1. **Course**: PHYS1301W – Introductory Physics for Science and Engineering I

2. **Workload**: 4 credits; 6.8 instructor contact hours per week

3. **Coordinator**: Jennifer Kroschel

4. **Text book and other materials**:
   b. Lab manual

5. **Specific course information**
   a. **Catalog Description**: Use of fundamental principles to solve quantitative problems. Motion, forces, conservation principles, structure of matter. Applications to mechanical systems.
   b. **Prerequisites**:
      i. Calculus I (MATH 1371) – Concurrent registration allowed
   c. **Role in Program**: required

6. **Specific goals for the course**
   a. **Course Outcomes**:
      i. The class exposes the student to physical principles and concepts, demonstrates how these principles can be applied to quantitatively describe natural phenomena, and provides the student with an opportunity to perform hands-on experiments and measurements that model how physical knowledge is obtained. The basic principles of classical mechanics and conservation principles are described with particular emphasis to their application in current technology, using mathematical analysis at the level of basic calculus. The development of conceptual understanding of physical principles and their quantitative application are further deepened in the discussion section, where students practice problem solving skills. In addition, familiarity with the methods and findings of the physical sciences not only forms a crucial component of a common education, but also prepares students to be scientifically literate citizens.
      ii. Because all knowledge in the physical sciences is empirically acquired, the laboratory component of the course is essential to properly expose students to the scientific method and the ways of knowing and thinking in the physical sciences. The lab component involves the formulation of scientifically sound predictions by the student, followed by empirical testing of the hypotheses through hands-on experimentation. Since the language of the physical world is mathematical, quantitative analysis of experimental data is an essential aspect of the lab experience. Physics, like all sciences, is a social endeavor, and students are exposed to cooperative problem solving, working in small groups with other students, in both the laboratory and discussion sections of the course.
   b. **Criterion 3 Outcomes and Program Criteria**:
      i. (a) apply math science or engineering
ii. (b) design and conduct experiments
iii. (g) communications

7. Topics:

- One dimensional motion, constant and non-constant acceleration
- Motion in 2 and 3D; displacement; velocity; acceleration as vectors
- Projectile motion; uniform circular motion
- Newton’s first law: inertia, force, mass
- Newton’s second law: Newton’s third law
- Friction and drag; curved path numerical integration
- Center of mass, constant and variable forces; work problems
- Potential energy and conservation of mechanical energy
- Conservation of energy
- Mass and energy
- Universal law of gravitation
- Conservation of linear momentum; system kinetic energy, collisions, rockets
- Rotation, moment of inertia, Newton’s second law: rotation, rolling
- Torque and angular momentum
- Equilibrium; statics applications; stability; stress and strain
- Simple harmonic motion; damped harmonic motion
- Driven harmonic motion and resonance