Lahore University of Management Sciences

AST 104 / PHY 106 – The Universe Around Us

Summer 2024

Instructor	Rizwan Khalid / Sabieh Anwar
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TA	TBA
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Course URL	TBA

Course Teaching Methodology
This class will be taught in-person. In addition to the mandatory lectures, there will be tutorials if the students demand them for further clarification.

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	4	Duration	60 mins
Observation Sessions (per week)	Nbr of Lec(s) Per Week	~1	Duration	6 hours

Course Distribution	
Core	None
Elective	
Open for Student Category	All
Closed for Student Category	

Course Description
This is an introductory course on Astronomy which discusses the physical basis of our understanding of our place in the Cosmos. We will begin with our immediate surroundings to understand important questions about the phases of the moon, eclipses and how we use them to compute the distance scale of the solar system. We will then talk about the processes that power our sun and stars in general. The next step would be understanding the structure of the Universe as a whole as we know it from astronomical observations. We talk, in particular, about the expanding and accelerating Universe, and how we know it is in a phase of accelerated expansion. All along, we will be focused on why we think the way we think about our Cosmos. An illuminating feature of this course is understanding the skies around us whose detailed observational study has informed our understanding of the Universe and some of its fundamental physical principles. The course will also take a historical tour of our understanding of Cosmology beginning with the Greek models. The clear night skies of Gilgit-Baltistan will offer us observational evidence of what we will study. We will attempt to photograph the night sky, understand Astrology (and why it has nothing to do with science), and focus our telescope on various objects in the night sky.

Course Prerequisites
A love for the night sky and a lust for figuring out the basic structure of the Universe.

Learning Outcomes (CLOs)	
1	Demonstrate knowledge of the scales and composition of the Universe around us
2	Demonstrate knowledge of the physical principles underlying the motions of the heavens
3	Demonstrate elementary observational skills with reference to the night sky

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Grading break up: Component Details and Weightages
Assignments (30%): The students will submit a worksheet the day after every indoor class. The assigned work should not take up more than about an hour out of class. **Observation Sessions (30%):** Active participation in the observation sessions is worth 20% of the grade. The students will maintain a journal for all the observations. A short viva will be a part of the observation sessions. **Project (10%):** A moon journal needs to be meticulously maintained for the duration of this course. **Final Exam (30%)**: A two hour comprehensive final exam shall be held on the date specified by the RO. **Note:** I reserve the right to readjust the grading policy by upto 10%.
Grading Basis (Relative)
As per departmental policy.

Examination Detail	
Final Exam	Duration: The exam shall be of 2 hours duration. Preferred Date: As per the University schedule. Exam Specifications: The exam shall be comprehensive.

Course Overview (In-class sessions)			
Session#	Topics		CLOs
1-3	The cosmic distance ladder – from the size of the earth to the large scales in the Universe.		1
4	Spectroscopy, composition of the Universe and Hubble's law		1
5-7	Tyco Brahe, Kepler and Newton		2
8-10	Curved spacetime, and our cosmic origins		2
11-12	Lifecycle of stars, black holes		2

Course Overview (Outdoor activities and observation sessions)			
Activity#	Topics		CLOs
1	The moon journal. Students will be expected to keep a meticulous journal of the moon throughout the duration of the course. This activity will be treated as the course project.		3
2	Night-time photography. We will attempt to take pictures of the night sly using DSLRs/other cameras. We will capture star trails as well.		3
3	Observing constellations and looking for Greek, Chinese and Indian constellations.		3
4	Moon craters and terminator.		3
5	Long exposure images of andromeda using telescope.		3
6	Observing the planets through a telescope, Jupiter/saturn/venus and mars.		3
7	Seeing the differences in various stars in the night sky through a telescope.		3
8	Meteorite shower. We will get a chance to witness a meteorite shower.		3
9	Scale model of the solar system (if possible).		1

Textbook(s)/Supplementary Readings
The Essential Cosmic Perspective, J Bennett, M Donahue, N Schneider, M Voit. Supplementary resources will be provided when needed.

Course Policies	
Missed Components	Graded components missed due to reasons acceptable in the handbook may be made up by approaching the OSA. The relevant University guidelines shall be followed. Please inform the instructor immediately.
Disability/Sickness	Any disability, or chronic sickness issues should be brought to my notice immediately. In addition, please seek help from the office of student affairs (OSA) and office of accessibility and inclusion (OAI). We will follow the relevant University policies and decisions informed to us by the OSA accordingly.

Academic Honesty	The principles of truth and honesty are recognized as fundamental to a community of teachers and students. This means that all academic work will be done by the student to whom it is assigned without unauthorized aid of any kind. Plagiarism, cheating and other forms of academic dishonesty are prohibited. Any instances of academic dishonesty in this course (intentional or unintentional) will be dealt with swiftly and severely. Potential penalties include receiving a failing grade on the assignment in question or in the course overall. For further information, students should make themselves familiar with the relevant section of the **LUMS student handbook**. You are required to declare **WHENEVER** help is sought from a source other than the Textbooks and supplementary reading mentioned in this outline. In case of group assignments, the individual contributions need to be highlighted (grading will not take this information into account).
Equity and Belonging	In addition to LUMS resources, SSE's **Council on Belonging and Equity** is committed to devising ways to provide a safe, inclusive and respectful learning environment for students, faculty and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at cbe.sse@lums.edu.pk. In case a differently-abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.
Zero Tolerance for any form of Harassment	SSE, LUMS and particularly this class, is a harassment free zone. There is absolutely zero tolerance for any behaviour that is intended, or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential. This includes, but is not restricted to, sexual harassment, harassment on the basis of religion, caste, gender, sexual orientation or political leanings. Basically, you should feel comfortable taking this course and interacting with the faculty and other students is the bottom line of this message. If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at oai@lums.edu.pk or the sexual harassment inquiry committee at harassment@lums.edu.pk for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of offending behavior. You can find more details regarding the LUMS sexual harassment policy here. To file a complaint, please write to harassment@lums.edu.pk.