PHY 301: Classical Mechanics

Fall 2023

To understand how to navigate course outlines, consult: How to Use a Course Outline (http://surl.li/gpvuw)

Instructor	Tajdar Mufti	**TA**	TBA
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Communication	LMS, and Email. Cellphone: 0340-2130662	**Office Address**	SSE, 9-117A
Support Services	LUMS offers a range of academic and other services to support students. These are mentioned below, and you are encouraged to use these in addition to in-class assistance from course staff. For a complete list of campus support services available for you click here (https://advising.lums.edu.pk/#supportservices)		

Course Teaching Methodology

The course is intended to be taught in a classroom unless some unavoidable situation emerges.

Course Information

Description: This course is an intermediate level course on classical mechanics introducing students to the Lagrangian and Hamiltonian formulations of classical mechanics. We will begin a quick review of calculus of variation and then develop the Lagrangian formulation of mechanics. The treatment of central-force problem will be revisited using the Lagrangian formulation followed by the mechanics in accelerating frames of reference. The last half of the course will address the Hamiltonian formulations, canonical transformations, and scattering and perturbation theory in classical mechanics. The course will be concluded with application of learning of course material to continuous physical systems.

Pre-Requisite Knowledge: PHY101 and knowledge in calculus is required for the course.

Course Learning Objectives (CLOs): After the course, you should be able to

1. Apply the calculus of variations to certain problems in geometry and physical systems using Euler Lagrange equations
2. Use Lagrangian mechanics on central force problems
3. Apply mechanics in non-inertial frames on certain physical systems
4. Analyze many particle systems performing small oscillations
5. Apply Hamiltonian formulation, canonical transformation and their applications

List of Topics

Modules	Topics	CLOs
1	Brief review of Newtonian approach	CLO1
2	Calculus of variations	CLO1
3	Lagrangian mechanics	CLO1, CLO2
4	Two-body central force problems	CLO2
5	Mechanics in non-inertial frames	CLO3
6	Small Oscillations	CLO4
7	Hamiltonian mechanics, Canonical transformations	CLO5
8	Hamilton-Jacobi theory	CL05

9	Canonical perturbation theory	CLO5

Books

1	Classical Mechanics by Taylor, 2005 Edition	Mostly, the topics from (1) and (2) will be covered. However, it is strongly encouraged to go through the literature thoroughly.
2	Classical Mechanics by H. Goldstein	
3	Classical Mechanics by Tai L. Chow	

Class Logistics

Live Lectures	We will have ungraded lectures. However, attending them is strongly encouraged. The lectures may not be recorded unless absolutely necessary.

Assessments

Home works	4-7 home works. Around 2 weeks will be given for most of the home works, but the deadlines will be strictly followed	Total Weight: 20 %
Quizzes	4-6 quizzes in total. Most of them will be take home quizzes with strict deadline	Total Weight: 20 %
Mid-term examination (written)	In the 9^{th} week of Fall 2023 semester	Total Weight: 25 %
Final examination (written)	The examination will cover the entire course outline	Total Weight 35%

Note: The instruments of evaluations may vary up to 5%.

Course Policies

Late/Missed Assignment	Late Assignments will be accepted with 10% deduction for each late day, with a maximum penalty of 50%.
Disability/Sickness/Internet Access	Any disability, sickness, are chronic internet issues should be brought to instructor immediately, as soon as possible. Also, help can be sought from the office of student affairs (OSA) and office accessibility and inclusion (OAI). We will follow the policy of university and decisions made by the OSA accordingly.
Plagiarism/Cheating	Any discussion with and help from anybody else including from people remotely that directly solves the problems in assignments, quizzes, and exams is prohibited. However, students are allowed to take help from any notes/books unless

	explicitly asked not to. A violation of this policy in exams and assignments will result in referral to university's disciplinary committee.

Campus supports & Key university policies

Campus Supports

Students are strongly encouraged to meet course instructors and TA's during office hours for assistance in course-content, understand the course's expectations from enrolled students, etc. Beyond the course, students are also encouraged to use a variety of other resources. (Instructors are also encouraged to refer students to these resources when needed.) These resources include Counseling and Psychological Services/CAPS (for mental health), LUMS Medical Center/LMC (for physical health), Office of Accessibility & Inclusion/ OAI (for long-term disabilities), advising staff dedicated to supporting and guiding students in each school, online resources (https://advising.lums.edu.pk/advising-resources), etc. To view all support services, their specific role as well as contact information click here (https://advising.lums.edu.pk/#supportservices).

Academic Honesty/Plagiarism

LUMS has zero tolerance for academic dishonesty. Students are responsible for upholding academic integrity. If unsure, refer to the student handbook and consult with instructors/teaching assistants. To check for plagiarism before essay submission, use similarity@lums.edu.pk. Consult the following resources: 1) Academic and Intellectual Integrity (http://surl.li/gpvwb), and 2) Understanding and Avoiding Plagiarism (http://surl.li/gpvwo).

LUMS Academic Accommodations/ Petitions policy

Long-term medical conditions are accommodated through the Office of Accessibility & Inclusion (OAI). Short-term emergencies that impact studies are either handled by the course instructor or Student Support Services (SSS). For more information, please see Missed Instrument or 'Petition' FAQs for students and faculty (https://rb.gy/8sj1h)

LUMS Sexual Harassment Policy

LUMS and this class are a harassment-free zone. No behavior that makes someone uncomfortable or negatively impacts the class or individual's potential will be tolerated.

To report sexual harassment experienced or observed in class, please contact me. For further support or to file a complaint, contact OAI at oai@lums.edu.pk or harassment@lums.edu.pk. You may choose to file an informal or formal complaint to put an end to the offending behavior. You can also call their Anti-Harassment helpline at 042-35608877 for advice or concerns. *For more information: Harassment, Bullying & Other Interpersonal Misconduct: Presentation (http://surl.li/gpvwt)*