PHYS 346 SYLLABUS

INSTRUCTOR: Vayujeet Gokhale
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OBSERVATORY MANAGER: Lauren Hoffman (lth4418@truman.edu)

WHERE/WHEN WE MEET:

6.30 pm – 08:20 pm Magruder Hall 1006, T, Th;
7.30 pm – 8.20 pm Wednesday
Class time will become more flexible later in the Semester, depending on weather.

OFFICE HOURS:

Monday, Tuesday, Wednesday, Thursday: 10:30 AM – 11:20 AM

TEXT: No official textbook. Reference books are in the astronomy lab (MG 3153) or Observatory warm room. Handouts will be provided. We will use plenty of resources on the internet.

Additional Online Resources:

- http://www.aavso.org/
- https://astro.swarthmore.edu/transits/transits.cgi
- http://keplerebs.villanova.edu/
- http://cdsweb.u-strasbg.fr/

We will rely heavily on online material, class notes on blackboard, and class handouts through the semester. Students are encouraged to be enterprising and find material online or from the library by themselves and share it with the instructor and their peers.

All course information is managed on Blackboard (http://blackboard.truman.edu/).

Course Outline:

The main objective of the course is to introduce the student to modern techniques in observational astronomy. This includes learning how to use a modern telescope and CCD camera; how to acquire images and process them, and how to analyze data to generate lightcurves. In addition, the student will learn how to access astronomical data on the internet; in particular how to access and analyze publicly available data from important missions like the TESS, Kepler, and (soon) JWST missions.

We will meet two out of the allotted three days for the class, depending on the weather. If the weather is good, we will meet at the Observatory to collect data. When we meet in Magruder, we will learn about variable stars, photometry, data analysis, and so on. Each 'lecture' will consist of a traditional lecture, followed by assignments related to the material covered in the lectures. Some of these assignments will count as quizzes or homework. **The short and long projects are the focus of this class** – most of the things we do will be aimed toward successful completion of these projects.

Course Objectives:

In this course, students will

1) Learn the properties of eclipsing binary stars, supernovae, and exoplanet transits,
2) Be introduced to modern techniques in observational astronomy,
3) Be able to operate an astronomical observatory in-situ and remotely and,
4) Be trained in astronomy outreach.

Course Delivery

Due to the uncertain situation related to the COVID-19 pandemic, the course will be offered in an "hybrid" format (i.e. less than 75% of course content will be delivered online). The Zoom link will be posted on blackboard. The **exact mode of instruction will be decided based on the status of the pandemic, student health, directions from Truman administrators, and common sense**.

FACE COVERING REQUIREMENTS: Consistent with guidance for higher education institutions from the Centers for Disease Control and to help us reduce the possible spread of COVID-19, **when this class meets, or you attend office hours, you will be required to wear a face covering that completely covers your nose and mouth**. **You will be expected to keep the covering on at all times while we are meeting. In the event you arrive to class without a face covering, I will ask you to leave until you are able to obtain one and return**. Thank you for your help in containing this virus and helping to protect your peers.

Course Workload: This course is worth four credit hours. In addition to the scheduled class meeting times, which are the equivalent of 200 minutes per week, **you should expect to do an average of 400 minutes of work per week related to this course outside of class**. This may include, but is not limited to, reading, written assignments, essays, discussion boards, study for examinations and quizzes, and other tasks as described in this syllabus. The time to complete these tasks is an average that represents the typical amount of time a student can expect to commit. Times may vary by the student.

Disability Services: To obtain disability-related academic accommodations students with documented disabilities must contact the course instructor and the Office of Student Access and Disability Services (OSA) as soon as possible. Truman complies with ADA requirements. For additional information, refer to the Office of Student Access and Disability Services website at http://disabilityservices.truman.edu/
You may also contact OSA by phone at (660) 785-4478 or email studentaccess@truman.edu

Exams, Homework & Quizzes

Homework and quizzes will contribute substantially toward your final grade, both of which will be assigned quasi-regularly throughout the semester. I will take **attendance** at random several times through the semester. If you know beforehand that you are going to miss a particular class for official reasons (sick, going for a conference or athletic meet etc), it is your responsibility to notify me ahead of time (via email is fine). The point distribution is outlined in the table below –

	Number	*Points Per*	*% Total*
Quizzes	10	15	15
Homework	5	25	15
Outreach Events	2	50	10+10
Mid-term (Early March)	1	100	10
Short Projects	2	50	10+10
Long Project	1	100	20

All quizzes, projects, tests and homework must be done individually, unless otherwise specified by the instructor.
Test/Exam Schedule (Tentative, Subject to change)

Homework Policy:

The majority of the homework will consist of answering questions and problems assigned by me. Occasionally, a reading assignment followed by a quiz will be considered homework. Unless otherwise indicated, these should be done individually. I will consider it academic dishonesty, if homework is done in group or copied from any unauthorized source. **You must turn in your homework assignments in person at the beginning of the class session** in which they are due unless you have a valid reason not to attend the class. Homework handed in after the class has started will be considered late homework. No late homework will be admitted without a valid excuse.

Missing a homework, test or class

Students are expected to attend all the lectures. If you miss a lecture class for whatever reason, it is your responsibility to contact me and get informed about what you missed in class. I'd advice against getting this information from one of

your classmates. If you are to miss a class, exam or test for a valid reason (for example, a medical emergency), then I'll try my best to accommodate your needs by having an alternate test or give you more time to complete your homework etc. If you know in advance you cannot make it to class and have a valid reason, then let me know as soon as possible. ***Note**: As the semester progresses and we begin to collect data out at the Observatory, I will relax the attendance policy. Not everyone is required to be out at the Observatory at all times. In general two students at a time are sufficient, and students will take turns depending on their schedules and other commitments. The idea is to spread out 'student shifts' so we can collect data on an object for several hours a night.*

Grading, Final Grades etc

The point scheme is already outlined in the table above. I reserve the right to modify some aspects of it, depending on progress made as we go along (for example, we may have 9 homework assignments instead of 10 etc), but the weight that each field carries will remain the same (homework will still count for 20% of your grade etc). The grading scheme is as follows:

% Range	Letter Grade
90-100	A
80-90	B
70-80	C
60-70	D
0-60	F

If you have any questions about the point and grading scheme, please ask me right away. With respect to the letter grade, I reserve the right to upgrade borderline cases to a higher grade.
You will have an opportunity to obtain extra-credit, for example, on homework done exceptionally well, class participation, finding mistakes I may make in a lecture or homework solutions (trust me, I'll make some!) and so on. Again, assigning extra credit is left largely to my discretion.

List of Short Projects

1. Analyses of Kepler Data
2. Light Pollution

Other Possible short project topics (discuss with Instructor):

3. Properties of telescopes (1-m NURO, 17-inch TSO, eVScope, etc.)
4. Color Magnitude Diagram of Star Cluster
5. Astrophotography (Star trails, Moon/sun-imaging, Deep Sky objects, etc.)

Outreach Events

1. 'Stargazers' Open House [at Observatory or campus]
2. "Dark Sky" Planetarium Event [Planning, advertizing, and execution)

List of Long Projects

1. Light Curve analysis of Eclipsing Binary Stars using TSO/NURO
2. Light Curve analysis of Exoplanets using TSO/NURO for TESS Follow Up [TFOP]

Academic Integrity: Academic dishonesty of any form will not be tolerated in this class. Anyone caught cheating on a test, quiz or lab will automatically receive a grade of zero on that test, quiz or lab. Further disciplinary action consistent with University policy will be considered, including failing the course. Students are encouraged to discuss coursework as well as lab and take-home quiz assignments with their fellow students, but are required to complete all of their coursework and assignments using their original words and ideas and should properly cite the words and ideas of others. Students are expected to work alone on the exams and quizzes without the use of any outside resources (other than those permitted by your instructor). Students are also expected to be honest in their interactions with the professor. A student found to have not upheld these expectations is subject to failing this course and being reported to the appropriate authorities. For more information about the University policy on academic dishonesty, consult the appropriate sections of the Student Conduct Code (see the code and related information at http://conduct.truman.edu).

Statement on disruptive behavior

"Behavior that persistently or flagrantly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be asked to leave class pending discussion and resolution of the problem…" and may be reported to the Office of Citizenship and Community Standards. *(Quotation from Washington State University).*

University Student Support Services

The University provides a range of both academic and student support services to ensure your success. These offices can advise you on learning strategies, point you toward valuable services, and help you troubleshoot technical problems as they arise.

Center for Academic Excellence

The Center for Academic Excellence provides advising services for students in their first year for most departments, as well as tutoring services. The Center is located in Kirk Building 112 and it may be reached at 660-785-7403.

Counseling Services

Counseling Services are available on campus at McKinney Center. Appointments may be scheduled by calling (660) 785-4014. An after-hours crisis line is also available at 660-665-5621.

IT Help Desk

The IT Service Center has combined the IT Call Center, Help Desk and Telephone Services into a one-stop location to serve you. You will find the following services and more when you stop by Pickler Library 109 or call 660-785-4544. You may submit a customer support ticket.

Office of Student Access and Disability Services

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Writing Center

I encourage you to use the University's Writing Center for your writing projects. It is not a proofreading service. The writing consultants will read your work and give you feedback, letting you know what is working well (and why) and what might not be working so well (and why). They can help you understand and better your writing craft. They can also do brainstorming if you're having a hard time getting started. And they have an online scheduler, so making an appointment is easy. The Writing Center is located in Kirk Building 120. If you would like to receive participation credit for working with a writing consultant, please notify the Writing Center that you want them to email me a confirmation when making the appointment.

Quick Links to Other Student Services

Various offices that provide services to online students are identified at the One Stop Services page on online.truman.edu. You can also use this list of links to Truman Administrative Offices and Academic Departments.

FERPA

Education records are protected by the Family Education Right to Privacy Act (FERPA). As a result, course grades, assignments, advising records, etc. cannot be released to third parties without your permission. There are, however, several exceptions about which you should be aware. For example, education records can be disclosed to employees or offices at Truman who have an "educational need to know". These employees and offices may include your academic advisor, the Institutional Compliance Officer, the Registrar's Office, or Student Affairs depending on the type of information. For more information about FERPA, see http://www.truman.edu/registrar/ferpa/.

Emergency Procedures

In each classroom on campus, there is a poster of emergency procedures explaining best practices in the event of an active shooter/hostile intruder, fire, severe weather, bomb threat, power outage, and medical emergency. This poster is also available as a PDF at this link: http://police.truman.edu/files/2015/12/Emergency-Procedures.pdf .
Students should be aware of the classroom environment and note the exits for the room and building. For more detailed information about emergency procedures, please consult the Emergency Guide for Academic Buildings: http://police.truman.edu/emergency-procedures/academic-buildings/
This six-minute video provides some basic information on how to react in the event there is an active shooter in your location: http://police.truman.edu/emergency-procedures/active-shooter/active-shooter-preparedness-video/

Truman students, faculty, and staff can sign up for the TruAlert emergency text messaging service via TruView. TruAlert sends a text message to all enrolled cell phones in the event of an emergency at the University. To register, sign in to TruView and click on the "Truman" tab. Click on the registration link in the lower right of the page under the "Update and View My Personal Information" channel on the "Emergency Text Messaging" or "Update Emergency Text Messaging Information" link. During a campus emergency, information will also be posted on the TruAlert website http://trualert.truman.edu/.

Discrimination and Title IX

Truman State University, in compliance with applicable laws and recognizing its deeper commitment to equity, diversity and inclusion which enhances accessibility and promotes excellence in all aspects of the Truman Experience, does not discriminate on the basis of age, color, disability, national origin, race, religion, retaliation, sex (including pregnancy), sexual orientation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Faculty and staff are considered "mandated reporters" and therefore are required to report potential violations of the University's Anti-Discrimination Policies to the Institutional Compliance Officer.

Title IX prohibits sex harassment, sexual assault, intimate partner violence, stalking and retaliation. Truman State University encourages individuals who believe they may have been impacted by sexual or gender-based discrimination to consult with the Title IX Coordinator who is available to speak in depth about the resources and options. Faculty and staff are considered "mandated reporters" and therefore are required to report potential incidents of sexual misconduct that they become aware of to the Title IX Coordinator.
For more information on discrimination or Title IX, or to file a complaint contact:
Ryan Nely, Institutional Compliance Officer, Title IX and Section 504 Coordinator
Office of Institutional Compliance, Violette Hall, Room 1308, 100 E. Normal Ave, Kirksville, MO 63501
Phone: (660) 785-4354, titleix@truman.edu
The institution's complaint procedure can be viewed at http://titleix.truman.edu/files/2015/08/University-Complaint-Reporting-Resolution-Procedure.pdf and the complaint form is accessible at http://titleix.truman.edu/make-a-report/

SCHEDULE (TENTATIVE)

The course assignments are a bit skewed – with most homework and quizzes due in the first half of the Semester. The idea is to complete these assignments which will build on what you learn in class to give you the requisite background to address your projects. Note that we will spend a significant amount of time in class working on your homework and quizzes.

The Outreach Events have to be done after mid-term break, since the weather is expected to be more favorable in the second half of the spring semester.

You will largely be working on your projects and outreach events in the second half of the semester.

Week	#	Topics	Assignments	Most Important concepts
10th Jan	1	Review	Quiz I: The Sky, EM Radiation	EM Radiation, Wein's Law, SB Law
17th Jan	2	Review	Quiz II: VSP Targets	Spectra, Bohr Atom; Software + Websites
24th Jan	3	Variable Stars	HW I: JWST & Kepler	HR Diagram, Variable star "zoo", Introduction to Kepler Project
31st Jan	4	Differential Photometry I	Quiz III: AstroImageJ HW III: NAAP Variable Stars	Software: AstroImageJ, Maxim dl
7th Feb	5	Differential Photometry II	HW II: Paper Review Quiz IV: Select Targets	Telescopes, CCD cameras, websites
14th Feb	6	Kepler Data, Lightcurves	Quiz V: Differential Photometry Homework IV: NAAP Eclipsing Binaries	Preliminary Modeling, analysis of LCs
21st Feb	7	Kepler Data, Lightcurves	**Short Project I: Kepler Data** HW V: Binary Maker	Long Project Discussion
28th Feb	8	Review	**Long Project Abstract** **MIDTERM [Take Home]**	Astronomy Outreach ideas
7th Mar	9	MID TERM BREAK + LOWELL DATA COLLECTION		
14th Mar	10	Lightcurves & Analysis	Quiz VI: Script/plan for Observatory Open House	Differential Photometry, AstroImageJ
21st Mar	11	Data Analysis, Telescopes	**OUTREACH I: Open House**	Modeling, Data Collection
28th Mar	12	Telescopes	Quiz VII: Telescopes, CCDs	Observatory + Data Collection
4th Apr	13	Final Project Analyses	**Short Project II: LP**	Data Collection
11th Apr	14	Final Project Analyses	**OUTREACH I: Open House [Backup date]**	Data Collection + Analysis
18th Apr	15	Final Project Analyses	Quiz IX: Script for Outreach Event	Writing paper
25th Apr	16	Review	**OUTREACH II: Planetarium (International Dark Sky Week)**	
2nd May	17	**FINAL Project Due**		