Course Title: EMCH 212 "Dynamics"
Section: 001
Credits: 3
Class Meeting: MWF 10:00 – 10:50, Room 305 General Studies Building

Instructor: Dr. Jacob Moore, Assistant Professor of Mechanical Engineering
E-mail: jmoore@psu.edu
Phone: (717) 749-6209
Office Location: 7 Bookstore Building
Office Hours: Monday 3-5 PM and Thursday 10-12 AM, or by appointment.

Course Overview:
This course follows statics in the engineering mechanics course sequence. In this course, students will learn to analyze the motion and the forces experienced by bodies in planar motion.

Course Learning Objectives:
Upon successfully completing this course students will be able to...

- Apply mathematical principles (algebra, trigonometry, and calculus) to relate position, velocity, and acceleration to one another in different types of coordinate systems.
- Create free body diagrams of particles and rigid bodies in motion.
- Apply Newtonian mechanics and mathematical principles to relate forces to positions, velocities, and accelerations of bodies in motion.
- Apply work-energy principles and mathematical principles to relate energy to positions, velocities, and accelerations of bodies in motion.
- Apply impulse-momentum principles and mathematical principles to relate forces and momentum to positions, velocities, and accelerations of bodies in motion.

Course Policies:
Attendance:
- Students are expected to attend all classes except in cases of extenuating circumstances.
  Attendance may be recorded to report to the registrar’s office; however, it will not count as part of your course grade.
• Class will begin promptly at 10:00 and students are expected to be present and ready to begin class at that time.

• Students should contact the instructor before class for any pre-scheduled absences. In the case of an illness or another unexpected reason for absence, the student should contact the instructor as soon as possible.

• It is the responsibility of the student to determine what activities and assignments were missed in the case of any missed classes or significant tardiness. This can be done by contacting the instructor. Not all assignments may be made up in the case of non-university sanctioned excuses for absence.

Assignments:
• All assignments will be graded according to the mastery grading system. For details on this system, see the section on “Mastery Assignment Grading”.
• All assignments and due dates will be documented on Canvas (https://psu.instructure.com).
• Homework is to be formatted according homework formatting guidelines. Submissions that do not follow the formatting guidelines may lose points or may be handed back for the student to redo.
• All assignments are due at the beginning of class on the listed due date. Assignments may be dropped off with the instructor in class. Late assignments will not be accepted without prior consent of the instructor.
• Students are encouraged to work in groups, however, students are expected to complete and submit their own original work.

Tests:
• Tests will be conducted during the class periods indicated on the schedule unless otherwise noted in class. Because of this the tests will be limited to the regular 50 minute time period. Time starts at the beginning of class regardless of when the student shows up.
• Tests will be closed book, but students will be allowed to bring one page (front and back) of notes to each test and 3 pages (front and back) for the final. Students may also be given access to computer tools such as Matlab during some exams.
• The tests will consist of two main sections:
  o The basics section will cover the fundamentals of the topics covered in class and consist of a combination of multiple choice and open response style questions. Students will be expected to answer all the questions in this section.
  o The challenge section will cover more complex topics and may string various topics together. This section will consist entirely of open response style questions and students will be expected to choose and solve a subset of the questions.

General Conduct:
• Students are expected to act professionally during all class related activities and meetings. Inappropriate behavior or language during any class activities will not be tolerated.
Grade for Mastery Assignment Grading:
The purpose of having assignments in this class is to have students to master the material covered in the course. Students are expected to show mastery of the material through complete and correct solutions to the homework assignments, though it is understood that this may not happen the first time students attempt to solve a problem. To match this expectation, the following process will be used to grade all homework assignments.

1. Students will be given a weekly assignment with a number of homework problems on the material covered in class. Students must complete all problems to the best of their abilities and document their work using the specified homework formatting guidelines by the assigned due date.

2. Within one week, the instructor will grade and return the assignment. Each problem will have one of three marks on it, indicating the whether or not the instructor feels the problem was mastered.
   - **M (Mastered):** Indicating that the student completely and correctly answered the problem.
   - **NM (Not Mastered):** Indicating that the student did not completely and correctly answer the problem. This will be accompanied by comments from the instructor indicating any mistakes or missing information that the instructor has identified.
   - **X (Not Attempted):** Indicating that the instructor felt that the student did not make a reasonable attempt at answering the problem.

3. All problems that were marked NM (Not Mastered) can be redone and resubmitted within one week of being returned. Problems may not be resubmitted more than one week after being returned. All problems resubmitted will be regraded and just as the original assignment was. The new marks for each problem will replace the previous marks the student received. Resubmissions should be written on a separate sheet and must be stapled to the front of the original assignment and any previous resubmissions. The whole problem must be written out again unless the instructor has marked a “continue from here” point in the previous submission.

4. Problems can be resubmitted as many times as needed so long as the problem is marked NM.

5. The last day of classes will be the last day to resubmit any assignment. After this date, no more resubmissions will be accepted.

6. Each student’s course homework grade will be the average of all homework grades at the end of the semester.

Services for Students with Disabilities
Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Disability Coordinator, Kendra Sites, located on the first floor of the General Studies Building in the Student Success Center. She can be reached at 749-6045 or kmw24@psu.edu. For further information regarding the Penn State Student Disability Resources, please visit their web site at www.equity.psu.edu/ods/.
Instructors should be notified as early in the semester as possible regarding the need for reasonable academic adjustments.

**Academic Integrity:**
All students are expected to act with civility, personal integrity; respect other students’ dignity, rights and property; and help create and maintain an environment in which all can succeed through the fruits of their own efforts. An environment of academic integrity is requisite to respect for self and others and a civil community.

Academic integrity includes a commitment to not engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty include cheating or copying, plagiarizing, submitting another persons' work as one's own, using Internet sources without citation, fabricating field data or citations, "ghosting" (taking or having another student take an exam), stealing examinations, tampering with the academic work of another student, facilitating other students' acts of academic dishonesty, etc.

Students charged with a breach of academic integrity will receive due process and, if the charge is found valid, academic sanctions may range, depending on the severity of the offense, from F for the assignment to F for the course.

The University's statement on academic integrity, from which the above statement is drawn, is available at [http://www.psu.edu/dept/oue/aappm/G-9.html](http://www.psu.edu/dept/oue/aappm/G-9.html)

**Grading Policy:**
Your grade will depend on your homework assignments, lab assignments, as well as the four course exams (The three section exams and the final). Grades will be distributed as follows:

- Homework Assignments 20%
- Lab Assignments 20%
- Exams 60% (drop lowest exam grade, average of other 3)

Final letter grade will be assigned as follows:

- 94 - 100      A
- 90 – 93.99    A-
- 87 – 89.99    B+
- 83 – 86.99    B
- 80 – 82.99    B-
- 75 – 79.99    C+
- 70 – 74.99    C
- 60 – 69.99    D
- below 60      F
<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic</th>
<th>Reading</th>
<th>Assignments Due</th>
</tr>
</thead>
</table>
| 1/11    | M - Preliminaries and course introduction  
W - Continuous Particle Motion in 1 Dimension  
F - Non-Continuous Particle Motion in 1 Dimension | W – 12.1 – 12.2  
F – 12.3 | |
| 1/18    | M - No Class, MLK Day  
W – Curvilinear Motion with Rectangular Coordinates  
F – Curvilinear Motion with Normal/Tan Components | W – 12.4 – 12.6  
F - 12.7 | W – HW1 |
| 1/25    | M - Curvilinear Motion with Cylindrical Coordinates  
W – Boom Lift Analysis Lab  
F – Boom Lift Analysis Lab (cont.) | M – 12.8 | W - HW2 |
| 2/1     | M - Dependent Motion Systems  
W - Relative Motion Analysis with Local Coord Sys  
F – Review for Exam | M – 12.9  
W – 12.10 | M – Boom Lift Lab  
F - HW3 |
| 2/8     | M – Exam 1  
W – Particle Kinetics and the Equations of Motion  
F- Particle Kinetics in Rectangular Coordinates | W – 13.1 - 13.2  
F – 13.4 | |
| 2/15    | M - Particle Kinetics in Normal/Tan Coordinates  
W – Particle Kinetics in Cylindrical Coordinates  
F – Rigid Body Motion Translation and Rotation | M – 13.5  
W – 13.6  
F – 16.1 – 16.3 | F – HW 4 |
| 2/22    | M – Absolute Motion Analysis  
W – Abolition Motion Analysis cont.  
F – Relative Motion Analysis (velocity) | M – 16.4  
W – 16.4  
F – 16.5 | F – HW5 |
| 2/29    | M – Relative Motion Analysis (acceleration)  
W – Mass Moments of Inertia via Integration  
F – Mass Moments of Inertia via Composite Parts | M –16.7  
W – 17.1  
F – 17.1 | F – HW6 |
| 3/7     | Spring Break (no classes) | | |
| 3/14    | M – Planar Kinetics Translation and Rotation  
W – General Planar Kinetics  
F – General Planar Kinetics cont. | M – 17.2 – 17.4  
W – 17.5  
F – 17.5 | |
| 3/21    | M - Review for Exam  
W – Exam 2  
F – 14.1 – 14.6  
F – 18.1 – 18.5 | M – HW 7  
W - HW8 |
| 4/4     | M - Work and Energy in Extended Bodies cont.  
W – Impulse and Momentum in Particles  
F – Impact in Particles (1D) | M –18.1 – 18.5  
W – 15.1 – 15.3  
F – 15.4 | W – HW9  
W – HW10 |
| 4/11    | M – Impact in Particles (2D)  
W – Steady Flow Systems  
F - Rigid Body Impulse Momentum | M –15.4  
W – 15.8  
F – 19.1 – 19.3 | W – HW10 |
W - Review for Exam  
F - Exam 3 | M – 19.1 – 19.3 | W – HW11 |
| 4/25    | M – Pendulum Lab  
W – Pendulum Lab  
F –Course wrap up | | F – Pendulum Lab |
| 5/2 – 5/5 | Finals Week | | |