University of Management and Technology

School of Science and Technology

Department of Physics

Course Code: PH-311
Course Title: **Classical Mechanics**
Program: **BS (PHY&MATH)**

Course Outline (Fall Semester 2022)

Schedule	8:00 a.m – 9:15 a.m (Tuesday & Friday)	**Pre-requisite**	PH-101 Mechanics
Course Coordinator	**Syed Nasrullah Ali Qazi**	**Contact**	**nasrullah.qazi@umt.edu.pk**
Course Description	Newton Second Law of Motion in Cartesian and Polar Coordinates, Momentum Conservation, Rockets, Angular Momentum for Single & Several Particles, Conservation of Energy, Central Forces, Harmonic Oscillator, Two Dimensional Harmonic Oscillator, Damped Oscillation & Resonance, Euler-Lagrange equations, Lagrange's equations for unconstrained & constrained motion, , Two Body Central Forces Problems, Kepler Orbits, Hamiltonian's Equations for One and Several Dimensions, Mechanics in Non-inertial Frames		
Expected Outcomes	Participants will learn calculus based Classical Mechanics approach. They will also be ready for Quantum Mechanics, Statistical Mechanics and Relativity courses.		
Text Book	Classical Mechanics by John R Taylor 1st Edition		
Reference Book:	Classical Dynamics of Particles and System by Marion Thornton, 5th Edition An Introduction to Mechanics by Daniel Kleppner & Robert Kolenkow, 2nd Edition		
Assignments	Problems will be assigned at regular intervals as an assignment.	**Quizzes**	All quizzes will be announced well before time. No make-ups will be offered for missed quizzes
Mid Term Examination	A 60-minutes exam will cover all the material covered during the first half of the semester.	**Final Examination**	A 120-minutes exam will cover all the material covered during the semester.
Attendance Policy	Students missing more than 20% of the lectures will receive an "SA" grade in the course and will not be allowed to take final exam.		

Department of Physics

Classical Mechanics (PH311)

Lecture Plan (Fall 2022)

Week	Lecture #	TOPICS	CH	Sections
1.	1	Space, Time, Mass, Force	01	1.1-1.3
	2	Newton's Laws of Motion: Inertial Frame & Newton's Third Law	01	1.4-1.5
2.	1	Newton's Second Law in Cartesian & Polar Coordinates	01	1.6-1.7
	2	Conservation of Momentum & Rockets	03	3.1-3.2
3.	1	Center of Mass, Angular Momentum for single particle	03	3.3-3.4
	2	Angular Momentum for Several Particles	03	3.5
4.	1	Kinetic Energy and Work, Potential Energy and Conservative Forces	04	4.1-4.2
	2	Potential Energy and Conservative Forces, Force as Gradient of Potential Energy,	04	4.2-4.3
5.	1	Second Condition F be Conservative, Central Forces	04	4.4,4.8
	2	Central Forces(cont),Interaction of Two Particles	04	4.8-4.9
6.	1	Hooke's Law & Simple Harmonic Motion	05	5.1-5.2
	2	Two Dimensional Oscillators, Damped Oscillations	05	5.3-5.4
7.	1	Damped Oscillations(cont), Driven Damped Oscillation	05	5.4-5.5
	2	Driven Damped Oscillation(cont), Resonance	05	5.5-5.6
8.	1	Two Examples , Euler Lagrange Equation	06	6.1-6.2
	2	Applications of Euler Lagrange Equations, More than Two Variables	06	6.3-6.4
9.	1	Lagrange's Equations for Unconstrained & Constrained Motion	07	7.1-7.2
	2	Constrained Systems in General, Examples of Lagranges's Equations	07	7.3,7.5
10.	1	Examples of Lagranges's Equations (cont)	07	7.5
	2	Examples of Lagrange's Equations (cont),Generalized Momenta and Ignorable Coordinates	07	7.5-7.6
11.	1	The Problem, CM and Relative Coordinates; Reduced Mass	08	8.1-8.2
	2	Equations of Motion, The Equivalent One-Dimensional Problem	08	8.3-8.4
12.	1	The Equivalent One-Dimensional Problem(cont), Equations of Orbit	08	8.4-8.5
	2	Kepler Orbits, Unbounded Kepler Orbits	08	8.6-8.7

13.	1	The Basic Variables, Hamilton's Equations for One-Dimensional Systems	13	13.1-13.2
	2	Hamilton's Equations in Several Dimensions	13	13.3
14.	1	Ignorable Coordinates, Lagrange's Equations vs. Hamilton's Equations	13	13.4-13.5
	2	Acceleration Without Rotation, Tides	9	9.1-9.2
15.	1	The Angular Velocity Vector, Time Derivatives in a Rotating Frame	9	9.3-9.4
	2	Newton's Second Law in a Rotating Frame	9	9.5
16.	1	Revision week		
	2	Revision week		