General relativity: Preliminary courseplan, spring 2020

Note: there may be changes in dates and times.

	Date	Subject	Reading (Hartle)
1	23 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	
2	26 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: 7, 8, 11, 20	
3	30 March (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	
	30 March, 15:15 – 17:00	**Problem solving session**	
4	2 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	6 April (Monday) 13:15 –15:00	**Geodesics and symmetries.** **Local inertial frames.**	Chap 8
		Problem 8: 3, 5, 6, 8	
	6 April, 15:15 – 17:00	**Problem solving session**	
6	8 April (Wednesday) 13:15 –15:00	**The Schwarzschild geometry.**	Chap 9.1 – 9.3
		Problem 9: 1, 5, 6, 7, 8, 10, 12	
7	16 April (Thursday) 13:15 –15:00	**More on the Schwarzschild geometry, and light ray orbits**	Chap 9.4 (Chap 10)
		Problem 9: 16	
8	20 April (Monday) 13:15 –15:00	**Vectors, dual vectors and tensors.**	Chap 20.1 – 20.3
		Problem 20: 3, 4, 7	
	23 April, 13:15 – 15:00	**Problem solving session**	
9	27 April (Monday) 13:15 –15:00	**The covariant derivative.**	Chap 20.4 – 20.5
		Problem 20: 5, 10, 15, 18, 20	
10	29 April (Wednesday) 13:15 –15:00	**The Riemann tensor:** **the result of parallel transport.**	See lecture notes!

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