Course Syllabus

Course: Mechanics (Physics 311)

Fall 2015, MWF, 9:30 - 10:20, JH 247

Instructor: Prof. Ilya I. Fabrikant, JH 310P, tel. 472-2774
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Office Hours: MWF 12:20 - 1:00 p.m. or by appointment

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

Text: G. R. Fowles and G. L. Cassiday, Analytical Mechanics, seventh edition (Brooks/Cole 2005).

Recommended reading:

This course requires a good knowledge of linear algebra, real calculus, complex algebra, vector algebra and ordinary differential equations. A short review of these topics will be given during the first week of classes. For updating and/or refreshing your background in these, the following book is recommended:

M. L. Boas, Mathematical Methods in the Physical Sciences, third edition (John Wiley 2006), Chapters 1,3-6,8.

There are many other good books on introductory classical mechanics. For those who want to extend their knowledge the following books are recommended:

K. R. Symon, Mechanics. Addison Wesley, Reading, 1971. More detailed text with more examples.

R. Baierlein, Newtonian Dynamics. McGraw-Hill, New York, 1983. More Lagrangian mechanics, extension of oscillations to nonlinear systems.

D. Kleppner and R. Kolenkow, An Introduction to Mechanics. Cambridge Univ Press, 2013.
A more advanced course taught at MIT.

Problems and Solutions on Mechanics (Major American universities Ph.D. Qualifying Questions and Solutions), compiled by the Physics Coaching Class, University of Science and Technology of China. World Scientific, New Jersey, 1994.

This book is for those who want to practise more advanced problems.

Outline: (1) Newtonian mechanics of one particle
(2) Motion in a central field
(3) Dynamics of systems of particles and rigid bodies
(4) Lagrangian and Hamiltonian mechanics

HOMEWORK: specific assignments and due dates are given on the blackboard;

Homework should be turned in in the hardcopy form (electronic files will not be accepted) by 5 p.m. on the due date by giving it to the instructor personally or placing it in the instructor's mail box. Homework turned in after the due dates loses two points per day. No homework is accepted one week after the due day.In case of illness or a personal emergency the new terms should be negotiated with the instructor. Note that travel (personal or to a conference) is not an excuse for turning in homework late.In doing homework you are allowed to discuss problems with each other, but you are NOT allowed to cooperate on writing down the solutions on the paper.

EXAMS: four quizzes, one Midterm Exam and Final Exam. All quizzes are closed-book. At the exams you are allowed to use the textbook, but not allowed to use notes. Any electronic equipment, including calculators, is not allowed on the quizzes and the exams.

QUIZZES (in-class): 9/9, 9/30, 10/30, 11/18 (tentative).
It is the student's responsibility to be in class when quizzes are given. No make-up quizzes will be given unless in case of illness or personal emergency.

MIDTERM EXAM: Wednesday, 10/14, 6:00-8:00 p.m. (tentative)

FINAL EXAM: TBA (this will be the official time, and rescheduling Is unlikely)

Grades: midterm exam - 30%; final exam - 30%; quizzes - 20%; homework - 20%

Tentative grade scale

%	grade
>96%	A+
90-96%	A
85-90%	A-
80-85%	B+
75-80%	B
70-75%	B-
65-70%	C+

60-65%	C
57-60%	C-
54-57%	D+
52-54%	D
50-52%	D-
<50%	F

Tentative schedule

8/24 - 8/28	Mathematical introduction. Units, dimensions. Chapter 1
8/31- 9/4	Rectilinear motion Chapter 2.
9/7	LABOR DAY HOLIDAY
9/9 - 9/11	Oscillations Chapter 3, 3.1-3.5.
9/14- 9/18	Forced harmonic motion. 3-dim motion of a particle. 3.6, 4.1-4.4
9/21- 9/25	Motion in external fields. Noninertial reference systems. 4.5,4.6; Chapter 5.
9/28-10/2	Gravitation and Kepler's laws 6.1 - 6.6
10/5 -10/9	Motion in a central field 6.7 - 6.14
10/12-10/16	Dynamics of systems of particles. 7.1 - 7.6
10/19	FALL BREAK
10/21-10/23	Rocket motion. Mechanics of rigid bodies 7.7, 8.1 - 8.5
10/26-10/30	Mechanics of rigid bodies 8.6 - 8.7, 9.1 - 9.2
11/2 -11/6	Rotation of a rigid body. Mechanics of a top. 9.3 - 9.10
11/9 -11/13	Generalized coordinates. Lagrangian mechanics. 10.1 - 10.7
11/16-11/20	Hamiltonians and Hamilton equations. 10.8 - 10.9
11/23	Oscillations

	11.1 - 11.2
11/25-11/29	Thanksgiving break
11/30-12/4	Oscillations. 11.3 - 11.6
12/7 -12/11	Review and discussion