Syllabus for Physics 7

DLM refers to a 2.5 hour Discussion/Lab Meeting of a section of about 30 students. Each section meets approximately twice a week and, after factoring in holidays, there are generally about 18 DLMs per 10 week quarter.

7A – Energy conservation, work, three-phase model and phase transitions, thermal energy, bond energy, mechanical energies, potential energy and force, Lennard-Jones potential, microscopic description of thermal and bond energy, thermodynamics, entropy

Week 1 –
DLM01: thermal energy and chemical bond energy and phase transitions.
DLM02: energy conservation, heat capacities and heats of vaporization etc.

Week 2 –
DLM03: thermal and bond energies, including applications to chemical reactions.
DLM04: mechanical energies: kinetic, gravitational potential, and spring potential.

Week 3 –
DLM05: mechanical energies, work
DLM06: mechanical energies, including graphing energies.

Week 4 –
DLM07: connection between potential energy and force.
DLM08: "particle model of matter" (i.e. solids, liquids, and gasses).

Week 5 –
DLM09: connections between microscopic mechanical energies and internal energies thermal and bond energy.
DLM10: connections between microscopic mechanical energies and internal energies thermal and bond energy.

Week 6 –
DLM11: microscopic picture of bond energy and microscopic picture of thermal energy.
DLM12: Law of Equipartition of energy.

Week 7 –
DLM13: Connect thermal energies and equipartition to molar specific heats.
DLM14: intro thermodynamics (state functions etc.).

Week 8 –
DLM15: Discussions of constant pressure processes including uses of enthalpy.
DLM16: Thermodynamic processes (isobaric, isochoric, adiabatic, isothermal, etc…). Intro to statistics and microscopic understandings of entropy.

Week 9 –
DLM17: Statistical description of entropy and connection to thermodynamic description.
DLM18: More on entropy (both microscopic and macroscopic pictures) and connection to Gibbs energy.

7B: fluid statics and fluid flow: complete Bernoulli's equation, circuits, linear transport, exponential change, capacitors, vectors, linear motion, conservation of linear momentum, angular motion, conservation of angular momentum, force, torque, static equilibrium, Newton's Laws, kinematics, harmonic motion

Week 1 –
DLM01: Fluid statics and fluid flow, Bernoulli's equation including resistance.
DLM02: Fluid statics and fluid flow, Bernoulli's equation including resistance.

Week 2 –
DLM03: Experimental study of fluid system and intro to basic electric circuits
DLM04: electric circuits

Week 3 –
DLM05: electric circuits as well as extension to currents carried by ions in solution
DLM06: General linear transport, situations with finite reservoirs and exponential behavior, and osmotic pressure.

Week 4 –
DLM07: More on exponential changes due to finite reservoir.
DLM08: Start Newtonian mechanics – position, displacement, and velocity vectors

Week 5 –
DLM09: Forces as vectors. Momentum conservation, impulse, and Newton's 2nd Law written for momenta.
DLM10: Momentum changes in 1D, 2D, and 3D.

Week 6 –
DLM11: Momentum conservation and momentum changes.
DLM12: Torque, angular velocity, and angular momentum and changes in angular velocity and momentum.

Week 7 –
DLM13: Torque and forces in static situations.
DLM14: Rotational inertia and angular momentum changes.

Week 8 –
DLM15: Newton's Laws, now including idea of acceleration.
DLM16: Newton's 2nd Law, graphs of r, v, and a in 1D. Extension to 2D circular motion.

Week 9 –
DLM17: Oscillating systems.
DLM18: Oscillating systems.

7C: review of harmonic motion, waves, interference, Doppler effect, reflection, refraction, standing waves, atomic energy spectrum, beats, mirrors (plane, concave, convex), lenses, thin lens equation and ray tracing, electric fields and forces, electric dipole, electric potential energy, magnetic fields and forces, magnetic induction, EM waves, light polarization.

Week 1 –
DLM01: Review of oscillations and intro to waves (sound and light mostly).
DLM02: Waves and wave equation

Week 2 –
DLM03: Waves, wavefront model of waves, intro to superposition.
DLM04: Interference with sound waves.

Week 3 –
DLM05: Interference in 1D and 2D with sound and light.
DLM06: Interference, beats, standing waves.

Week 4 –
DLM07: Standing waves in 1D, 2D, and 3D, photons, hydrogen emission spectrum, thin film interference
DLM08: Thin film interference, law of reflection, mirror (plane, convex, concave)

Week 5 –
DLM09: Mirrors, refraction, Snell's Law, dispersion.
DLM10: Thin lenses, real and virtual images, magnification, multiple lens systems.

Week 6 –
DLM11: Thin lens, amateur optometry, introduction to electrostatics.
DLM12: Electric fields and forces.

Week 7 –
DLM13: Electric fields and forces, electric dipole, electric potential energy.
DLM14: Electric fields and forces, electric potential and potential energy.

Week 8 –
DLM15: Equipotential lines, magnetic fields and dipoles.
DLM16: Magnetic fields from currents, magnetic forces on moving charges.

Week 9 –
DLM17: Electromagnetic induction.
DLM18: Electromagnetic induction, and EM waves.