

BITS Pilani KK Birla Goa Campus
Second Semester 2022-23
Course Handout (Part II)

Date: 14/03/2023

Course No: PHY F111

Course Title: Mechanics, Oscillation and Waves

Instructor in charge: Sunilkumar Vattezhath

Instructors:

- Sunilkumar Vattezhath(D320/16)
- Chandradew Sharma(D320/14)
- Radhika Vatsan(D320/15)
- Gaurav Dar(D320/13)
- Indrani Chakraborty(D320/9)
- Indrakshi Raychaudhury(D320/8)
- Prasanta Kumar Das(D320/18)

Scope and Objective: This course covers Oscillation, waves and Newtonian mechanics. This core course is taught to all Science and Engineering students. Students are assumed to be familiar with a basic introduction to mechanics, simple harmonic motion and waves at the 10+2 level (NCERT).

Text Books

1. Introduction to Mechanics by *Kleppner and Kolenkow*, 2nd ed. Cambridge university press
2. Vibration and Waves by *A. P. French*. MIT Publishers (Indian edition by CBS publishers)

Reference book:

1. Mechanics, Berkeley Physics Course, Vol I

Evaluation Scheme:

Sr. No	Evaluation Components	The weightage (%)	Remarks
1	Mid-semester exam	30	Closed Book 02/05/2023 11:30-1 pm
2	2 Quiz	20	(online/offline quizzes) Dates will be announced well in advance). Closed Book
3	Comprehensive Examination	40	Open Book (Only TBs) 13/07/23(AN)
4	Attendance	5	
5	7 Mini tests (based on concepts discussed in lectures)	5	Open book, Online

Notices: Course notices, references, grades and discussions will be put up on the course page at Moodle <https://quantaaws.bits-goia.ac.in/>

Make-up Policy: Make-up will be granted only for genuine cases and medical emergencies leading to hospitalization.

Lecture Plan

Lecture	Topics	Reference
	MECHANICS	
M1A	Polar coordinates	KK 1.10,1.11
M1B, C	Review of Angular Momentum, torque and rotations, moment of inertia For fixed axis rotations (FOR), dynamical equations in FAR.	KK Ch.7
M2A	Vector nature of angular velocity and angular momentum	KK 8.2
M2B	Angular momentum and moment of inertia tensor	KK 8.6
M2C	Gyroscope	KK 8.3
M2D	Gyroscope: Examples	KK 8.4
M3A	Physics in rotating coordinate systems	KK 9.5
M3B	Relation between velocity and acceleration in rotating and inertial frame	KK 9.5.3
M3C	Fictitious forces	KK 9.5.4
M3D	Applications: Deflection of falling mass, Foucault pendulum	KK 9
	Oscillations and Waves	
O1A	Review of Simple harmonic motion (Free and Damped)	APF Ch.3
O1B	Forced oscillation: steady state solution, Resonance	APF Ch.4
O1C,D	Forced Oscillations: Transient phenomena	APF Ch.4
O2A	Two Coupled oscillators and equation of motion, Normal modes, Superposition of normal modes	APF Ch.5
O2B	N coupled oscillator: transverse vibration and normal modes	APF Ch.5
O2C,D	Large N limit	APF Ch.5
O3A, B	Normal modes of the continuous system: Transverse vibrations of a stretched string	APF Ch.6
O3C,D	Fourier Analysis	APF Ch.6
W1A	Travelling wave in 1-D, wave equation	APF Ch.7
W1B	Superposition of waves, Wave pulses	APF Ch.7
W1C	Dispersion, group velocity and phase velocity	APF Ch.7
W1D	Energy in a mechanical wave, Energy transported by a wave	APF Ch.7

Student-instructor interaction

- Each tutorial and lecture instructor will provide a chamber consultation hour for doubt clearance. This will be announced in the class after discussing it with the respective students
- Students must interact with the faculty in person, and mail or office should be used only for unavoidable situations. Doubt clearance through Email will not be encouraged.
- Any discrepancies in attendance or other evaluation components should be addressed to the respective instructor without delay.

Sunilkumar Vattezhath

(Instructor-in-charge)