

General relativity: Preliminary courseplan, spring 2019

	Date	Subject	Reading (Hartle)
1	25 March (Monday) 13:15 – 15:00	Introduction to curved surfaces. Special relativity: the Minkowski metric	Chap 2 Chap 3.1, 3.2 Chap 4
		Problem 2: 3, 4, 5, 7 Problem 4: 9, 13, 15	
2	28 March (Thursday) 13:15 – 15:00	Special relativity: 4-vectors, energy-momentum and acceleration. The equivalence principle (EP)	Chap 5 Chap 6.1, 6.2
		Problem 5: 2, 7, 8, 11, 20	
3	1 April (Monday) 13:15 – 15:00	Newtonian gravity as spacetime geometry. Or: EP + SR = Curved spacetime!	Chap 3.3 – 3.5 Chap 6.3 – 6.6
		Problem 6: 12, 13, 14	
	1 April, 15:15 – 17:00	Problem solving session	
4	4 April (Thursday) 13:15 – 15:00	The description of curved spacetimes: The metric	Chap 7
		Problem 7: 2, 5, 9, 11, 12, 18, 20	
5	8 April (Monday) 13:15 – 15:00	Geodesics and symmetries. Local inertial frames.	Chap 8
		Problem 8: 3, 5, 6, 8	
	8 April, 15:15 – 17:00	Problem solving session	
6	11 April (Thursday) 13:15 – 15:00	The Schwarzschild geometry.	Chap 9.1 – 9.3
		Problem 9: 1, 5, 6, 7, 8, 10, 12	
7	15 April (Monday) 13:15 – 15:00	Bonustest I More on the Schwarzschild geometry.	Chap 9.4 (Chap 10)
		Problem 9: 16	
	15 April, 15:15 – 17:00	Problem solving session	
8	25 April (Thursday) 13:15 – 15:00	Vectors, dual vectors and tensors.	Chap 20.1 – 20.3
		Problem 20: 3, 4, 7	
9	29 April (Monday) 13:15 – 15:00	The covariant derivative.	Chap 20.4 – 20.5
		Problem 20: 5, 10, 14, 15, 17, 18, 20	
10	2 May (Thursday) 13:15 – 15:00	The Riemann tensor: the result of parallel transport.	See lecture notes!

11	6 May (Monday) 13:15 – 15:00	The Riemann tensor: geodesic deviation. The Einstein vacuum equation.	Chap 21.1 – 21.4
		Problem 21: 4, 6, 7, 11, 12, 13, 14, 18	
	6 May, 15:15 – 17:00	Problem solving session	
12	9 May (Thursday) 13:15 – 15:00	The stress energy tensor. The Einstein equation.	Chap 22
		Problem 22: 4, 8, 9, 10, 13, 15	
13	13 May (Monday) 13:15 – 15:00	Black holes.	Chap 12 (Chap 15.1 – 15.3)
		Problem 12: 3, 5, 13, 14, 15, 17 Problem 20: 16	
	13 May, 15:15 – 17:00	Problem solving session	
14	16 May (Thursday) 13:15 – 15:00	Bonustest II More on black holes.	
15	20 May (Monday) 13:15 – 15:00	Causal structure and Penrose diagrams.	Page 137, 274 + Lecture notes
		Problem 7: 6 Problem 12: 8, 9, 25	
	20 May, 15:15 – 17:00	Problem solving session	
16	23 May (Thursday) 13:15 – 15:00	Gravitational waves.	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	27 May (Monday) 13:15 – 15:00	Cosmology.	(Chap 17) Chap 18 (Chap 19)
		Problem 18: 5, 6, 7, 11, 23, 24	
	27 May, 15:15 – 17:00	Problem solving session	
18	29 May (Wednesday) 15:15 – 17:00 (Note time!)	Special topic session: Black hole thermodynamics	Extra material
	(Date to be decided)	Problem solving session	
	5 June (Wednesday) 8:00 – 13:00	Exam (AlbaNova, rooms FR4, FA31, FA32)	