

# General relativity: Preliminary courseplan, spring 2020

Usually the teaching will take place in AlbaNova, room FB41.

	Date	Subject	Reading (Hartle)
1	23 March (Monday) 13:15 – 15:00	<b>Introduction to curved surfaces. Special relativity: the Minkowski metric</b>	Chap 2 Chap 3.1, 3.2 Chap 4
		Problem 2: 3, 4, 5, 7 Problem 4: 9, 13, 15	
2	26 March (Thursday) 13:15 – 15:00	<b>Special relativity: 4-vectors, energy-momentum and acceleration. The equivalence principle (EP)</b>	Chap 5 Chap 6.1, 6.2
		Problem 5: 2, 7, 8, 11, 20	
3	30 March (Monday) 13:15 – 15:00	<b>Newtonian gravity as spacetime geometry. Or: EP + SR = Curved spacetime!</b>	Chap 3.3 – 3.5 Chap 6.3 – 6.6
		Problem 6: 12, 13, 14	
	30 March, 15:15 – 17:00	<b>Problem solving session</b>	
4	2 April (Thursday) 13:15 – 15:00	<b>The description of curved spacetimes: The metric</b>	Chap 7
		Problem 7: 2, 5, 9, 11, 12, 18, 20	
5	6 April (Monday) 13:15 – 15:00	<b>Geodesics and symmetries. Local inertial frames.</b>	Chap 8
		Problem 8: 3, 5, 6, 8	
	6 April, 15:15 – 17:00	<b>Problem solving session</b>	
6	8 April (Wednesday) 13:15 – 15:00 room: FP22	<b>The Schwarzschild geometry.</b>	Chap 9.1 – 9.3
		Problem 9: 1, 5, 6, 7, 8, 10, 12	
7	16 April (Thursday) 13:15 – 15:00	<b>Bonustest I More on the Schwarzschild geometry.</b>	Chap 9.4 (Chap 10)
		Problem 9: 16	
8	20 April (Monday) 13:15 – 15:00	<b>Vectors, dual vectors and tensors.</b>	Chap 20.1 – 20.3
		Problem 20: 3, 4, 7	
	23 April, 13:15 – 15:00	<b>Problem solving session</b>	
9	27 April (Monday) 13:15 – 15:00	<b>The covariant derivative.</b>	Chap 20.4 – 20.5
		Problem 20: 5, 10, 14, 15, 17, 18, 20	
10	29 April (Wednesday) 13:15 – 15:00 room: FP22	<b>The Riemann tensor: the result of parallel transport.</b>	See lecture notes!

11	4 May (Monday) 13:15 – 15:00	<b>The Riemann tensor: geodetic deviation. The Einstein vacuum equation.</b>	Chap 21.1 – 21.4
		Problem 21: 4, 6, 7, 11, 12, 13, 14, 18	
	4 May, 15:15 – 17:00	<b>Problem solving session</b>	
12	7 May (Thursday) 13:15 – 15:00	<b>The stress energy tensor. The Einstein equation.</b>	Chap 22
		Problem 22: 4, 8, 9, 10, 13, 15	
13	11 May (Monday) 13:15 – 15:00	<b>Black holes.</b>	Chap 12 (Chap 15.1 – 15.3)
		Problem 12: 3, 5, 13, 14, 15, 17 Problem 20: 16	
	11 May, 15:15 – 17:00	<b>Problem solving session</b>	
14	14 May (Thursday) 13:15 – 15:00	<b>Bonustest II More on black holes.</b>	
15	18 May (Monday) 13:15 – 15:00	<b>Causal structure and Penrose diagrams.</b>	Page 137, 274 + Lecture notes
		Problem 7: 6 Problem 12: 8, 9, 25	
	18 May, 15:15 – 17:00	<b>Problem solving session</b>	
16	20 May (Wednesday) 13:15 – 15:00 room: FP22	<b>Gravitational waves.</b>	Chap 21.5 Chap 16.1 – 16.3 (Chap 16.4 – 16.5)
		Problem 21: 21, 22, 24 Problem 16: 1, 2, 5, 8	
17	25 May (Monday) 13:15 – 15:00	<b>Cosmology.</b>	(Chap 17) Chap 18 (Chap 19)
		Problem 18: 5, 6, 7, 11, 23, 24	
	25 May, 15:15 – 17:00	<b>Problem solving session</b>	
18	28 May (Thursday) 13:15 – 15:00	<b>Special topic session: Black hole thermodynamics</b>	Extra material
	(Date to be decided)	<b>Problem solving session</b>	
	3 June (Wednesday) 8:00 – 13:00	<b>Exam</b> (AlbaNova, rooms FR4, FA31, FA32)	