**PHYS 4300: Classical Mechanics**
**Course Syllabus for Fall 2009, TR 1:00-2:25 pm**

Instructor: Dr. Wayne Keith: 793-3874, keith.wayne@mcm.edu
Office Hours: S 110-C: MWF 11-12, WR 2:30-5, F 9-10
Web: http://www.mcm.edu/~keith.wayne
Text: *Classical Dynamics ($5^{th}$)*, by Thornton and Marion
Required: scientific calculator, paper, pencil
Prerequisite: PHYS 2520, MATH 3341

**Course Description:** This is a required course for physics majors. This course is an in-depth study of kinematics, dynamics, central force motion, harmonic motion, and related areas of Mechanics.

**Grading: 30%** Homework: Assignments will be made in class and posted online. Homework will be due at the beginning of class on the date indicated.
**10%** Quizzes: Includes any graded activities conducted during class (quizzes, presentations, discussions, etc.).
**45%** exams (15% each): Three in-class exams.
**15%** Final exam: Comprehensive, concentrating on the final quarter of the course.

**Attendance/Make up policy:** Make-up exams will be given for excused absences only at the discretion of the instructor. Contacting the instructor via email or phone prior to missing class for any reason is strongly encouraged, even if it is for a school sponsored event.

**Classroom Rules:** Students are expected to be present and on-time for all class meetings. Excessive absences (more than 3 unexcused) may result in the student being dropped from the course. Late homework loses 10% per week (up to a maximum of 40%), unless an extension is granted by the instructor. All late work requires a written explanation of why it was not turned in on time.

**ADA Policy:** If you have a documented disability that may impact your performance in this class and for which you may require accommodations, you must be registered with and provide documentation of your disability to the Disability Services Office, Old Main 102, 793-4880.

**Final notes:** Class discussion is strongly encouraged; please feel free to ask questions, during class or outside of class, about anything that is not clear. Properly preparing for class by reading the textbook and keeping up with the homework is the most important factor in doing well in this course.

**PHYS 4300 Fall 2009 Course Schedule**

All dates and topics are tentative and subject to change except **bold** dates.

| Date | Lecture # | Topic | Reading |
|---|---|---|---|
| 8/25 | 1 | Introduction and coordinate transformations | 1.1 – 1.3 |
| 8/27 | 2 | Matrices | 1.4 – 1.6 |
| 9/1 | 3 | Vector transformation | 1.7 – 1.9 |
| 9/3 | 4 | Vector operations | 1.10 – 1.12 |
| 9/8 | 5 | Derivatives – angular velocity | 1.13 – 1.15 |
| 9/10 | 6 | Gradient | 1.16– 1.17 |
| **9/15** | | **Test 1** | |
| 9/17 | 7 | Newton's Laws | 2.1 – 2.3 |
| 9/22 | 8 | Conservation Theorems | 2.4 – 2.5 |
| 9/24 | 9 | Energy | 2.6 – 2.7 |
| 9/29 | 10 | Simple Harmonic Oscillator | 3.1 – 3.3 |
| 10/1 | 11 | Damped Oscillations | 3.4 – 3.6 |
| 10/6 | 12 | Fourier Series | 3.7 – 3.8 |
| **10/8** | | **Test 2** | |
| 10/13 | 13 | Gravitational Potential | 5.1 – 5.3 |
| 10/15 | 14 | Tides | 5.4– 5.5 |
| 10/20 | 15 | Hamilton's Principle | 7.1 – 7.3 |
| 10/22 | 16 | Lagrange's Equations | 7.4 – 7.5 |
| 10/27 | 17 | Lagrangian Dynamics | 7.6 – 7.8 |
| 10/29 | 18 | Hamiltonian Dynamics | 7.9 – 7.11 |
| **11/3** | | **Test 3** | |
| 11/5 | 19 | Reduced Mass | 8.1 – 8.3 |
| 11/10 | 20 | Orbits | 8.4 – 8.5 |
| 11/12 | 21 | Planetary Motion | 8.6 – 8.7 |
| 11/17 | 22 | Orbital Dynamics | 8.8, 8.10 |
| 11/19 | 23 | Center of Mass | 9.1 – 9.3 |
| 11/24 | 24 | Properties of Systems | 9.4 – 9.6 |
| **11/26** | | **Thanksgiving – NO CLASS** | |
| 12/1 | 25 | Collisions | 9.7 – 9.9 |
| 12/3 | 26 | Rutherford Scattering | 9.10 – 9.11 |
| **12/8** | | **Final Exam – (Tuesday 10:30am – 12:30pm)** | |

| Course objectives and goals | Linked to which departmental program goal(s) | Linked to which institutional goal(s)? | Types of evidence used to demonstrate student achievement of objectives & goals |
|---|---|---|---|
| Students will demonstrate conceptual understanding of the basic principles of classical mechanics. | - to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics or engineering; but also, science teaching and careers in industry and science-related business. | 1,2,3,8 | Successful completion of in-class exam essay questions. |
| Students will demonstrate the ability to apply Lagrangian and Hamiltonian formalisms towards solutions of various mechanical problems. | - Same as above | 1,2,3,8 | Successful solving of appropriate problems during in-class discussions, homework and exams. |
| Students will demonstrate conceptual and practical understanding of central force motion, harmonic motion, and collisions. | - Same as above | 1,2,3,8 | Successful completion of in-class exam essay questions and solving of appropriate problems during in-class discussions, homework and exams. |