

# Ph.D. Course in Astrophysics and Cosmology

Academic Year 2020-2021

## I TERM

*Introduction to General Relativity*, Antonio Lanza, lanza@sissa.it, 14 Lectures, 3.5 credits (compulsory)

*High Energy Astrophysics*, Anna Lisa Celotti, celotti@sissa.it, 8 lectures, 2 credits (compulsory)

*Cosmology: from early Universe to galaxy formation*, Luigi Danese, danese@sissa.it, 14 lectures, 3.5 credits (compulsory)

*Radiative Processes in Astrophysics*, Francesca Perrotta, perrotta@sissa.it, 8 lectures, 2 credits (compulsory)

*Computational Physics*, Riccardo Valdarnini, valda@sissa.it, 8 lectures, 2 credits (compulsory)

*Statistical Methods in Astrophysics and Cosmology*, Andrea Lapi, lapi@sissa.it, 14 lectures, 3.5 credits (compulsory)

*Stellar Structure and Evolution*, Alessandro Bressan, sbressan@sissa.it, 14 lectures, 3.5 credits (compulsory)

## II TERM

*Dark Matter*, Paolo Salucci, salucci@sissa.it, 12 lectures, 3 credits

*B-modes in CMB polarization*, Nicoletta Krachmalnicoff, nkrach@sissa.it, 4 lectures, 1 credit

*Advanced GR*, Stefano Liberati, liberati@sissa.it, 18 lectures, 4.5 credits

*Early Universe*, Sabino Matarrese, matarrese@pd.infn.it, 4 lectures, 1 credit

*Large Scale Structure*, Riccardo Valdarnini, valda@sissa.it, 6 lectures, 1.5 credit

*Structure formation*, Matteo Viel, viel@sissa.it, 12 lectures, 3 credits

*Linear Cosmological Perturbations & CMB anisotropies*, Carlo Baccigalupi, bacci@sissa.it, 12 lectures, 3 credits

*Data Analysis in Astrophysics*, Giancarlo Ghirlanda, giancarlo.ghirlanda@inaf.it, 2 lectures, 0.5 credits

*Inter-Galactic Medium*, Stefano Cristiani, stefano.cristiani@oats.inaf.it, 6 lectures, 1.5 credits

## III TERM

*Compact objects*, John Miller, jcm@astro.ox.ac.uk, 8 lectures, 2 credits

*Gamma Ray Bursts and Cosmic Rays*, Lara Nava, lara.nava@inaf.it, 6 lectures, 1.5 credit

*Star Dynamics: Explosive NucleoSynthesis*, Marco Limongi, marco.limongi@inaf.it, 4 lectures, 1 credit

*Sub-mm Astronomy*, Marcella Massardi, massardi@ira.inaf.it, 6 lectures, 1.5 credit

*Astrobiology*, Giovanni Vladilo, vladilo@oats.inaf.it, 8 lectures, 2 credit

*Dynamics of Black Holes in Star Clusters*, Mario Spera, mario.spera@live.it, 8 lectures, 2 credit

*Gravitational Waves*, Enrico Barausse, barausse@sissa.it, 12 lectures, 3 credits

*GR & LSS*, Eleonora Villa, evilla@sissa.it, 4 lectures, 1 credit

*Inflation*, Paolo Creminelli, creminel@ictp.it, 8 lectures, 2 credits

## Room 135

Date/Time	08:30-10:00	10:00-11:30	11:30-13:00
1-ott-20			
2-ott-20			
3-ott-20			
4-ott-20			
5-ott-20		<b>APC Welcome Meeting</b>	
6-ott-20	Intro to GR 1	Statistical Methods for Astro/Cosmo 1	Stellar Structure and Evolution 1
7-ott-20	Radiative Processes 1	Computational Physics 1	Cosmology 1
8-ott-20	Intro to GR 2	Statistical Methods for Astro/Cosmo 2	Stellar Structure and Evolution 2
9-ott-20			
10-ott-20			
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12-ott-20			
13-ott-20	Intro to GR 3	Statistical Methods for Astro/Cosmo 3	Stellar Structure and Evolution 3
14-ott-20	Radiative Processes 2	Computational Physics 2	Cosmology 2
15-ott-20	Intro to GR 4	Statistical Methods for Astro/Cosmo 4	Stellar Structure and Evolution 4
16-ott-20			
17-ott-20			
18-ott-20			
19-ott-20			
20-ott-20	Intro to GR 5	Statistical Methods for Astro/Cosmo 5	Stellar Structure and Evolution 5
21-ott-20	Radiative Processes 3	Computational Physics 3	Cosmology 3
22-ott-20	Intro to GR 6	Statistical Methods for Astro/Cosmo 6	Stellar Structure and Evolution 6
23-ott-20			
24-ott-20			
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27-ott-20	Intro to GR 7	Statistical Methods for Astro/Cosmo 7	Stellar Structure and Evolution 7
28-ott-20	Radiative Processes 4	Computational Physics 4	Cosmology 4
29-ott-20	Intro to GR 8	Statistical Methods for Astro/Cosmo 8	Stellar Structure and Evolution 8
30-ott-20			
31-ott-20			
1-nov-20			
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3-nov-20			
4-nov-20	Intro to GR 9	Statistical Methods for Astro/Cosmo 9	Stellar Structure and Evolution 9
5-nov-20	Radiative Processes 5	Computational Physics 5	Cosmology 5
6-nov-20	Intro to GR 10	Statistical Methods for Astro/Cosmo 10	Stellar Structure and Evolution 10
7-nov-20			
8-nov-20			
9-nov-20			
10-nov-20	Intro to GR 11	Statistical Methods for Astro/Cosmo 11	Stellar Structure and Evolution 11
11-nov-20	Radiative Processes 6	Computational Physics 6	Cosmology 6
12-nov-20	Intro to GR 12	Statistical Methods for Astro/Cosmo 12	Stellar Structure and Evolution 12
13-nov-20	<b>SISSA Orientation Day</b>		
14-nov-20			
15-nov-20			
16-nov-20			
17-nov-20	Intro to GR 13	Statistical Methods for Astro/Cosmo 13 - NN1	Stellar Structure and Evolution 13

18-nov-20	Radiative Processes 7	Computational Physics 7	Cosmology 7
19-nov-20	Intro to GR 14	Statistical Methods for Astro/Cosmo 14 - NN2	Stellar Structure and Evolution 14
20-nov-20			
21-nov-20			
22-nov-20			
23-nov-20			
24-nov-20	Radiative Processes 8	High-Energy Astrophysics 1	Computational Physics 8
25-nov-20	Stellar Structure and Evolution - recovery	High-Energy Astrophysics 2	Cosmology 8
26-nov-20		<b>APC Orientation Meeting</b>	Stellar Structure and Evolution - recovery
27-nov-20			
28-nov-20			
29-nov-20			
30-nov-20			
1-dic-20		High-Energy Astrophysics 3	Cosmology 9
2-dic-20		High-Energy Astrophysics 4	Cosmology 10
3-dic-20			
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9-dic-20	How to give talks & write papers (Donevski)	High-Energy Astrophysics 5	Cosmology 11
10-dic-20	How to give talks & write papers (Donevski)	High-Energy Astrophysics 6	Cosmology 12
11-dic-20			
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15-dic-20	AGN evolution and cosmic backgrounds (Masini)	High-Energy Astrophysics 7	Cosmology 13
16-dic-20	AGN evolution and cosmic backgrounds (Masini)	High-Energy Astrophysics 8	Cosmology 14
17-dic-20		<b>APC Brainstorming (Interactive realtime pool)</b>	
18-dic-20			
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31-dic-20	<b>END OF I TERM</b>		
1-gen-21			
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11-gen-21	Gravitational Waves 1	Early Universe 1	Lin. Cosm. Pert. 1
12-gen-21	Gravitational Waves 2	Early Universe 2	Advanced GR 1
13-gen-21	Gravitational Waves 3	Early Universe 3	Lin. Cosm. Pert. 2
14-gen-21	Gravitational Waves 4	Early Universe 4	Advanced GR 2
15-gen-21			
16-gen-21			
17-gen-21			
18-gen-21	Gravitational Waves 5	Dark Matter 1	Lin. Cosm. Pert. 3
19-gen-21	Gravitational Waves 6	Large Scale Structure 1	Advanced GR 3
20-gen-21	Gravitational Waves 7	Dark Matter 2	Lin. Cosm. Pert. 4
21-gen-21	Gravitational Waves 8		Advanced GR 4
22-gen-21			
23-gen-21			
24-gen-21			
25-gen-21	Gravitational Waves 9	Dark Matter 3	Lin. Cosm. Pert. 5
26-gen-21	Gravitational Waves 10	Large Scale Structure 2	Advanced GR 5
27-gen-21	Gravitational Waves 11	Dark Matter 4	Lin. Cosm. Pert. 6
28-gen-21	Gravitational Waves 12		Advanced GR 6
29-gen-21			
30-gen-21			
31-gen-21			
1-feb-21		Dark Matter 5	Lin. Cosm. Pert. 7
2-feb-21		Large Scale Structure 3	Advanced GR 7
3-feb-21		Dark Matter 6	Lin. Cosm. Pert. 8
4-feb-21			Advanced GR 8
5-feb-21			
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7-feb-21			
8-feb-21		Dark Matter 7	Lin. Cosm. Pert. 9
9-feb-21		Large Scale Structure 4	Advanced GR 9
10-feb-21		Dark Matter 8	Lin. Cosm. Pert. 10
11-feb-21			Advanced GR 10
12-feb-21			
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15-feb-21		Dark Matter 9	Lin. Cosm. Pert. 11
16-feb-21		Large Scale Structure 5	Advanced GR 11
17-feb-21		Dark Matter 10	Lin. Cosm. Pert. 12
18-feb-21		Dark Matter 11	Advanced GR 12
19-feb-21			
20-feb-21			
21-feb-21			
22-feb-21		Dark Matter 12	Lin. Cosm. Pert. 13
23-feb-21		Large Scale Structure 6	Advanced GR 13
24-feb-21		Data Analysis 1	Lin. Cosm. Pert. 14
25-feb-21		Data Analysis 2	Advanced GR 14
26-feb-21			
27-feb-21			

28-feb-21			
1-mar-21			Structure formation 1
2-mar-21		Intergalactic Medium 1	Advanced GR 15
3-mar-21			Structure formation 2
4-mar-21		Intergalactic Medium 2	Advanced GR 16
5-mar-21			
6-mar-21			
7-mar-21			
8-mar-21			Structure formation 3
9-mar-21		Intergalactic Medium 3	Advanced GR 17
10-mar-21			Structure formation 4
11-mar-21		Intergalactic Medium 4	Advanced GR 18
12-mar-21			
13-mar-21			
14-mar-21			
15-mar-21			Structure formation 5
16-mar-21		Intergalactic Medium 5	Structure formation 6
17-mar-21			Structure formation 7
18-mar-21		Intergalactic Medium 6	Structure formation 8
19-mar-21			
20-mar-21			
21-mar-21			
22-mar-21			Structure formation 9
23-mar-21			Structure formation 10
24-mar-21			Structure formation 11
25-mar-21			Structure formation 12
26-mar-21			
27-mar-21			
28-mar-21	<b>END OF II TERM</b>		
29-mar-21			
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31-mar-21			
1-apr-21			
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12-apr-21		Explosive Nucleosynthesis 1	
13-apr-21		Explosive Nucleosynthesis 2	Compact Objects 1
14-apr-21		Explosive Nucleosynthesis 3	Compact Objects 2
15-apr-21		Explosive Nucleosynthesis 4	Compact Objects 3
16-apr-21			
17-apr-21			
18-apr-21			

19-apr-21		Astrobiology 1	Compact Objects 4
20-apr-21		Astrobiology 2	Compact Objects 5
21-apr-21	Gamma-Ray Bursts and CRs 1	Astrobiology 3	
22-apr-21	Gamma-Ray Bursts and CRs 2	Astrobiology 4	Compact Objects 6
23-apr-21			
24-apr-21			
25-apr-21			
26-apr-21	Gamma-Ray Bursts and CRs 3	Astrobiology 5	Compact Objects 7
27-apr-21	Gamma-Ray Bursts and CRs 4	Astrobiology 6	Compact Objects 8
28-apr-21	Gamma-Ray Bursts and CRs 5	Astrobiology 7	
29-apr-21	Gamma-Ray Bursts and CRs 6	Astrobiology 8	
30-apr-21			
1-mag-21			
2-mag-21			
3-mag-21	GR and LSS 1	Sub-mm Astronomy 1	Inflation 1
4-mag-21	GR and LSS 2	Sub-mm Astronomy 2	Inflation 2
5-mag-21	GR and LSS 3	Sub-mm Astronomy 3	Inflation 3
6-mag-21	GR and LSS 4	Sub-mm Astronomy 4	Inflation 4
7-mag-21			
8-mag-21			
9-mag-21			
10-mag-21	B-modes in CMB polarization 1	Sub-mm Astronomy 5	Inflation 5
11-mag-21	B-modes in CMB polarization 2	Sub-mm Astronomy 6	Inflation 6
12-mag-21	B-modes in CMB polarization 3		Inflation 7
13-mag-21	B-modes in CMB polarization 4		Inflation 8
14-mag-21			
15-mag-21			
16-mag-21			
17-mag-21		Dynamics of BHs in Star Clusters 1	
18-mag-21		Dynamics of BHs in Star Clusters 2	
19-mag-21		Dynamics of BHs in Star Clusters 3	
20-mag-21		Dynamics of BHs in Star Clusters 4	
21-mag-21			
22-mag-21			
23-mag-21			
24-mag-21		Dynamics of BHs in Star Clusters 5	
25-mag-21		Dynamics of BHs in Star Clusters 6	
26-mag-21		Dynamics of BHs in Star Clusters 7	
27-mag-21		Dynamics of BHs in Star Clusters 8	
28-mag-21			
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<b>END OF III TERM</b>			