

DAC Winter Astronomy School

Python for Astronomy Intensive Program

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Program Overview

This 10-day intensive winter school provides a comprehensive introduction to computational astronomy. Participants will progress from Python basics to advanced topics such as spectral analysis, Active Galactic Nuclei (AGNs), and database mining using SQL. The course features hands-on sessions with real astronomical data (SDSS) and specialized tools like **Astropy** and **DS9**.

Course Details

- **Duration:** 3rd - 13 January 2026 (4pm-6pm)
- **Mode:** Live Lectures + Hands-on Coding Labs
- **Prerequisites:** Basic understanding of physics and **mathematics**; no prior coding experience required.

Daily Schedule

Day	Theme	Topics Covered
1	Python Bootcamp I	Orientation; Python basics (variables, loops, functions); Introduction to NumPy and math for astronomy.
2	Python Bootcamp II	Data handling with Pandas; Visualization with Matplotlib; Introduction to FITS image handling (opening and manipulating astronomical images).
3	The Astropy Ecosystem	Introduction to Astropy: Units, physical constants, celestial coordinates (RA/Dec), and time transformations.
4	Spectral Analysis	Basics of spectroscopy; Emission vs. Absorption lines; Gaussian fitting techniques; Estimating Redshift from spectral data.
5	Galaxy Modelling	Introduction to GALAMO ; Galaxy Analysis & Modelling techniques; Modeling galaxy parameters using Python.
6	Statistics & Simulation	Basic statistics (mean, median, std dev); Introduction to Monte Carlo simulations; Simulating star clusters.
7	Data Mining the Cosmos	Introduction to Bayesian statistics basics; SQL with Astroquery ; Accessing real astronomical databases programmatically.
8	Active Galactic Nuclei	Introduction to AGNs; Physics of Accretion Disks; Creating BPT diagrams for AGN classification using SDSS data.
9	Hands-on Hackathon	Guided problem-solving session: Participants choose a real-world problem (e.g., classifying stars vs. galaxies) and apply learned tools.
10	Final Showcase	Final project presentations; Mentorship Q&A; Future roadmap for research in computational astrophysics.

Tools & Libraries

- **Core:** Python, NumPy, Pandas, Matplotlib
- **Astronomy Specific:** Astropy, Astroquery, DS9, Galamo
- **Data Source:** Sloan Digital Sky Survey (SDSS), HST, KECK, FITS archives

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