

SUGGESTED BOOKS: Fundamental Astronomy, Karttunen et al.; "To measure the sky", Chromey. Handbooks for the computational and data reduction practicals. **MANY PRACTICALS** in linux environment at the informatics laboratory.

This year the long-term topics related to the final exam are: 1. Astrometry of an image given by the teacher using starlink/gaia; 2. Light curve of a variable star using starlink/gaia in the case Dr. Iafrate will remake observations and the teacher give them to students (due to weather conditions these observations were not completed and are not useful); 3. Calibration and redshift measure of a NTT galaxy spectrum with IRAF using data given by the teacher; 4. Kinematics/structure of Milky Way using SALSA radio measures of HI clouds, that is to show that $velocity=const$ and to trace Galaxy map (data taken during the lecture or re-taken by the student itself). The student will select and discuss one of these topics.

NOTE: due to Covid-19 the astronomical observations were only performed in remote way and part of IRAF programme at the computer suffered of difficulties with the remote connection, the presence of the teacher only in remote way and not in person, and the change of the INFIS pc cluster of the Department with a new system (due to the sudden stop of INFIS). However registrations of the lectures are available.

Optics for Astronomy and Astronomical Telescopes

Simple telescopes. Image quality: telescopic resolution and optical aberrations. Telescope mounts and drives. Reflecting telescope optics. Telescopes in space. Ground-based telescopes. (BOOKS: Karttunen 3.2; Chromey 5(part) and 6.

Catalogs and web archives

Name, catalogs, databases, stellar maps and finding charts. (BOOKS: Karttunen 2.12 p.39-42 Chromey cap.4 p.105-117 (interesting tables) KarttunenCat.ps, ChromeyCatTab.ps). The use of several web-sites for literature, catalogs, and data archive: ADS, arXiv, CDS/Vizier, NED + Practical/Homework. See Moodle.

FITS format of images and DS9 visualization

Astronomical images and their FITS format: HDU, Header, Data Unit. Array and operations with arrays. WCS. CCD (a short introduction, Chromey p.236). The use of the DS9 tool for visualization and treatment + Practical/Homework. See Moodle.

Astrometry and Photometry and GAIA tool

Astrometry of astronomical images and the use of GAIA + Practical/Homework (see Moodle). Basics of Photometry: standard stars, instrumental magnitudes, calibration and zero-point correction. Photometry of stars and galaxies. The use of GAIA, in particular for aperture photometry. Object detection and catalogs using GAIA. Starlinks BOOKS.

CCD reduction of images and Spectra calibration and IRAF tool

IRAF tool and its application to images. Basics of CCD reduction of images (bias, flat). Spectra calibration: trace and extract the spectrum, identification of arc lines, calibration, redshift measure.

Outdoor and Remote Observational Activities with collaboration of Dr. Giulia Iafrate

Presentation and use of the instrumentation at the local Astronomical Observatory of OATS/INAF at Basovizza: the SVAS Telescope Celestron C14 and the Solar Telescope Coronado HELIOS 1. Image acquisition of several astronomical objects: e.g., nebulae, variable stars, recent supernovae and their host galaxies. During the day: image acquisition of the Sun. The use of Radio SALSA Onsala Telescope in remote to measure the velocity of the HI clouds in the Milky Way (with Practical/Homework).