PCS 125 W2021 – Course Content & Suggested Problems

Unit	Content	Learning goals	Readings and Problems
Unit 1 **5-hour periods**	**Harmonic Motion** • Mass Attached to a Spring • Simple Harmonic Motion • Energy of the Simple Harmonic Oscillator • Simple Harmonic Motion and Circular Motion • Pendulum • Damped Oscillations • Forced Oscillations and Resonance	To understand and describe the characteristics of oscillatory motion and to differentiate it from uniform or uniformly accelerated motion To describe SHM and understand the conditions when this approximation is valid. To solve application problems that involve oscillatory motion	**Reading:** Review: 1.1 – 1.6; 15.1-15.4, 15.5, 15.6, 15.7 (skip torsional pendulum in 15.5) **Suggested Problems:** Ch15: 1, 2, 3, 4, 5, 7, 10, 11, 13, 14, 15, 17, 18, 24, 27, 31, 33, 35, 39, 40, 47.
Unit 2 **9-hour periods**	**Mechanical Waves** • Wave Motion • Speed of Waves on Strings • Reflection and Transmission of Waves • Sound Waves • Doppler Effect • Superposition and Interference of Waves • Standing Waves • Resonance in waves • Beats	To distinguish oscillatory motion from wave motion. To classify waves and to understand and describe the special characteristics of wave motion. To describe sound wave properties To solve application problems that involve mechanical waves	**Reading:** 16.1 - 16.4**,** 16.6 – 16.9 17.1 – 17.6, 17.7 **Suggested Problems:** **Ch 16:** 1, 5, 7, 8, 9, 11, 13, 14, 15, 23, 24, 25, 28, 31, 32, 33, 35, 37, 41, 42, 43, 47, 52. **Ch 17:** 1,2, 7, 9, 11, 12, 13, 14, 15, 16, 17, 26, 28, 31, 32, 34, 35, 36, 42, 43, 47, 48, 49.
Unit 3 **3 hour periods**	**Gravitational Field** • Newton's Law of Universal Gravitation • Free-Fall Acceleration • The Gravitational Field • Gravitational Potential Energy • Planetary and Satellite Motion	To be familiar with the concepts of gravitational force and field and distinguish them To extract energy information for a body in a gravitational field To understand the consequences of the gravitational field for planetary and satellite motion	**Reading:** 13.1 – 13.3, 13.5 – 13.6 Example 13.5(A) on geosynchronous orbits Escape speed in 13.6 is self-study **Suggested Problems:** Ch 13: 1, 2, 3, 5, 6, 7, 15, 17, 19
Unit 4 **13-hour periods**	**Electric Field and Electric Current** • Coulomb's Law of Electric Force • The Electric Field • Electric Field Lines • Gauss' Law • Motion of Charged Particles in an Electric Field • Potential Difference and Electric Potential • Potential Difference in a Uniform Electric Field • Electric Potential Energy •Electric Current, resistance •DC Circuits (self-study)	To understand the concepts of electric force versus electric field, electric field lines and energy stored in an electric field Be able to calculate electric field for different charges configurations To be able to solve application problems of charges moving in electric fields and calculating their total energy To comprehend the phenomenon of electric current	**Reading**: 22.1 – 22.6 23.2 – 23.4 24.1 – 24.4, 24.6 Figure 24.22 26.1-2, 26.6 27 (Self-study) **Suggested Problems:** Ch22: 7, 10, 15, 17, 19, 23, 24, 25, 33, 48 Ch 23: 11, 12, 15, 19, 42 Ch 24: 1, 2, 3, 6, 8, 22, 24, 33 Ch 26**:** 1, 2,5, 10, 13, 14, 26, 27, 29
Unit 5 **6-hour periods**	**Magnetic Field** • Magnetic Fields and Forces • Motion of a Charged Particle in a Magnetic Field • Applications: Velocity Selector and Mass Spectrometer • Magnetic Force on a Current-carrying Conductor • The Biot-Savart Law Magnetic Force between parallel conductors	To understand the origin of magnetic fields To describe and manipulate the appropriate equations that govern the motion of charges in magnetic fields and in regions where magnetic and electric fields co-exist. To calculate the magnetic force between carrying current conductors.	**Reading:** 28.1 – 28.4, 28.6 29.1 – 29.2 Fig. 34.4 (self-study) **Suggested Problems:** Ch 28: 1, 3, 5, 7, 9, 11, 13, 15, 17, 21, 25, 27, 43, 47, 51 Ch 29: 1, 5, 7, 9, 11, 13, 15, 17, 39