

University of Wisconsin – Stevens Point

Dept. of Physics and Astronomy

Advanced Mechanics – PHYS 335

Spring 2017

Course Information

- **Course title:** Advanced Mechanics
- **Course number:** PHYS 335
- **Instructor:** Maryam Farzaneh
- **Contact:** B105 Science Building, x--2423, mfarzane@uwsp.edu
- **Office hours:**
MR: 2:00 pm – 3:00 pm
TR: 11:00 am – 12:00 pm
W: 10:00 am – 11:00 am

If you cannot make any of the above office hours, please know that I have an open door policy. Please stop by as often as you wish or make an appointment by emailing me.

- **Pre-requisites:** PHYS 250, Math 213, Math 222.
- **Textbook:** *Classical Mechanics*, John R. Taylor, University Science Books. ISBN-13: 978-1-891389-22-1.
- **Calculator:** Please have a scientific calculator handy, just in case. A cell phone is *not* a scientific calculator.
- **Class times:**
 - **Lectures (SCI- A106)** TRF 10:00 – 10:50 am
- **Course description and objectives:** In Advanced Mechanics we study classical Newtonian mechanics with more rigor and mathematical sophistication compared to your introductory physics courses. In this course we will study Newton's Laws using vectors and differential equations in both Cartesian and polar coordinates. We will revisit momentum, angular momentum and energy conservation laws and will study oscillations in detail. A new approach to classical mechanics, called Lagrangian Mechanics will be introduced and will be used to study central forces and many more examples. We will also study motion in non-inertial frames and investigate the rotational motion of rigid bodies.

The course objectives are as follows:

1. Gain an in-depth understanding of Newtonian Mechanics, especially Newton's Laws, and apply these laws in different situations in Cartesian and polar coordinates.
 2. Learn to solve differential equations of motion and determine velocity and position of a particle, given initial conditions.
 3. Understand damped and driven oscillation of a mass.
 4. Learn Lagrangian Mechanics and be able to apply its results in different situations.
 5. Understand the rotation of a rigid body.
 6. Learn to work out problems in a non-inertial frame of reference.
- **Lecture participation:** I strongly encourage you to attend *all* the lectures and take good notes. Sometimes the lecture covers more material than you might find in your textbook.
 - **Homework:** There will be one homework set per week which is due at the beginning of the class period on the day indicated on the assignment. The solution to most of the homework problems should follow a logical step-by-step approach. You should use brief sentences to describe which concepts you are using, write down any equations you are using and justify any approximation. The numerical answers should have a unit and a brief description of why they make sense physically. Please refer to **PHYS335 Homework Guidelines** for more information. Homework counts for 20% of your overall grade.
 - **Exams:** There will be *three* midterm exams during the semester, not counting your final exam. Each midterm counts for 20% of your grade. Midterm exams are tentatively scheduled for Mondays February 13, March 13 and April 17, 6:00 – 8:00 pm. The final exam is tentatively comprehensive and is scheduled for **Tuesday, May 16, 10:15 am – 12:15 pm.** It counts for 20% of your grade.

General Course Policies

- **Disability services**
Any student who has a disability and is in need of classroom and/or exam accommodations, please contact the instructor and the Disability & Assistive Technology Center (715-346-3365).
- **Academic misconduct:** As a student at UWSP, I expect you to be familiar with the following document: <http://www3.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf>, especially Section 14.03. Simply put, *do not* copy each other's homework, lab reports and exams and pass them off as your own. Any confirmed incidence of academic misconduct, including plagiarism and other forms of cheating will be treated seriously and in accordance with University policy.
- **Since texting and cell phone use creates distraction both for me as your instructor and your classmates, texting and use of cell phone are not allowed in the classroom. All cell phones should be turned off or silenced during the class and kept in your bag. No cell phone should**

remain in your pockets or on your desk. If I see a student texting in class, I will ask him/her to leave the classroom for the remainder of the class period.

- Make-up work will only be accepted in the case of excused absences. Excused absences include death in the immediate family, illness with a note from the appropriate health care professional, religious observance, an event in which you officially represent the UWSP and the event directly conflicts with an exam. Excused absences must be approved with documenting materials prior to the date of absence. You should contact me in advance to inform me of your absence.
- If you are a student-athlete and encounter a time conflict with an exam because you have to be away for a sport competition, please make sure to approach me about the make-up exam in advance **with a note from your coach.**
- **I do not assign work for extra credit. There are no bonus points that you can earn.**
- The schedule for the finals is set by the University. I will not schedule an early final exam for whatever reason.
- Once you hand in your final exam, there is nothing more you can do to change your grade.

Grading and Evaluation

I will calculate your grade based on a weighted percentage of your scores as follows:

Homework	20%
Exams (3 midterms, 20% each)	60%
Final exam	20%

Your final grades will be determined as follows:

90% and above	A	82--85%	B+	70--73%	C+	56--60%	D+
86--89%	A-	78--81%	B	66--69%	C	50--55%	D
		74--77%	B-	61--65%	C-	below 50%	F

Please note that I do *not* grade on a curve. Scores will be rounded up. For example, 85.6% will become an A-, but 85.3 will remain a B+. **A score of 85.5% will be rounded to 85% not 86%.**

Tentative Course Schedule

The tentative course schedule is as follows. This might change and I will try my best to announce any changes beforehand.

Week	Date	Chapter and Topic	Comments
(1)	Jan 24 (T)	(1) Introduction, Space, time, mass and force	HW1
	Jan 26 (R)	(1) Newton's 1 st and 2 nd Laws, Inertial frames	
	Jan 27 (F)	(1) Newton's 3 rd Law and conservation of momentum	
(2)	Jan 31 (T)	(1) Newton's 2 nd Law in Cartesian coordinates	HW2
	Feb 2 (R)	(1) Newton's 2 nd Law in polar coordinates	
	Feb 3 (F)	(2) Projectile motion with linear drag	
(3)	Feb 7 (T)	(2) Projectile motion with linear drag, contd.	HW3
	Feb 9 (R)	(3) Conservation of Momentum, Rocket Motion	
	Feb 10 (F)	(3) Center of Mass,	
(4)	Feb 14 (T)	(4) Conservation of Angular Momentum	Exam 1, Monday February 13, 6:00 – 8:00 pm HW4
	Feb 16 (R)	(4) Work, KE, Conservative forces	
	Feb 17 (F)	(4) PE, Conservation of mechanical energy, Non-conservative forces	
(5)	Feb 21 (T)	(4) Force and PE, Gradient and Curl	HW5
	Feb 23 (R)	(4) Energy in one dimension, Graphs of PE	
	Feb 24 (F)	(5) Oscillations	
(6)	Feb 28 (T)	(5) Oscillations	HW6
	March 2 (R)	(5) Oscillations	
	March 3 (F)	(6) Calculus of Variations	
(7)	March 7 (T)	(6) Calculus of Variations	HW7
	March 9 (R)	(6) Calculus of Variations	
	March 10 (F)	(7) Lagrange's Equations	

(8)	March 14 (T)	(7) Lagrange's Equations	Exam 2, Monday March 13, 6:00 – 8:00 pm HW8
	March 16 (R)	(7) Lagrange's Equations	
	March 17 (F)	(7) Lagrange's Equations	
SPRING BREAK ----- NO CLASS!			
(9)	March 28 (T)	(8) Two-body Central Force Problem	HW9
	March 30 (R)	(8) Two-body Central Force Problem	
	March 31 (F)	(8) Two-body Central Force Problem	
(10)	April 4 (T)	(8) Two-body Central Force Problem	HW10
	April 6 (R)	(8) Two-body Central Force Problem	
	April 7 (F)	(8) Two-body Central Force Problem	
(11)	April 11 (T)	(9) Motion in non-inertial frames	HW11
	April 13 (R)	(9) Motion in non-inertial frames	
	April 14 (F)	(9) Motion in non-inertial frames	
(12)	April 18 (T)	(9) Motion in non-inertial frames	Exam 3, Monday April 17, 6:00 – 8:00 pm HW12
	April 20 (R)	(9) Motion in non-inertial frames	
	April 21 (F)	(9) Motion in non-inertial frames	
(13)	April 25 (T)	(10) Rotational Motion of Rigid Bodies	HW13
	April 27 (R)	(10) Rotational Motion of Rigid Bodies	
	April 28 (F)	(10) Rotational Motion of Rigid Bodies	
(14)	May 2 (T)	(10) Rotational Motion of Rigid Bodies	HW14
	May 4 (R)	(10) Rotational Motion of Rigid Bodies	
	May 5 (F)	(10) Rotational Motion of Rigid Bodies	
(15)	May 9 (T)	(11) Coupled Oscillators and Normal Modes	HW15
	May 11 (R)	(11) Coupled Oscillators and Normal Modes	
	May 12 (F)	(11) Coupled Oscillators and Normal Modes	
(16)		Final Exam: Tuesday, May 16, 10:15 am – 12:15 pm	

