FYS4160 – General Relativity (Spring 2017)

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Literature

[Car] S. M. Carroll, *Spacetime and Geometry: An Introduction to General Relativity*, Addison Wesley (2004).

While the course content is defined by the lecture (and exercises), I will most of the time closely follow the textbook by Carroll, and always (try to) stick to its conventions. The lecture is divided into two main parts. The first part (until about a month before the Easter break) will introduce general relativity as our leading theory of gravitation, including the necessary mathematical tools. The second part, starting around week 12, will focus on some of the most important applications, namely *i)* the spacetime geometry resulting from a spherically symmetric mass distribution, *ii)* gravitational waves and *ii)* cosmology.

Tentative syllabus

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Date	Subject
week 3 – 4 (from Jan 17)	Recap: Special Relativity [Car 1.1–1.9]
week 5 (from Jan 31)	Equivalence principles; gravity as a geometric effect [∼ Car 2.1, 4.1]
week 6 – 9 (from Feb 7)	Curved space(time) and Riemannian geometry [∼Car 2–3]
week 10 (from Mar 7)	Einstein's field equations [Car 4.2, 4.4]
week 11 (from Mar 14)	General Relativity as classical field theory [Car 1.10, 4.3]
week 12 (from Mar 21)	Schwarzschild solution [Car 5.1–5.4]
week 13 – 14 (from Mar 28)	Black holes [∼ Car 5.6–5.8, (6)]
week 15 (from Apr 11)	**easter (no lectures)**
week 16 (from Apr 18)	Experimental tests of GR [Car 5.5, ∼7.1-7.3]
week 17 – 18 (from Apr 25)	Gravitational waves [∼ Car 7.4–7.7]
week 19 – 21 (from May 9)	Cosmology [∼ Car 8.1–8.5]
week 22 (from May 30)	Repetition / open issues
June 16 (9:00 pm)	**Final exam**