

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 of LAB-INFIS (Dept. of Physics - Univ. of Trieste, ubuntu op. system).

This year the long-term topics related to the final exam are: 1. Astrometry of an image given by the teacher; 2. Light curve (data given by the teacher, typically the one observed in that year); 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 the part at the computer suffered of the presence of the teacher only in remote way and not in person, in particular there were some difficulties in the IRAF part due to the remote connection with INFIS pc cluster of the Department, however registrations of the lectures are available.

Astronomical Measurements and Quantities

Summary of Celestial Coordinates: horizontal system; equatorial system and the sidereal time; ecliptic system; galactic system. Visibility of stars and circumpolar stars. Exercises on coordinates. (BOOKS: Karttunen).

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. 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. Star/galaxy classification with Practical/Homework.

CCD reduction of images and Spectra calibration and IRAF tool

IRAF tool and its application to images. Basics of CCD reduction of images (bias,dark,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 Oractical/Homework).