Montgomery County Community College
AST 130
Astrophysical Research Techniques
3-2-2

COURSE DESCRIPTION:
Research in Astronomy is a one-semester college-level course concerned with a study of the techniques required in making and reducing astronomical observations. This course will focus on methods of modern data collection, reduction, and analysis using a telescope, CCD detector, and filter system. The students will be required to carry out individual as well as group observing projects on a specialized topic in astronomy using a remote robotic telescope located in Utah.

PREREQUISITE(S):
AST 120/PHY 120/GLG 121 (or equivalent) taken within the last 5 years with a minimum grade of C

CO-REQUISITE(S):
None

Upon successful completion of this course, the student will be able to:

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
1. Evaluate modern astronomical techniques used in observatories using robotic telescopes, CCD cameras, spectrometers, and filtering techniques.	Discussion Telescopic Observations and Data Collection	Exams Homework Assignments Wiki Assignments
2. Use astronomical software to calibrate, analyze, and reduce data as well as to create color images, biases, flat and dark fields	Discussion Image Reduction and Analysis	Exams Homework Assignments Reduced Images
3. Evaluate absolute and differential photometry and the components used to reduce data in the standard BVR system.	Discussion Image Reduction and Analysis	Exams Homework Assignments Reduced Images
4. Identify the importance of measurement and uncertainty when analyzing data and	Discussion Image Reduction and Analysis	Exams Homework Assignments Wiki Assignments

assessing image quality.		
5. Create an observing project using photometry of variable stars, asteroids, and exoplanets that is accurately recorded in an observing log.	Discussion Image Reduction and Analysis Telescopic Observations and Data Collection	Group Project Observing Log Scientific Research Paper Exams Homework Assignments Blog Assignment

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

SEQUENCE OF TOPICS:

1. Course Introduction
2. Robotic Telescopes
3. CCD Cameras
4. Types of Images: Flat Field, Dark Field, Bias
5. Color Images using filtering techniques
6. Photometry: Absolute and Differential Photometry
7. BVR system for data reduction
8. Measurement and Uncertainty in Data Analysis
9. Observational Logbook and Record Keeping
10. Photometry of variable stars, asteroids, and exoplanets

LEARNING MATERIALS:

The Sky is Your Laboratory – Advanced Astronomy Projects for Amateurs, Robert K Bucheim, Springer Praxis Books, 2007

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:

Prepared by: Peter Detterline and Kelli Spangler Date: 11/28/2016

VPAA/Provost or designee Compliance Verification: Date: 2/2017

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.