Course Outline for AS.171.646 (General Relativity)

Instructor:	**Emanuele Berti**
Class Schedule:	Tue/Thu 9:00am-10:15am
Classroom:	Bloomberg 475
Office Hours:	By appointment
Instructor's Office:	Bloomberg 449
Teaching Assistant:	Keyer Thyme (kthyme1 [at] jhu.edu)
Course Website:	`https://pages.jh.edu/~eberti2/teaching/`

Main textbooks:

(1) *Gravity: Newtonian, Post-Newtonian, Relativistic*, by Eric Poisson and Clifford M. Will

(2) *A Relativist's Toolkit*, by Eric Poisson

Suggested/complementary reading:

For complementary material on compact objects (black holes and neutron stars):

(1) *Black Holes, White Dwarfs and Neutron Stars*, by Stuart L. Shapiro and Saul A. Teukolsky

(2) Instructor's notes and Mathematica notebooks on *Black Hole Perturbation Theory*, https://www.icts.res.in/event/page/3071

More basic introductions to general relativity:

(1) *Spacetime and Geometry: An Introduction to General Relativity*, by Sean Carroll

(2) *A First Course in General Relativity (Second Edition)*, by Bernard Schutz

(3) *Gravity: An Introduction to Einstein's General Relativity*, by James B. Hartle

(4) *General Relativity and its Applications*, by Valeria Ferrari, Leonardo Gualtieri and Paolo Pani

We may occasionally refer to specific material from various books and technical articles, including:

(1) *Gravitation*, by Charles W. Misner, Kip S. Thorne and John Archibald Wheeler

(2) *Modern Classical Physics*, by Kip S. Thorne and Roger D. Blandford

(3) *General Relativity (Second Edition)*, by Norbert Straumann

(4) *Relativity in Modern Physics*, by Nathalie Deruelle and Jean-Philippe Uzan

(5) *Gravitational Waves: Volume 1: Theory and Experiments* by Michele Maggiore

(6) *Gravitational Waves: Volume 2: Astrophysics and Cosmology*, by Michele Maggiore

(7) *Gravitational-Wave Physics and Astronomy: An Introduction to Theory, Experiment and Data Analysis*, by Jolien D. E. Creighton and Warren G. Anderson

Course goals and learning outcome:

The goal of this course is to provide an introduction to general relativity and relativistic astrophysics. The course is addressed to students with a background in Newtonian gravity, classical mechanics, electromagnetism and modern physics.

Homework, in-class tests and final exam:

Homework assignments will be announced in class, and they must be turned in by the beginning of class on the due date. **Late homework will not be accepted.** In exceptional cases students may be excused from turning in an assignment. Homework must be easy to read: please write down clearly your name and the problem set number, do not use a red pen, and write consistently on either one side or both sides of the paper. The use of AI tools such as ChatGPT is not acceptable under any circumstance. Please submit your work by emailing a pdf file and the source code (when coding is necessary) to the instructor.

Attendance:

There is no strict attendance requirement, but you are strongly advised to attend class. Inform me in advance by email if you have a serious reason why you must miss a test or you cannot complete your homework on time.

Academic Integrity:

Violations of the University's policy of academic integrity will result in a failing grade and other disciplinary actions.

Note:

If a change in the syllabus becomes necessary during the semester, it will be discussed in class and then posted on the course website. The course website will also contain up-to-date information on the class schedule, homework assignments and complementary material.