Physics 101 – 2011 Fall Term – Tentative Schedule

Text: Custom Phys 101 text Volume 1

See the Phys 101 Laboratory Manual for the lab and tutorial schedule

Week	Dates	General Topics	Major learning Goals The student should be able to:	Recommended Text Problems & Homework
1	Sept. 5	Classes start on Wednesday/Thursday Introduction to Phys101 Density Pressure in Fluids Ch15: 1-2	• Describe macroscopic and microscopic differences between solids, liquids, and gases • Use and convert between different units • Define density, specific gravity and pressure • Understand the causes of pressure • Access the on-line homework: MasteringPhysics • Log onto the course management site: Web-CT VISTA	**Ch 15:** 1, 3 Read Exp 1
2	Sept. 12	Measuring Pressure Pascal's Principle Hydraulic Lift Buoyancy Archimedes' Principle Ch 15: 3-4	• Explain and contrast how pressure changes as a function of position in a fluid and a gas • Calculate pressure at any point inside a static liquid • Distinguish between absolute and gauge pressure • Explain how suction works • Describe how manometers and barometers are used to measure pressure • Explain what the upper and lower values in blood pressure measurements mean • State Pascal's Principle and apply this principle to basic hydraulic systems • Define buoyancy and explain why an upward force is exerted on an object immersed in a fluid • Use Archimedes' principle to determine the buoyant force on an object • Calculate buoyant forces on floating and immersed objects • Distinguish the true weight and apparent weight of an object in a fluid	**Ch 15:** 5, 7, 9, 11, 15, 17, 19, 21, 33, 35, 39, 41, 45, 53, 57 **MP:** Assignment 1
3	Sept. 19	Fluid Dynamics Ch15: 5	• Explain what is meant by streamline flow • Use the idea of conservation to derive the equation of continuity for fluids and gases • Explain the connection between conservation of energy and Bernoulli's equation • Use Bernoulli's equation and the concept of streamline flow to calculate the effects of changing the cross-sectional area, height, density, pressure, and velocity for fluids in pipes • Show Bernoulli's principle at work in examples of fast flowing air • Describe the effects of viscosity and turbulence in real fluids • Explain the microscopic origin of surface tension.	**Ch 15:** 23, 25, 59,61, 63, 65, 67 **MP:** Assignment 2 See Vista for additional homework
4	Sept. 26	Uniform Circular Motion Oscillations Kinematics of Simple Harmonic Motion Relation between Simple harmonic Motion and	• Describe uniform circular motion • Define radians, angular velocity, angular acceleration, period, angular frequency, frequency • Describe the basic properties of oscillatory motion • Interpret oscillations as periodic motion of a single particle • Show oscillations in displacement/velocity/acceleration	**Ch 14:** 3, 5, 7, 9, 11, 31, 35 **MP:** Assignment 3

		Uniform Circular Motion Ch 14: 1-4	vs. time graphs. • Write equations for displacement, velocity, and acceleration as sinusoidal functions of time for an object undergoing SHM • Contrast uniform circular motion and SHM • Distinguish phase and phase constant • Use the kinematic equations to determine the displacement, velocity and acceleration at a particular moment of time • Distinguish between linear and angular quantities • Explain what a restoring force is and why systems oscillate • State the conditions required to produce SHM • Calculate displacement of a spring from Hooke's law	
5	Oct. 3 MidT 1=Wed Oct 5	Energy in the Simple Harmonic Motion The Dynamics of SHM Vertical Oscillations The Pendulum Damped Oscillations Resonance Elasticity Ch 10: 5 Ch 14: 5-8 Ch 15: 6	• Define elastic potential energy for a spring/mass system • Apply conservation of energy to calculate potential and kinetic energy in SHM • Explain why systems oscillate at their natural frequency • Describe the relationship between spring constant k (or elastic properties of a material) and natural frequency. • For a spring/mass system, compare and contrast horizontal and vertical oscillations • Understand the behavior of simple and physical pendula • Calculate the velocity, acceleration, potential, and kinetic energy at any point in the motion of an object undergoing SHM • Discuss the factors that affect the period of a simple pendulum of length *L* • Compare ideal SHM to realistic (damped) systems and to driven (forced) oscillations • For a damped system, determine the damping constant from a graph of displacement versus time • Identify the basic types of damped harmonic motion • Define the time constant for damped motion • Describe and explain the phenomenon of resonance • Give examples of instances where resonance is a) beneficial and b) destructive • Explain how damped harmonic motion can be achieved to prevent destructive resonance • Discuss the limitations of Hook's Law • Describe what happens on a microscopic level when a solid is deformed (elastically) • Distinguish between elastic and plastic deformation • Distinguish between stress and strain and between tensile stress, compressive stress, and shear stress • Write the equations for the relationship between stress and strain for the three types of deformation of an elastic solid • Distinguish the spring constant from Young's modulus and explain the difference • Know what the bulk modulus is • Extend the idea of stress/strain to spring systems	**Ch 14:** 13, 15, 17, 19, 21, 23, 27, 29, 37, 39, 41, 43, 47, 49, 53, 61, 69 **Ch 15:** 27, 29, **MP:** Assignment 4
6	Oct. 10 Mon, Thanksgiving	The Wave Model Wave Speed One-Dimensional Waves Sinusoidal Waves,	• Demonstrate that mechanical waves are due to oscillations of particles and their elastic interaction with neighboring particles • Distinguish between longitudinal and transverse waves and give examples of each type of wave	**Ch 20:**

		Ch 20: 1-3	• Understand the basic properties of periodic waves • Use snapshot and history graphs to represent traveling waves • Predict wave speeds from elastic properties. • Describe sinusoidal waves mathematically (wave number k) • Infer the wavelength from the oscillation period. • Connect wave amplitude to particle amplitude. • Distinguish displacement of a wave from displacement of a particle. • Distinguish wave speed from particle speed • Distinguish phase from phase constant and phase difference	1, 3, 5, 7, 11, 13, 19, 21, 41, 45, 47, 51, 53, 55, 59, 63 **MP:** Assignment 5
7	Oct. 17	Waves on a string Phase and Phase Difference Sound and Light Power and Intensity Ear Response, Intensity of Sound Waves (decibels), Ch: 20: 4-6	• Identify forms of energy in a wave and describe energy transport. • List characteristics of sound and show similarities and differences between sound and light waves. • Describe pitch, loudness, and coloration of a tone in physical quantities. Determine the speed of sound in air at one atmosphere of pressure at different temperatures. • Define power and intensity. • Determine sound intensity level in decibels if the intensity of the sound is given in W/m^2. • Determine the sound intensity level as a function of distance from a sound source.	**Ch 20:** 15, 17, 25, 29, 31, 33, 35, 65, 67, 69 **MP:** Assignment 6 See Vista for additional materials and homework
8	Oct. 24	Doppler Effect Principle of Superposition Transmission and Reflection of Waves. Ch: 20: 6, 7 Ch: 21: 1	• Calculate the energy transmitted by a wave, the power of a wave and the intensity of a wave, across a unit area • Explain the Doppler effect and calculate frequency shifts for moving sources and observers • Use the Doppler shift for light to determine the speed of galaxies • Demonstrate how the principle of superposition applies to wave behavior. • Illustrate the reflection and transmission of wave pulses at a boundary • Contrast constructive and destructive interference	**Ch 20:** 37, 39, 71, 75 **Ch 21:** 3, 21, 59 **MP:** Assignment 7
9	Oct 31	Standing Waves Transverse Standing Waves Standing Waves and Musical Acoustics Vibrating Air Columns, Ch 21: 2-4	• Describe interference mathematically and in diagrams. • Show that standing waves are due to the superposition of two waves and describe them mathematically • Explain how a standing wave can be produced in a string or rope and calculate the harmonic frequencies needed to produce standing waves in string instruments. • Represent possible wave patterns in string and wind instruments in equations and diagrams • Explain how a standing wave can be produced in a wind instrument open at both ends or closed at one end and calculate the frequencies produced by a pipe of a given length.	**Ch 21:** 7, 9, 11, 13, 15, 17, 19, 23, 33, 35, 37, 39, 41, 43, 47, 49, 51, 57 **MP:** Assignment 8
10	Nov. 7 Fri, Rem. Day	Interference in One Dimension (21.5) The Mathematics of Interference (21.6), Beats (21.8)	• Represent a wave in diagrams: Wave fronts and rays • Explain how an interference pattern can be produced by two sources of sound of the same wavelength separated by a distance *d*	**Ch 21:** 21, 25, 27, 29, 59, 61, 65, 69, 75, 77

		Ch 21: 5, 6, 8	• Understand the spatial interference from two sources, find locations of constructive and destructive interference • Distinguish between interference in space and interference in time • Determine the beat frequency produced by two sound sources of different frequencies	**MP:** Assignment 9
11	Nov. 14 MidT2= Thurs Nov 17	The Interference of Light (22.2) (two-slit interference, thin film interference, Michelson interferometer) Ch 22: 2 + Giancoli Chapter 34:1 -6	• Describe similarities and differences between sound and light • Describe and explain interference as a difference in optical path length • Know what Huygen's principle is and how it can be used to explain many phenomena involving light • Explain diffraction of waves from Huygen's principle • Describe Young's two-slit experiment in terms of wave interference for light • Determine the locations of bright and dark fringes in the two-slit experiment • Determine the conditions for constructive and destructive interference of reflected or transmitted waves in air wedges and thin films • Understand the basics of how optical interferometers work • Explain how a Michelson interferometer can be used for precision measurements of distance and refractive indices	**Ch 21:** 63 **Ch 22:** 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 25, 27, 31, 35, 39, 43, 45, 53, 57, 65, **MP:** Assignment 10
12	Nov. 21	The Diffraction Grating Single-Slit Diffraction Circular Aperture Resolution Ch 22: 3-5	• Explain how a diffraction grating can be used to split light into its color components • Describe the diffraction of waves emerging from a single slit or a circular aperture • Know what diffraction is and under what conditions it becomes important • Explain the Rayleigh criterion for the resolution of two objects • Calculate the resolution limit of a simple telescope due to diffraction	**Ch 22:** 5, 7, 9, 11, 15, 17, 19, 21, 33, 35, 39, 41, 45, 53, 57 **MP:** Assignment 11
13	Nov. 28	Applications - Communications	• Describe how information is stored and read on a CD • FM and AM waves	**MP:** Assignment 12

Physics 101, Section 102 - Fall 2011 (MWF 2-3 PM) **INFO SHEET**

Instructor: Cynthia Heiner, Hennings 405, heiner@phas.ubc.ca , Office hours: Mon 3 - 4:30 PM, (tentatively) Thursday Friday 10:00 – 11:00 AM. Send email or phone (604) 822-3816 if you cannot meet at these times.

Text: Custom Text (Volume 1) including Chapters 10, 11, 14, 15, 20, 21, 22 from Physics for Scientists and Engineers, 2nd edition by Randall Knight and Chapter 34 from Physics for Scientists and Engineers with Modern Physics, 4th edition, by Douglas Giancoli

Course VISTA Page: http://www.vista.ubc.ca (Use your campus wide login)

iClickers: (Radio Frequency) Transponders ('iClickers') are required and will be used for answering in class questions. You will be required to register your clicker on our Vista site.

MasteringPhysics: This is a web-based problem solving site (http://www.masteringphysics.com) where we shall present weekly assignments over the term.
Your Student Access Code is: USSMPS-ABYSS-BLEAK-NIXED-GLAIR-JOKES.
Once you have registered with MasteringPhysics using your Student Access code, you should enroll in our online problem solving course (P10111W) using your name and UBC student number. You may use the same ID for Physics 101 and 102. There is also a step-by-step powerpoint presentation on VISTA, if you have questions.

Tutorials (2 hours alternate weeks in Hebb 10, 12 or 13)

- Tutorials begin the week of September 19, 2011.
- Tutorials are **mandatory**. A 30-45 minute Tutorial Quiz will be given during the tutorials.
- You will be assigned a tutorial section. Please check VISTA for your Tutorial Assignment.
- For any problems concerning tutorials please contact Dr. Francis Bates (Hennings 330A)

Laboratory (3 hours alternate weeks in Hebb 22)

- Labs will begin on the week of September 12, 2011.
- Labs are **mandatory**, unless a student has been granted an exemption.
- Please check Vista to see your TA section and whether you have a lab or a tutorial the first week.
- **Students must do all the experiments.** A missed lab has to be made up within the next two weeks.
- Students generally work in groups of two.
- Bring to your lab: lab manual, lab notebook, calculator.

(See the Physics 101 Laboratory Manual for the lab and tutorial schedule)

Midterms and Quizzes

- There will be two midterms during the term on Wed, Oct 5th and Thur, Nov 17th.
- A weekly 30-45 minute quiz will be given during the tutorials. Please bring your Student ID cards for midterms.

Final Exam

- The final exam will include **all topics** covered during the term.
- The final exam and midterms are the same for sections 101, 102, 103 and 104 of Physics 101.

Only the Sharp EL-510RB scientific calculator sold at the UBC bookstore for $10.00, or an equivalent non-programmable calculator, is permitted for midterms and exams.

Mark Distribution To pass PHYS 101, the student must: (1) obtain a passing grade for the exam component (midterms plus exam) and (2) pass the laboratory component of the course. The course mark breakdown is:

Final	Midterms	Tutorial Quizzes	Prereading	iClicker	MasteringPhysics	Labs	**Total**
47	15	5	2	6	5	20	**100**