wavelengths* (Cambridge Observing Handbooks for Research Astronomers), 2015.<br>2. Kovačević, A. B., Wang, Jian-Min, Popovic, Luka Č. 2020, Astronomy & Astrophysics, Kinematic signatures of reverberation mapping of close binaries of supermassive black holes in active galactic nuclei. Ill. The case of elliptical orbits, Volume 635, id.Al,<br>3. Kovačević, A. B. , Songsheng, Y.-Y. , Wang, J.-M. , Popović, L. Č. 2020, Astronomy & Astrophysics, Probing the elliptical orbital configuration of the close binary of supermassive black holes with differential interferometry, Volume 644, id.A88, 31 pp<br>3. Python documentation of pyhdust module<br>4. Lectures material from classes |

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| **Total number of classes**: 10 | **Theoretical classes**: 4 | **Practical classes**: 6 |

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| **Teaching methods**:<br>Ex cathedra, group work, student research |

| **Grading system (maximum number of points: 100)** | | | |
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| **Pre-exam requirements** | points | **Final exam** | points |
| Activity in class | | Written exam | 40 |
| Practical work | 30 | Oral exam | 30 |
| Colloquia | | | |
| Seminars | | | |