

PHYS 4010/7010: General Relativity - Fall 2025

Course Web Site: <http://www2.physics.umanitoba.ca/u/shalchi/PHYS4010/>

Class Times: Mondays, Wednesdays, and Fridays 9:30 - 10:20, 319 Allen Building

Instructor: Dr. Andreas Shalchi, Professor, 219 Allen Building
Email: Andreas.Shalchi@umanitoba.ca

Office Hours: Fridays 11:30 - 12:30, 219 Allen Building

Textbooks: **There will be no specific textbook for this course!**
Good books about General Relativity are:
Introducing Einstein's Relativity, by Ray d'Inverno
Gravitation, by C.W. Misner, J.A. Wheeler, and K.S. Thorne

Assignments: There will be 8 homework assignments. A thorough understanding of the homework problems will be necessary in order to perform well on the final exam. Marks will be deducted for late assignments at a rate of 10% per day.

Examinations: There will be two midterm tests held in class in October/November 2025 (dates will be announced in class). A three-hour final exam will be written during the December examination period, scheduled by Student Records.

<u>Evaluation Procedure:</u>	Assignments:	25%
	Midterm tests:	25%
	Final Exam:	50%

Course Outline:

- 1) Newtonian Gravity and Special Relativity
- 2) Relativistic Hydrodynamics
- 3) Relativistic Electrodynamics
- 4) Non-Inertial Reference Frames and the Principle of Equivalence
- 5) Riemannian Geometry and Curved Space-Time
- 6) The Principle of Covariance and Einstein's Field Equations
- 7) Linearized Field Equations and Gravitational Waves
- 8) Schwarzschild's Solution with the Application to a Static Black Hole

Policy on Plagiarism and Cheating:

University of Manitoba Undergraduate Calendar, pp. 28-9: *Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room (e.g., crib notes, pagers or cell phones). Exam cheating can also include exam impersonation. (Please see Section 5.2.9 of the Undergraduate Calendar on Examinations: Personations). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.*