

PHYC54 -- Classical Mechanics

University of Toronto (UTSC)- Fall 2013

Lecturer:

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Lectures

WE	11:00	13:00	BV 260
MO	11:00	13:00	MW 262

Office Hours:

Wednesday and Thursday, 1:00-2:00 PM, or by appointment.

TA (Marker) for the course: TBA

Books:

There is no single textbook that covers all the materials thoroughly. There for we recommend two books which we will follow closely. There are other books that you may consult from time to time. We will provide lecture notes when is required.

Suggested textbooks:

Classical Mechanics, Taylor

Classical Dynamics of Particles and Systems, Thornton and Marion, 5th edition

Additional reading material:

Mechanics, Landau and Lifshitz

Classical Mechanics, A Modern Prospective, Barger and Olsson

Classical Mechanics, Goldstein

Theoretical Mechanics of Particles and Continua, Fetter and Walecka

Mathematical Methods for Physicists**, Arfken and Weber

Evaluation: This is tentative and will be discussed with students in class.

Homework 25%, Midterm 25%, class participation 5% and Final 45%

Homework will be assigned (almost) every week and will be due on Monday (or Thursday) at the beginning of the Lecture. Generally, you can discuss the homework with your colleagues but what you submit must be your own work. Please check the UTSC regulation on this matter. Late homework submission will be penalized by 20% for each day after the due date and will not be accepted after two days.

There will be one (or two) midterm each will be a 1.5 hours exams. The date and format of the test will be discussed in class. The final exam will be during the examination period in January.

Course Structure

Lectures and homework will be the most important parts of the class. Try to follow the derivations during the lecture closely and stop me when something is not clear. The homework will take a substantial amount of time, however it is important that you start working on the homework on your own before discussing with your colleagues.

Topics covered during the course include (time permits) the following:

Chapter 1: Review of basic concepts you learned in your first and second year

Kinematics in 1 and 2 dimensions

Conservation of energy, work

Motion with resistance forces

Chapter 2: Functional optimization

Constraints

Chapter 3: Lagrangian formalism

Canonical Momentum

Hamiltonian Equations

Cyclic coordinates

Forces of constraint

Frequency of small oscillations

Chapter 4: Force and potential due to gravity

Potential due to mass distribution

Chapter 5: Effective potential with angular momentum

Elliptic Orbits

Orbits in arbitrary force law

Orbital Precession and stability

Chapter 7: Scattering Cross-section

Chapter 8: Simple Harmonic Oscillator with damping

Green's function **

Chapter 9: Coupled oscillators **

Eigenfrequencies and eigenvectors

Chapter 10: Forces in non-inertial coordinate systems

Coriolis force

Chapter 11: Tensor moment of inertia

Principal moments of inertia

Euler equations for rotation

Motion of a rotating top

Mathematical concepts:

Separable differential equations

Second order linear differential equations

Taylor expansion

Eigenvectors and Eigenvalues

GOOD LUCK