



University of Management and Technology

School of Science

Department of Physics

Course Code PH-311

Course Title: Classical Mechanics

Program: BS (Physics) Spring 2021

Course Outline

Online Mode of Teaching (COVID-19)

Schedule	Tuesday - Friday	Pre-requisite	PH-101 Mechanics
Course Coordinator	Dr. Qayyum Zafar	Contact	qayyum.zafar@umt.edu.pk
Course Description	Newton's Law, Equation of motion for a particle, Conservation Theorems, Simple Harmonic Oscillator, Harmonic Oscillator in two Dimensions, Phase Diagram, Damped Oscillation, Sinusoidal driven forces, Gravitational Potential, Equipotential Surfaces, Hamilton's Principle, Generalized coordinates, Lagrange's equations of motion in generalized coordinates, Lagrange's equations with undermined multiples, Equivalence of Lagrange's and Newton's equations, Kepler's Problems, Orbital Dynamics		
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 Dynamics of Particles and Systems, By Marion Thornton, 5 th Edition		
Assignment	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 14-16 lectures.	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.		



Classical Mechanics

Lecture Plan

Week	Lecture #	TOPICS	CH	Sections
1	1	Newton's Law, Equation of motion for a particle	02	1 – 4
	2	Conservation Theorems	02	5
2	1	Energy	02	6
	2	Rocket Motion, Limitation of Newtonian Mechanics	02	7 – 8
3	1	Simple Harmonic Oscillator, Harmonic Oscillator in two Dimensions, Phase Diagram	03	1 – 4
	2	Damped Oscillation, Sinusoidal driven forces	03	5 – 7
4	1	Electrical Oscillations	03	8
	2	Principle of Superposition	03	9
5	1	Gravitational Potential	05	1 – 2
	2	Equipotential Surfaces	05	3 – 4
6	1	Ocean Tides	05	5
	2	Calculus of Variations	06	1 – 2
7	1	Euler's Equation	06	3
	2	Second Form of Euler's Equation	06	4 – 5
8	1	Euler's equation with auxiliary condition	06	6 – 7
	2	Hamilton's Principle, Generalized coordinates	07	1 – 3
9	1	Lagrange's equations of motion in generalized coordinates	07	4
	2	Lagrange's equations with undermined multiples, Equivalence of Lagrange's and Newton's equations	07	5 – 7
10	1	Conservation theorems, Canonical equation,	07	8 – 10
	2	Dynamical variables	07	11
11	1	Reduced Mass, Conservation Theorem, Equation of motion	08	1 – 4
	2	Orbits in central fields, Centrifugal energy	08	5 – 6
12	1	Kepler's Problems	08	7
	2	Orbital Dynamics	08	8
13	1	Center of mass, Linear and Angular momentum of system	09	1 - 4
	2	Energy of system, Elastic Collision	09	5 – 7
14	1	Inelastic Collision, Cross section	09	8 – 9
	2	Rutherford Scattering Formula	09	10
15	1	Revision		
	2	Revision		