Physics M20C-31376 – Spring 2019

We will cover large swaths of Chapters 15-18 and 34-46 of the textbook, pretty much in order, approximately according to the following schedule. This schedule will be updated throughout the semester.

Note: Problems in parentheses can safely be ignored…

Week 1 (Jan 7)
  Ch 15: introduction; review of simple harmonic motion, mass on a spring, pendulum, physical pendulum, torsion pendulum
    HW #1 due 1/15: Read: 15.1-15.7
      Ch 15 #5, 18, 29, 31, 35, 59, 64, 66, 70, 75
   No quiz

------------- ***Homework and reading below this line are not final (updated weekly)*** ----------------

    Ch 15 #5, 18, 29, 31, 35, (39), 59, 64, 66, 70, (75), (81), [(86, 87)]

Week 2 (Jan 14)
  Ch 16: basics of waves, wave motion, speed of waves on a string, linear wave equation
  HW#2 due 1/22: Read: 16.1-16.3, 16.6
    Ch 16 #4, 9, 16, 24, 25, 30, 43, 51, 52, 64
  Quiz 1

Week 3 (Jan 21) (No class Monday Jan 21—*Martin Luther King, Jr. Day*)
  Ch 16 & 17: energy transfer of waves, reflection and transmission at boundaries; sound waves, speed of sound, intensity of sound waves
  HW#3 due 1/29: Read: 16.4-16.5, 17.1-17.3
    Ch 16 #36, 39, 61
    Ch 17 #1, 2, (9), 10, (11), 18, 26, 30 (emits equally in all directions), 50, 52, 68
    (NOTE: Unless stated otherwise, $v = 343$ m/s)
  Quiz 2

Week 4 (Jan 28)
  Ch 17 & 18: Doppler effect, shock waves; superposition, standing waves, beats, Fourier series (just a taste)
  HW#4 due 2/5: Read: 17.4, 18.1-18.8
    Ch 17 #39, 47, 63, 64, (70), (71)
    Ch 18 #23, (32), 33, 54, 56, 67, 68, 77, 80, (87)
    [Fourier series sawtooth problem *NOT* assigned in class—*See me if interested*]
  Quiz 3

Week 5 (Feb 4)
      Ch 34: Maxwell's Equations, intensity, radiation pressure
      HW#5 due 2/12: Read: 34.1-34.7
            Ch 34 #4, 9, 17, 22, 43, 65, 76
            Following the notes for $\vec{E}$, derive the wave equation for $\vec{B}$. Assume the solution $\vec{B} = B_{max} \sin(kx - \omega t)\,\hat{z}$ and show that this is a solution of the wave equation.
      Midterm 1 Thursday Feb 7 at 10am, covering all material related to weeks 1-4
      No quiz

Week 6 (Feb 11)
      Ch 34: reflection, refraction, total internal reflection, dispersion, Fermat's principle
      HW#6 due 2/19: Read 35.1-35.8
            Ch 35 #8, 32, 33, 37, 40, (44), 45, 46, 56, 68, 70, 73, (74)
      Quiz 4

Week 7 (Feb 18)(No Class Monday Feb 18—*President's Day*)
      Ch 36: types of images, ray-tracing, types of images, imaging with mirrors and thin lenses, lens/mirror combinations
      HW#7 due 2/26: Read 36.1-36.2, 36.4
            Ch 36 #9, 18, 24, 40, 41, 46, 78, 82, 89
      Quiz 5

Week 8 (Feb 25)
      Ch 36: more on refraction, applications—eye, aberrations
      HW #8 due 3/5: Read 36.3-36.10
            Ch 36 #29, 31, 49, 58, 63, 79, 84, 95
      Quiz 6

Week 9 (Mar 4)
      Ch 37:interference, double slit experiment, intensity distribution for double slit, thin films
      HW #9 due 3/12:   Read 37.1-37.6
            Ch 37 #9, 13, 17, 27, 29, 30, (33), 37, 52, 60, 66, 67
      Quiz 7

Week 10 (Mar 11)
      Ch 38: single slit; resolution, diffraction gratings, polarization, linear and circular polarization; (scattering, interferometry foreshadowing)
      HW #10 due 3/19:   Read 38.1-38.6
            Ch 38 #3, 8, 18, 32, 33, 40, 47, 48, 51, 56, 59, (63), (70)
      No quiz
      Midterm 2 Thursday Mar 14 at 10am, covering all material related to weeks 5-9

Week 11 (Mar 18)
    Ch 39: special theory of relativity, time dilation, length contraction,
    HW #11 due 4/2: Read 39.1-39.6
        Ch 39 #(3), 5, 7, 12, 15, 16, 24, 28, 30, 86

      NOTE: Problem 39-30 should read "show that: $\ell = \ell_p \left[1 - \frac{v^2}{c^2} \cos^2 \theta_p\right]^{\frac{1}{2}}$ and $\tan \theta = \gamma \tan \theta_p$"
    Quiz 8

Week 11.5 (Mar 25)—Spring Break—

Week 12 (Apr 1)
    Ch 39: relativistic Doppler effect, Lorentz transformations, relativistic momentum and energy, general relativity
    HW #12 due 4/9: Read 39.4-39.9
        Ch 39 #23, 26, 32, 35, 43, 49, 52, 63, (87), 91
    Quiz 9

Week 13 (Apr 8)
    Ch 40: blackbody radiation, Compton effect, particle-wave duality, Heisenberg uncertainty principle;
    HW #13 due 4/16: Read 40.1-40.8
        Ch 40 #10, 14, 20, 30, 45, 51, 56, 67, 69
    Quiz 10

Week 14 (Apr 15)
    Ch 41: wave function, Schrödinger's equation, particle in a box—infinite square well
    HW #14 due 4/30: Read 41.1-41.3
        Ch 41 #2, 17, 19, 20, 24, 28, 52, 56
    Quiz 11

Week 15 (Apr 22)(No class Thu 25 & Fri 26—*Faculty FLEX Days*)
    Ch 41 & 42: finite square well, tunneling, quantum harmonic oscillator, (step potential barrier);
    HW #15 due 4/30: Read 41.1-41.7
        Ch 41 #32, 36, 50
    No quiz

Week 16 (Apr 29)
    Ch 42: Bohr model, quantum description of hydrogen, electronic configuration and periodic table of the elements, lasers
    HW #16 due 5/7: Read 42.1-42.8
        Ch 42 #12, 18, 21, 30, 42, 43, 60, 62, 65, 80, 85

No quiz
Midterm 3 Thursday November 29 at 10am, covering all material related to weeks 10-15

Week 17 (May 6)
Ch 15-18, 34-42: discuss final homework; review for the final
HW: Read everything
No quiz

Final Exam Tuesday May 14 at 10:15am covering the material for the entire course

Note:
Schedule is subject to change!

radioactivity, carbon dating

Ch 42 #12, 18, 21, 30, 42, 43, 60, 62, 65, 80, (84), 85
Ch 42 #(4), (7), 12, 18, 21, (24), (26), 30, 42, 43, 60, 62, 65, 80, 84, 85 (full list)
Ch 44 #32, 35, 39, 42, 63, 65, 78
Ch 44 #32, 42, 63, 65 (Note: 1 Bq = 1 becquerel = 1 decay/s)