PHYS 4300: Classical Mechanics I
Course Syllabus for Fall 2021, MWF 1:00-1:50 pm

Instructor: Dr. Wayne Keith: 793-3874, keith.wayne@mcm.edu
Office Hours: S 110-C: MWF 9-11, TR 8:30-9:30, and MR 2:30-4:30
Web: http://www.mcm.edu/~keith.wayne
Text: *Classical Dynamics (5th)*, 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.

You will receive a during-term grade for this course by the 5th week of classes and after midterm. You can access your grades though Moodle or MyMcM. If your during-term grade is below a C-, you will receive a message from the Mindset for Success Office regarding your academic underperformance in this course. This email will contain information about several resources that can help you.

Attendance/Make up policy: Attendance is required. 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. Students are responsible for keeping up with the due dates of course material whether or not they are in class. **Students may attend remotely ONLY if officially excused from in-person attendance by the University.**

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. Ringing cell phones and other disruptions during class may result in a loss of homework points or other penalties. Tablet PC's may only be open when needed for class activities. Late homework loses 10% per week (up to a maximum of 60%), 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, President Hall, 793-4880. Details available via Moodle links.

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. **Face coverings are required during class. You will receive one warning before being asked to leave the room. Repeat offenders will be dropped.**

PHYS 4300 Course Schedule

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

Date	Lecture #	Topic	Reading
8/23	1	Introduction	
8/25	2	Coordinate transformations	1.1 – 1.3
8/27	3	Matrix Operations	1.4 – 1.5
8/30	4	Transformation Matrices	1.6 – 1.7
9/1	5	Vector transformation	1.8 – 1.9
9/3	6	Vector operations	1.10 – 1.12
9/6	7	Derivatives	1.13 – 1.14
9/8	8	Angular velocity	1.15
9/10	9	Gradient	1.16– 1.17
9/13	10	Exam Review	
9/15		**Exam 1**	
9/17	11	Newton's Laws	2.1 – 2.2
9/20	12	Frames of Reference	2.3
9/22	13	Conservation Theorems	2.4 – 2.5
9/24	14	Energy	2.6
9/27	15	Limitations	2.7
9/29	16	Simple Harmonic Oscillator	3.1 – 3.3
10/1	17	Damped Oscillations	3.4 – 3.6
10/4	18	Fourier Series	3.7 – 3.8
10/6	19	Exam Review	
10/8		**Test 2**	
10/11	20	Gravitational Potential	5.1 – 5.2
10/13	21	Lines of Force	5.3
10/15	22	Tides	5.4– 5.5
10/18	23	Hamilton's Principle	7.1 – 7.2
10/20	24	Generalized Coordinates	7.3
10/22	25	Lagrange's Equations	7.4 – 7.5
10/25	26	Lagrangian Dynamics	7.6 – 7.7
10/27	27	Hamiltonian Dynamics	7.9 – 7.10
10/29	28	Dynamical Variables	7.11
11/1	29	Exam Review	
11/3		**Test 3**	
11/5	30	Reduced Mass	8.1 – 8.2
11/8	31	Conservation Theorems	8.3
11/10	32	Orbits	8.4 – 8.5
11/12	33	Planetary Motion	8.6 – 8.7
11/15	34	Orbital Dynamics	8.8, 8.10
11/17	35	Center of Mass	9.1 – 9.2
11/19	36	Linear Momentum	9.3
11/22	37	Properties of Systems	9.4 – 9.6
11/24		**Thanksgiving – NO CLASS**	
11/26		**Thanksgiving – NO CLASS**	
11/29	38	Collisions	9.7 – 9.9
12/1	39	Rutherford Scattering	9.10 – 9.11
12/3	40	Final Review	
12/6		**Final Exam – (Monday 1:00pm – 3:00pm)**	

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.