PHYS 502A
Classical Electrodynamics
Fall 2026
Tuesdays, 5:30–6:50 pm
Thursdays, 5:30–6:50 pm

Instructor: Pavel Denisenkov
Email: pavelden@uvic.ca
Office: TBD

This graduate course provides a rigorous introduction to classical electrodynamics with an emphasis on its relativistic formulation. The course develops the fundamental principles of electromagnetic theory from the viewpoints of special relativity and variational mechanics, culminating in the description of electromagnetic radiation from moving charges. Along the way, students will gain a unified understanding of mechanics, electromagnetism, and spacetime symmetries.

The principal topics include

- The Principle of Special Relativity
- Relativistic Mechanics
- Variational Principles and Noether's Theorem
- Motion of Charged Particles in Electromagnetic Fields
- Maxwell's Equations in Classical and Covariant Form
- Constant Electromagnetic Fields
- Electromagnetic Waves
- Propagation of Light
- Fields of Moving Charges
- Radiation from Accelerated Charges

Learning Outcomes

Upon successful completion of the course, students will be able to

- formulate classical electrodynamics using both three-vector and covariant notation;
- apply variational principles to derive equations of motion and conservation laws;
- solve problems involving charged particles in prescribed electromagnetic fields;
- analyze electromagnetic wave propagation in vacuum;
- calculate the electromagnetic fields produced by moving charges; and

- derive and apply the principal results describing electromagnetic radiation.

The primary textbook is *The Classical Theory of Fields* by L. D. Landau and E. M. Lifshitz (any edition). The lectures closely follow the first nine chapters of this text while emphasizing the physical interpretation of the principal concepts and their derivations. Complete lecture notes will provide all material required for the homework assignments and examinations.

For additional reading, the following textbooks are recommended:

- J. D. Jackson, *Classical Electrodynamics*;
- D. J. Griffiths, *Introduction to Electrodynamics*.

All of these books are available through the McPherson Library.

Assessment

Course grades will be determined as follows:

Homework assignments	40%
Midterm examination	30%
Final examination	30%

Three or four homework assignments will be distributed during the semester, each with approximately a two-week submission period. The assignments are designed to reinforce the theoretical material presented in lectures and to develop analytical problem-solving skills. The midterm and final examinations will consist primarily of problems similar in style and difficulty to those assigned in the homework.