PHYSICS 3660 **WINTER 2021**

VIBRATIONS AND WAVES - PHY-3660
Tu Th 10.00 - 11.47 pm ON-LINE

Instructor: **ANDREI SLAVIN**

Office: 186G MSC Phone: 248 495 5387; Office hours: Tu Th 3.00 - 4.00 p.m. ON-LINE
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TEXT: The Physics of Vibrations and Waves in by H.J. Pain (fifth or later editions).

GRADE BASIS: Homework: 15%, 1 mid-term exam: 40%, Final exam: 45%.

HOMEWORK: Solutions of homework problems should be sent to slavin@oakland.edu as PDF files by 12.00 (noon) on the due dates, and will be posted on MOODLE by 2.00 p.m. on the days the answers are collected.

EXAMINATIONS: There will be 1 mid-term exam (Chapters 1-4) and a non-comprehensive final exam (Chapters (5,6,8,10,12)).
You will get the exam text by e-mail by 10.00 on the exam date. You will need to send the solutions of the exam problems as PDF files to slavin@oakland.edu by 1.00 p.m. on the exam dates. You may use a calculator during the exams.
You may NOT collaborate with another student during the exam.

SYLLABUS

DATE	CHAPTER	DATE	CHAPTER
		02 MAR Tu	5
07 JAN Th	INTRO,1	04 MAR Th	5 HW3 (14)
12 JAN Tu	1	09 MAR Tu	5
14 JAN Th	2	11 MAR Th	6
19 JAN Tu	2	16 MAR Tu	6
21 JAN Th	3	18 MAR Th	6
26 JAN Tu	3	23 MAR Tu	8
28 JAN Th	3 HW1(1,2)	25 MAR Th	8 HW4 (5,6)
02 FEB Tu	4	30 MAR Tu	10
04 FEB Th	4	01 APR Th	10
09 FEB Tu	14	06 APR Tu	10
11 FEB Th	14 HW2(3,4)	08 APR Th	12 HW5(7-8)
16 FEB Tu	REVIEW (1-4)	13 APR Tu	12
18 FEB Th	**EXAM 1 (CH.1-4)**	15 APR Th	REVIEW(5,6,8,10,12),HW6(10-12)
23 FEB Tu	WINTER		
25 FEB Th	RECESS	**27 APR Tu**	**FINAL EXAM (CH.5-8, 10,12) 8.00 - 11.00 a.m.**

Homework Assignments

Problem numbers below are given using the 5th edition of the "The Physics of Vibrations and Waves in by H.J. Pain

HW#1 (chapters 1-2)

1.2, 1.4, 1.5, 1.9, 1.12;

2.1, 2.2, 2.3, 2.5, 2.7.

HW#2 (chapters 3-4)

3.1, 3.3, 3.6, 3.7, 3.14;

4.4, 4.7, 4.12.

HW#3 (chapter 14)

14.1, 14.3, 14.4, 14.5.

HW#4 (chapters 5-6)

5.1, 5.8, 5.15, 5.24;

6.1, 6.3, 6.6, 6.9.

HW#5 (chapters 7-8)

7.2, 7.5, 7.6, 7.7;

8.6, 8.9, 8.13, 8.15.

HW#6 (chapters 10, 12)

Four problems on Ch.10;

12.2, 12.3, 12.4.

PHY – 3660 HW #6

Problems on chapter 10

1. Show that the Fourier series for an even function may be written

$$\psi(t) = b_0 + \sum_{n=1}^{\infty} b_n \cos n\omega_1 t$$

where

$$b_0 = \frac{1}{\tau}\int_0^{\tau} \psi(t)\,dt$$

$$b_n = \frac{2}{\tau}\int_0^{\tau} \psi(t)\cos n\omega_1 t\,dt \quad (n \neq 0)$$

$\tau = \frac{2\pi}{\omega_1}$

2. Sketch the frequency spectrum representing the modulated carrier

$$\psi(t) = (A + B\cos\omega t)\cos N\omega t$$

where N is a large integer.

3. A single period of a 'sawtooth' vibration may be written $\psi(t) = At/\tau$, where A is the distance separating the maxima of $|\psi|$, and τ is the period. (a) Sketch the graph of ψ against t over several periods. (b) Choosing an origin that makes ψ odd, find the c_n coefficients for the Fourier expansion of $\psi(t)$.

4. Show that $f(x) = x^2$ may be represented in the interval $\pm\pi$ by

$$f(x) = \frac{1}{3}\pi^2 + \sum(-1)^n \frac{4}{n^2}\cos nx$$