Instructor: Brian Hill

Course/Department: Observational Astrophysics / Physics 197

Course Type: Upper Division

Regular Course Name/Number: Observational Astronomy and Astrophysics / Physics 185

Term: Spring

Credit/Unit Type: Undergrad 1.00

Title of Course of Study: Observational Astronomy and Astrophysics

Outline:

- Telescope Operation
  - Altitude / Azimuth and Equatorial Mounts
  - Balancing
  - Polar Alignment
  - Sky Models / Meridian Flip
  - Dew and Moisture Protection / Clearances / Stalls
- Software Controlled Telescope Operation
  - GOTO Pointing
  - Focusers
  - Filters and Filter Trays
  - Camera Control
- Magnitude and Color System
  - Luminosity/Magnitude/Absolute Magnitude
  - Atmospheric Extinction and Seeing Conditions
  - Variable Stars
- CCD Data Collection
  - CCD Data Acquisition
  - Computer Image Processing
  - Blank Field Correction
  - Light Distribution Functions
  - Correcting for Atmospheric Extinction
- Star Cluster Magnitude Diagrams
- Variable Star Light Curves

Textbook and References

- Textbook: *A Practical Guide to Lightcurve Photometry and Analysis*, 2nd Edition, Brian D. Warner, Springer, 2016 (http://www.springer.com/us/book/9783319327495)
- *An Introduction to Astronomical Photometry Using CCDs*, W. Romanishin, PDF, 2006 (http://www.physics.csbsju.edu/370/photometry/manuals/OU.edu_CCD_photometry_wrccd06.pdf)
- *The AAVSO Guide to CCD Photometry*, Version 1.1 PDF, 2016 (https://www.aavso.org/sites/default/files/publications_files/ccd_photometry_guide/CCDPhotometryGuide.pdf)

Evaluation Criteria

[The italicized information below need not go to the registrar.]

(1) Demonstrate Ability to Operate and Collect Data With the College's Telescopes and Astrophotography Equipment.

The deliverable demonstrating this will be a manual covering one telescope configuration (comprising a mount, the telescope itself, the astrophotography equipment attached to the mount, and the whatever software packages are necessary to operate the configuration). The manuals should be complete by the midterm break and at least one draft of the manual should be circulated two full weeks prior to the break. The target audience for the manual is a Physics faculty member or fellow Physics senior.

Since we have two students doing independent study, we will end up with two manuals covering two configurations. Good choices for the configurations would be (a) the TeleVue Pronto on an iOptron mount carrying solar photography equipment, or (b) a Maksutov-Cassegrain on a German equatorial mount carrying CCD photometry equipment. The Geissberger telescope is also a candidate configuration, but we should start with the simplest and least expensive equipment.

(2) Demonstrate Ability to Capture, Reduce, Correct and Analyze Data for one of the last two course outline items (Star Cluster Magnitude Diagrams or Variable Star Light Curves).

The deliverable demonstrating this will be a 20-30 minute presentation to the Physics Department faculty and any interested fellow Physics majors during the last week before finals.

Some stretch goals would be to have light curve data accepted by the American Association of Variable Star Observers (AAVSO) or to have a poster session abstract submitted for the AAVSO June, 2017 meeting.

Note

I understand that this course of study will involve extended night-time observing and time-consuming debugging of hardware and software packages (which we will need to understand and use — not author) as well as understanding of the theoretical material in the above textbook and references, and as such involves a rather different mix of activities than the usual lecture/reading/assignment/testing cycle that is the bread and butter of regular coursework. By making this petition I am stating that my interest in astronomy and astrophysics is sufficient to sustain and self-motivate me through this independent study.