Instructor
Hossain Ahmed

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Office Location
PSC, 1009

Student Hours
Monday: 9:30 – 10:20 am
Wednesday: 9:30 –10:20 am
Thursday: 10:30 – 11:20 am

Email me to arrange a meeting at a different time

Class Time and Location
Tuesday: 9:30 - 10:20 am
Thursday: 8:30 – 9:20 am
Friday: 10:30 – 11:20 am

Location: **SCHW 190**

St. Francis Xavier University

# Classical Dynamics I

Phys 242, Winter 2025
Course Overview

This course is more advanced than PHYS 101/102 and PHYS 121/122 level courses. By completing this course, students will be acquainted with the classical concept of everyday objects and can prepare themselves for higher-level classes, e.g. Quantum Mechanics, Classical Electrodynamics, General Relativity, etc.

PHYS 242 focused on conservative systems and potential energy, non-inertial frames, multi-particle systems, calculus of variations, Lagrangian mechanics, the connection between symmetries and conservation laws, central force problems, orbital mechanics, coupled oscillators and normal modes; Hamilton's equations of motion. This is a three-credit course.

Additional Course Information

Class participation, textbook consultation, doing assignments, and participating in-class quizzes are the key to success in this course. Class attendance is strongly recommended, and students are responsible for collecting information from the classes.

Required Textbook: Classical Mechanics by John R. Taylor
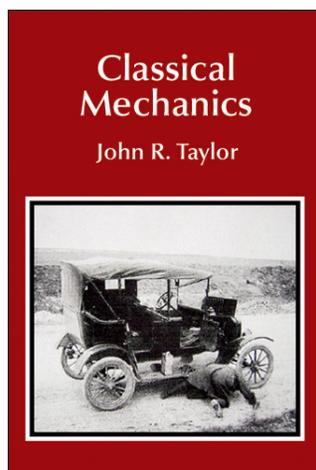
** Textbook is available in the StFX bookstore.

Evaluations

Category	Weight
Assignments	20%
Quizzes	15%
Midterm	20%
Final	45%
Total	100%

Assignments

Assignments will be given periodically, and you will be notified in class. You will have one week to solve the problems. The problems will be primarily based on questions from the textbook. Consultation with other students regarding the problems is welcomed, but make sure you can solve the problems by *yourself* since you'll be working on exams by *yourself*. Late submission without a valid reason will affect your grade!

Exams

In class quizzes: TBA
Midterm: February 14, 2025 (Friday) [Time: 10:30am – 11:20am]
Final: The final exam date will be set by the University registrar.

Method of Instruction

- Face-to-face at SCHW190
- Online (if necessary): https://ca-lti.bbcollab.com/collab/ui/scheduler/session/settings/cded4aa1146e4376a4603165ad44c58a

Course Schedule

Note: Based on time and situation, we might include or discard some of the contents in the table below.

Chapter 1 & 2 Introduction
- 1.1   Review on Unit and Dimension
- 1.2   Review on Vector
- 1.3   Review on Rectilinear Motion
- 1.4   Space, time, Mass, and Force
- 1.5   Newton's Laws of Motion
- 1.6   Various coordinate systems: Cartesian, Polar, Spherical, and Cylindrical
- 1.7   Problem Solving
- 2.5   Motion of a Charge in a Uniform Magnetic Field
- 2.6   Complex Exponentials

Chapter 3   Linear and Angular Momentum
- 2.1   Conservation of Momentum
- 2.2   The Center of Mass
- 2.3   Angular Momentum for single and Multi-particles system
- 2.4   Problem Solving

Chapter 4   Energy System
- 3.1   Kinetic Energy and Work
- 3.2   Potential Energy and Conservative Force
- 3.3   Force as a Gradient of Potential Energy
- 3.4   Time-Dependent Potential Energy
- 3.5   Energy for Linear One-Dimensional System
- 3.6   Energy of a Multiparticle System
- 3.7   Problem Solving

Chapter 6   Calculus of Variations
- 4.1   Review
- 4.2   The Euler-Lagrange Equation
- 4.3   Application of Euler-Lagrange Equation
- 4.4   Multi Variable System

Chapter 7   Lagrangian Mechanics

Chapter 8   Two-body Central Force Problems

Wish List: Hamiltonian Mechanics (Chapter 13)

Course Materials & Resources

Besides in-class lectures, the course webpage (Moodle page) is the primary source of the course materials. Lecture slides, assignments, quizzes, and solutions (if any) will be uploaded to the Moodle page accordingly. To avoid any biases, I usually upload lecture slides after my in-class lectures. Any announcements, formula sheets, practice problems (if any), and other materials (if any) will also be uploaded on Moodle page. Students are strongly advised to follow the

Course webpage: https://moodle.stfx.ca/course/view.php?id=37434

Artificial Intelligence Aids

Students may use artificial intelligence aids on "open internet" activities such as assignments and labs. In all cases, the use of such aids must be acknowledged and described by the student in their submitted work. Failure to do so will constitute an act of Academic Dishonesty.

Statement on Equitable Learning

Everyone learns more effectively in a respectful, safe and equitable learning environment, free from discrimination and harassment. Instructors and students are invited to work together to create a relationship space that fosters and promotes values of human dignity, equity, non-discrimination, and respect for diversity. Please feel free to talk with your course instructor or the Chair about your questions or concerns about equity in our classroom or in the StFX community in general. Should students have additional questions, they are encouraged to talk to the Chair/Coordinator of the Department/Program or the Human Rights and Equity Advisor, contact information can be found at https://www.stfx.ca/human-rights-equity

Academic Integrity

The university has a strict policy against academic dishonesty. For a precise definition of what St. Francis Xavier University considers to be academic dishonesty, please refer to https://www.stfx.ca/applications-admissions/registrars-office/academic-integrity. It is your responsibility to know what constitutes academic dishonesty.

Tantetive dtaes for assignments and quizzes

	Assignment Handing out	Assignment Due	Quiz
01	Jan. 17	Jan. 24	
02	Feb. 04	Feb. 11	Jan. 28
03	Mar. 07	Mar. 14	Mar. 18
04	Mar. 24	Mar. 31	Apr. 01