Physics 329 – Classical Mechanics
Spring 2012

Instructor: Jerry Seidler (seidler@uw.edu)
Class bulletin board: tinyurl.com/phys329

Syllabus

Classical Mechanics – the Big Picture, Chapter 1: Review concepts of space-time, forces, masses and Newton’s laws; 1, 2 and N-body systems.

1-D (Linear) Motion, Chapter 2: Review 1-D motion, solutions of linear 2nd order inhomogeneous differential equations using complex notation (damped, driven harmonic oscillators; Behavior of conservative but nonlinear systems (solutions by constants of motion); Collisions.

Motion in 2- & 3-D: Energy and Angular Momentum, Chapter 3: Review motion in 3 spatial dimensions as described by vector and scalar quantities (energy, momentum and angular momentum); the relation of symmetries and conserved quantities (central forces, rotational invariance and conserved angular momentum); the Calculus of Variations of the Methods of Hamilton & Lagrange.

Central Conservative Forces, Chapter 4: Discuss 3-D motion in a central (typically 1/r) potential using the symmetries and conservation laws to simplify the analysis; Orbits, Scattering and Cross Sections.

Rotating Frames, Chapter 5: Transformations of the physics (equations of motion) between different reference frames (symmetries); Special features of rotating (non-inertial) reference frames (apparent gravity, Coriolis force and weather, the Larmor effect and angular momentum).

Potential Theory, Chapter 6: Using a scalar field, the potential (energy), to simplify the analysis of gravitational and electrostatic problems (potentials due to extended charge and mass distributions); applications to the earth (why isn’t it a sphere) and the tides.

The Two-Body Problem, Chapter 7: The Center of Mass system and relative coordinates; more on collisions and cross sections.

Many-Body Systems, Chapter 8: Examples of 2 (and more) body systems (e.g., the earth and moon system) analyzed with the methods of Lagrange; the transition from classical mechanics to (classical) statistical mechanics.

Rigid Bodies, Chapter 9: Systems with even more bodies (with approximately fixed relative distances – i.e., all of us) as described by motion of CM and motion about CM; Moments of inertia, Principal axes, orientation and motion described by the (infamous) Euler angles.

Lagrangian Mechanics, Chapter 10: Systems described by generalized coordinates, a Lagrangian and the Euler-Lagrange equations (precessing tops, pendula, charged particles in a magnetic field and strings).

Small Oscillations and Normal Modes, Chapter 11: Motion around an equilibrium, coupled oscillators, motion and modes of a string.

Hamiltonian Mechanics, Chapter 12: hidden symmetries, more statistical mechanics.

Last Day of Instruction: Friday June 1 2011.

FINAL EXAM TBA
Assignments

HW assignments will be due twice per week (typically Monday and Thursday, 4pm, in a marked mailbox in the short hallway full of mailboxes near the SPS lounge). A typical HW assignment will consist of 4-6 problems. For means of review, one of the problems will typically come from an earlier chapter. Half of the credit will come from a careful grading of one problem, the other half credit will come from a very cursory look at the other problems.

There will also be several brief, in-class graded ‘activities’ each week. These will include very short quizzes or problem sessions where students are assigned responsibility for presenting the solution to a problem and then leading the subsequent discussion. There will be no midterm exams. There will be a final exam.

Grading scheme

Weighting factors:
- Homework: 70%
- In-class ‘activities’: 10%
- Final Exam: 20%

We will employ a fixed scale: 4.0 = 90%, 3.0 = 75%, 2.0 = 60%, etc.
If for some reason this “really doesn’t work out sensibly,” then I’ll make an overall adjustment… but it really ought to “work out sensibly” – it did last year.