



**INSTRUCTION DIVISION**  
*SECOND SEMESTER 2016 -2017*  
Course Handout (Part-II)

Date: 13/01/2017

In addition to part I (General handout for all courses appended to the timetable) this portion gives further details regarding the course.

Course Number : PHY F111  
Course Title : Mechanics Oscillations and Waves  
Instructor-in-Charge : **KUSUM LATA**  
Team of Instructors : **Rishikesh Vaidya, Tapomoy G Sarkar, D D Pant, Debashis Bandyopadhyay, Kaushar Vaidya, Niladri Sarkar, Rakesh Choubisa and Srijata Dey**

Scope & Objective: Mechanics Oscillations and Waves is a foundation course in Physics that is mandatory for all the first degree students.

Course Description: The first half of the course deals with the applications of Newton’s laws to the systems of particles and the study of linear and rotational motion using polar coordinates and physics of non-inertial reference frames. The second half deals with oscillatory motion, coupled oscillations and waves.

**Text Book:**

1. **An introduction to mechanics, by Kleppner and Kolenkow**, Tata McGraw-Hill Indian edition 1999.
2. **Vibrations and waves, by A.P. French**, CBS Publishers and Distributors, Inc., first Indian edition 1987.

**Reference Book:**

- R1: Physics, Vol.1, by Halliday, Resnick, & Krane**, 5<sup>th</sup> Edition, John Wiley & Sons, Inc., 2002  
**R2: The Physics of Waves and Oscillations by N K Bajaj**, Tata McGraw-Hill 1984.

**Course Plan:**

Lecture Number	Learning Objectives	Topics to be covered	Chapter/Section
<b>Topics from Text Book 1 (Kleppner and Kolenkow)</b>			
1-3 (3)	Foundations of Newtonian mechanics	Motion in plane polar coordinates, applications of Newton’s laws in polar coordinates	1.9, EXAMPLE 2.5-2.7
4-6 (3)	Momentum	Dynamics of system of particles, conservation of momentum, impulse, flow of mass, momentum transport	3.1 – 3.6
7 (1)	Work and energy	Eqn. Of motion in one dimension and several dimensions, work energy theorem and application	4.1-4.6
8-10 (3)	Work and energy (contd.)	Potential energy & conservative systems, energy curve, small oscillations in bound system, non conservative forces, power	4.7-4.13
11-12 (2)	Angular momentum	Angular momentum, torque, fixed axis rotation	6.1 – 6.4



13-15 (3)	Angular momentum (contd.)	Dynamics of pure rotation, motion involving both translation and rotation	6.5, 6.7
16-18 (3)	Noninertial systems	Galilean transformations, uniformly accelerating systems, principle of equivalence	8.1 – 8.4
19- 21(3)	Noninertial systems [contd.]	Physics in a rotating frame, the Coriolis force	8.5
<b>Topics from Text Book 2 (A.P. French)</b>			
22-25 (4)	Simple harmonic motion (SHM)	The basic mass-spring system, solving SHM equation using complex exponentials, examples of SHM, the decay of free vibrations, effect of very large damping	Ch. 3 pp: 41-53, 62-70
26-28 (3)	Forced oscillator and resonance	Undamped oscillator with harmonic forcing, forced oscillator with damping	Ch. 4 pp. 77-95
29-30 (2)	Forced oscillator and resonance [contd.]	Power absorbed by a driven oscillator, resonance	Ch.4 pp: 96-101
31-35 (5)	Coupled Oscillations	Normal modes, normal frequencies and forced oscillations of two coupled oscillators, normal modes and their properties for N coupled oscillators	Ch.5 pp: 121-127 129-151
36-37 (2)	Normal modes of continuous systems	The free oscillations of stretched strings, normal modes of a stretched string, forced oscillations of a stretched string	Ch.6 pp: 161-170
38-40 (3)	Progressive waves	Progressive waves in one dimension, wave speeds in specific media, superposition, motion of wave pulses of constant shape, phase and group velocity	Ch.7 pp: 201-216 223-228 230-234
41-42 (2)	Progressive waves [contd.]	Energy and its transportation by a wave	Ch.7 pp: 237-243

**Evaluation Scheme:**

EC No.	Evaluation Component	Duration	Weightage (%)	Marks (300)	Date, Time & Venue	Nature of Component
1	Tutorials/Quiz		20	60	**	Closed Book
2	Midterm Test	90 mins.	35	105	11/3 11:00 - 12:30 PM	Closed Book
3	Comprehensive Examination	3 hours.	45 (25CB#+20OB#)	135 (75CB+60OB)	15/5 AN	Closed+Open Book

\*\* To be announced in tutorial class # CB: Closed Book OB: Open Book

Chamber Consultation Hour: To be announced in the tutorial class.

Notices: Notices and solutions will be displayed only on **Nalanda site**. If required sometime on

**PHYSICS or FDIII** notice board.

Make-up Policy: **Very strict:** Make up for tests will be given only to genuine cases. No makeup for tutorials/quizzes.

*Instructor-in-Charge (PHY F111)*