

MATH-4213 GENERAL RELATIVITY II WINTER 2025

Instructor: Prof. Xin Yang LU

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Classes: reading course

Office Hours: MW 4.30-5.30 in RB2015, or by appointment via email. Delivery either in person, or via Zoom. If you come in person, please confirm by email first.

DESCRIPTION

- **Textbook:** Spacetime and Geometry: An introduction to general relativity, by S. Carroll. (Cost: 90 dollars - prices are subject to market fluctuations). Any version, or second hand copy, would work.
- **Content:**
 - Physics in the curved spacetime.
 - Einstein's equations.
 - The cosmological constant.
 - Energy conditions.
 - The equivalence principle.
 - Alternative theories.
 - The Schwarzschild solution.
 - Schwarzschild metric.
 - Birkhoff's theorem.
 - Singularities.
 - Geodesics of Schwarzschild.
 - Schwarzschild black holes.
 - Stars and black holes.
 - The black hole zoo.
 - Event horizons.
 - Mass, charge, and spin.
 - Charged black holes.
 - Rotating black holes.
 - Penrose process.
 - Black hole thermodynamics.
- **Midterm:** 1 midterm exam counting for 35% of the final grade.
- **Final Exam:** There will be a final exam which will count for 65% of the final grade. There will be *NO* 100% final option.
- **Policies:**
 - Important announcements will be made through MyCourseLink to registered students via MyCourseLink. You are responsible for reading the info posted on MyCourseLink.
 - I attempt to reply to e-mail in a timely fashion, but do not expect immediate responses. In all email you send me make sure to add MATH5110 in the subject line.

- **Academic Dishonesty:** All cases of academic dishonesty will be dealt with according to the university's Code of Student Behavior and Disciplinary Procedures, copies of which are available from the university's web-site.
- **Accommodations:** Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit:
<http://studentaccessibility.lakeheadu.ca>