

Course Planning – 2022/2023 Academic Year

PhD Program in Cognitive and Cultural Heritage.....	2
Track in Analysis and Management of Cultural Heritage	2
Track in Cognitive, Computational and Social Neurosciences	4
Track in Museum Studies	6
PhD in Economics, Analytics and Decision Sciences	8
PhD in Systems Science.....	11
Track in Computational Mechanics.....	11
Track in Complex Systems and Networks	13
Track in Learning and Control	15
Track in Software Quality	17

PhD Program in Cognitive and Cultural Heritage

Track in Analysis and Management of Cultural Heritage

Compulsory courses

Course Title	Hours	Lecturer(s)
History of Ancient Art and Archaeology	30	Maria Luisa Catoni
Aesthetics and Visual culture: Contextual Analysis and Individual Objects	30	Linda Bertelli
Cultural Heritage and Law	40	Andrea Averardi
Data Analysis and Management for Cultural Heritage	20	Fabio Pinelli
Decision-Making in Economics and Management	10	Massimo Riccaboni
East and West, Present and Past: The Cultural and Political Interplays between the Arabic World and Europe	30	Amos Bertolacci
History of Contemporary Art	20	Michele Dantini
History of Early Modern and Modern Art	30	Chiara Franceschini
Museology and History of Collecting	30	Emanuele Pellegrini
Temporary Organizing and Event Management in Cultural and Creative Industries	10	Yesim Tonga Uriarte

Compulsory Long Seminars

Course Title	Hours	Lecturer(s)
Culture and Arts: Economic Analysis and Public Policy	20	Stefano Baia Curioni
Geospatial approaches to cultural heritage	20	TBD
Management and Models of Organization of Cultural Institutions	20	Paola Dubini
Management of Complex Systems: Approaches to Problem Solving	40	Andrea Zocchi
		Simone Gerola
Project Management	35	TBD

Elective courses

Course Title	Hours	Lecturer(s)
Advanced Seminars	30	Maria Luisa Catoni (aperto a tutti i docenti)
Advanced Topics in Archaeology and Visual Studies	40	Maria Luisa Catoni, Linda Bertelli, Alessandro Poggio, Riccardo Olivito
Advanced Topics in Museology	30	Emanuele Pellegrini, Ruggero Longo
Advanced Topics in Archaeology II	10	TBD
Global Law	10	Andrea Averardi
Introduction to East and West: Language, History, Challenges of Islam	30	Amos Bertolacci
Sources and methods of the History of Medieval Philosophy	10	Silvia Di Vincenzo
History of Medieval Art	10	Ruggero Longo

PhD students may choose courses related to a different PhD Program/Track.

Track in Cognitive, Computational and Social Neurosciences

Compulsory courses

Course Title	Hous	Lecture(s)
Basic Principles and Applications of Brain Imaging Methodologies to Neuroscience	48	Emiliano Ricciardi
		Luca Cecchetti
Basic principles and Applications of Electrophysiology and Stimulation Techniques	52	Giulio Bernardi
		Monica Betta
		TBD (selezione)
		TBD (selezione)
Neurobiology of Emotion and Behavior	12	Pietro Pietrini
Neuroscience of Perception and Experience-Dependent Plasticity	48	Emiliano Ricciardi
		Davide Bottari
Principles of Brain Anatomy and Physiology	26	Luca Cecchetti
Research Seminars (no exam)	24	Pietro Pietrini
		Emiliano Ricciardi

Elective courses

Corsi	Totale ore	Docente(i)
Advanced Neuroimaging	32	Giacomo Handjaras
		TBD (selezione)
		TBD (selezione)
Basic Linear Algebra and Statistics for Neuroscience	30	Giorgio Gnecco
		Francesco Serti
Basic Programming for Neuroscience	30	Monica Betta
		Giulio Bernardi
Behavioral Economics	20	Ennio Bilancini
Brain Networks	10	Tommaso Gili
Clinical Psychopathology and Psychiatry	16	Pietro Pietrini
Cognitive Economics	14	TBD
Critical Thinking (no exam)	20	Gustavo Cevolani
Forensic and Legal Psychology	16	Pietro Pietrini
Funding and Management of Research and Intellectual Property (no exam)	10	Marco Paggi
Introduction to Consciousness and Sleep	20	Giulio Bernardi
Introduction to Neuropsychology	10	Francesca Garbarini
Introduction to Psychometrics	10	Luca Cecchetti
Introduction to Psychophysics	12	Davide Bottari
Machine Learning in Brain Disorders: Methods and Applications	10	Andrea Mechelli
Neuroeconomics	12	Folco Panizza
Philosophy and Neuroscience in Moral Reasoning	14	Gustavo Cevolani
		Camilla Francesca Colombo
Philosophy of Science (no exam)	20	Gustavo Cevolani
Theories of rationality (no exam)	10	Gustavo Cevolani
		Camilla Francesca Colombo
Trends in Human Neuroscience (long seminars without exam)	15	Enzo Pasquale Scilingo
		Silvestro Micera
		Sara Palumbo
		Andrea Guzzetta
		Antonio Bicchi

PhD students may choose courses related to a different PhD Program/Track.

Track in Museum Studies

Compulsory courses

Course Title	Hours	Lecture(s)
Museums in the present	20	TBD
Anthropology and cultural institutions	TBD	TBD
Museology	30	Emanuele Pellegrini
Museums, places, territories	30	TBD
Italian Cultural heritage law	30	Andrea Averardi/Lorenzo Casini
Global Cultural heritage law	30	Andrea Averardi/Lorenzo Casini
Preservation practices in Italy and abroad	15	Andrea Averardi/Lorenzo Casini
Valorization practices in Italy and abroad	15	Andrea Averardi/Lorenzo Casini
Topics in preservation and restoration	20	TBD
Public/private relationship in museums or archeological sites	10	Andrea Averardi/Lorenzo Casini
Museum professionals, hiring and staff management	20	TBD
Catalogue, provenance, provenience	15	Olivito
Loans, exhibitions, temporary events	15	TBD
Illicit trafficking	10	TBD (Comando Carabinieri?)
Topics in Cultural Heritage Communication	10	TBD
Topics in web communication	10	TBD
The public	10	TBD
Museum management and organization	35	TBD
IT for museums and archaeological sites	20	TBD
Methods for data analysis and database organization	20	TBD
Museums storages	20	TBD
Museums, training, research	15	TBD
Seminars: Memory, history, museums, displays. Case studies	18	Various Lecturers

Long Seminars

Advanced Topics in Archaeology
Objects and contexts
Musealizing archaeology
Museums storages - archaeology
Ancient art and museums
Public archaeology

Long Seminars

Advanced Topics in Art History
Objects and contexts
Musealizing contemporary art
Museums storages - art history
Art History and Museums

PhD students may choose courses related to a different PhD Program/Track.

PhD in Economics, Analytics and Decision Sciences

Scientific fields' key: E = Economics
A = Analytics
D = Decisions sciences

Basic courses (with exam) (LIST 1), compulsory, 5 courses, 120 hours

Course Title	Hours	Lecturer(s)	E	A	D
Analytics	20	Massimo Riccaboni	X	X	X
Business Dynamics and Decision-Making	20	Nicola Lattanzi	X	X	X
Game Theory	20	Ennio Bilancini	X	X	X
Econometrics I	20	Armando Rungi	X	X	X
Microeconomics	40	Kenan Huremovic	X	X	X
		Andrea Canidio			

Basic courses (without exam) (LIST 2), compulsory, 5 courses, 50 hours

Course Title	Hours	Lecturer(s)	E	A	D
Philosophy of Social Sciences	10	Gustavo Cevolani	X	X	X
Fundamentals of computer architectures	10	Mirco Tribastone	X	X	X
Cognitive neuroscience tools for economics	10	Emiliano Ricciardi	X	X	X
Regulation and competition in the digital economy	10	Andrea Averardi	X	X	X
Introduction to sustainability	10	Angelo Facchini	X	X	X

Advanced courses with optional exam (LIST 3), at least 6 courses, at least 100 hours

Course Title	Hours	Lecturer(s)	E	A	D
Applied Econometrics: Policy Evaluation and Causality	20	Francesco Serti	X	X	X
Behavioral Economics	20	Ennio Bilancini	X		X
Decision Intelligence for Business Strategy and Performance Management	20	Nicola Lattanzi		X	X
Fundamentals of SMEs Management	20	Nicola Lattanzi		X	X
Econometrics II	20	Armando Rungi	X	X	
Evolutionary Game Theory	20	Ennio Bilancini	X	X	
Experimental Economics	20	Chiara Nardi	X		X
Industrial Organization	20	Massimo Riccaboni	X	X	
Socio-Economic Networks	20	Massimo Riccaboni	X		X
Advanced Topics in Machine Learning	10	Giorgio Gnecco		X	
Stochastic Processes	20	Irene Crimaldi	X	X	X
Foundations of Probability and Statistical Inference	30	Irene Crimaldi	X	X	X
Markov Processes (OFFERTO anche agli allievi del S.Anna)	12	Irene Crimaldi	X	X	X
Matrix Algebra	10	Giorgio Gnecco	X	X	X

Advanced courses without exam (LIST 4), at least 4 courses, at least 50 hours

Course Title	Hours	Lecturer(s)	E	A	D
Applications of Stochastic Processes	20	Mirco Tribastone	X	X	X
Business Cycle Theories (c/o Scuola Sant'Anna)	15	Andrea Roventini	X		
Introduction to Network Science	20	Tiziano Squartini	X	X	X
Network Reconstruction	20	Tiziano Squartini	X	X	
Information Economics	10	Federico Vaccari	X		
Decision-Making in Economics and Management	10	Massimo Riccaboni			X
Critical Thinking	20	Gustavo Cevolani	X	X	X
Global Law	10	Andrea Averardi	X		X
Optimal Control and Differential Games	20	Giorgio Gnecco		x	X
Philosophy of Science	20	Gustavo Cevolani	X	X	X
Theories of rationality	10	Gustavo Cevolani	X		X
		Camilla Colombo			

International Economics	20	Armando Rungi	X	X	X
Sustainability and Ecological Economics	20	Angelo Facchini	X		
Computer programming with Python	20	Mirco Tribastone	X	X	X
Neuroeconomics	20	Folco Panizza	X		X
Introduction to Machine Learning	20	Alberto Bemporad	X	X	

Labs without exam (LIST 5), at least 40 hours

Course Title	Hours	Lecturer(s)	E	A	D
MATLAB for Data Science	20	Giorgio Gnecco		X	X
Python for Data Science	20	Fabio Pinelli	X	X	
R and Stata for Data Science	20	Francesco Serti	X	X	
Virtual Lab	20	TBD	X		X
Innovation Center Lab - NS	20	TBD	X		X

Elective Long seminars

The School offers every year a list of Long seminars. External members of the Scientific Board are invited as speakers to hold a seminar (10 hours each) on specific topics based on their expertise. The long seminar list is updated every year, also considering the current research interests of PhD students. Attendance is elective, and long seminars are open to all the cycles.

PhD students may choose courses related to a different PhD Program/Track.

PhD in Systems Science

Track in Computational Mechanics

Basic courses

Course Title	Hours	Lecturer(s)
Fundamentals of Numerical Analysis	20	Andrea Mola
Reduced Order Models and Applications	20	Andrea Mola (10)
		Mirco Tribastone (5)
		Marco Paggi (5)
Applications of Stochastic Processes	20	Mirco Tribastone
Basics of Technological, Social, and Legal Aspects of Cybersecurity	20	Paolo Prinetto
Principles of Programming with Python	30	Mirco Tribastone
Dynamics on Complex Networks	10	Rossana Mastrandrea
Game Theory	20	Ennio Bilancini
Introduction to Machine Learning	20	Alberto Bemporad
Introduction to Network Science	20	Tiziano Squartini
Network Reconstruction	20	Tiziano Squartini
Numerical Methods for the Solution of Partial Differential Equations	20	Marco Paggi
Numerical Optimization	20	Alberto Bemporad
Concurrent Programming (Principles)	30	Rocco De Nicola
Concurrent Programming (HPC)		Fabio Pinelli
Concurrent Programming (Distributed Computing)		Letterio Galletta/Emilio Incerto
Python for Data Science (noi exam)	20	Fabio Pinelli

Advanced courses

Course Title	Hours	Lecturer(s)
Advanced Topics in Computational Mechanics	20	Marco Paggi
		Pietro Lenarda
Computational Contact and Fracture Mechanics	20	Marco Paggi
Numerical Methods for Optimal Control	30	Mario Zanon
Computational Fluid Dynamics for Incompressible Fluids	20	TBA

Soft skills

Course Title	Hours	Lecturer(s)
Funding opportunities and management of intellectual property (no exam)	10	Marco Paggi
Publication Strategies and Scientific Dissemination (no exam)	10	Rocco De Nicola/Mirco Tribastone/Paolo Prinetto/Gabriele Costa
Fundamentals of academic entrepreneurship (no exam)	10	Marco Paggi (5)
		Massimo Riccaboni (5)

PhD students may choose courses related to a different PhD Program/Track.

Track in Complex Systems and Networks

Basic courses

Course Title	Hours	Lecturer(s)
Fundamentals of Numerical Analysis	20	Andrea Mola
Reduced Order Models and Applications	20	Andrea Mola (10)
		Mirco Tribastone (5)
		Marco Paggi (5)
Applications of Stochastic Processes	20	Mirco Tribastone
Brain Networks	10	Tommaso Gili
Principles of Programming with Python	30	Mirco Tribastone
Dynamics on Complex Networks	10	Rossana Mastrandrea
Foundations of Probability and Statistical Inference	30	Irene Crimaldi
Game Theory	20	Ennio Bilancini
Introduction to Machine Learning	20	Alberto Bemporad
Introduction to Network Science	20	Tiziano Squartini
Complexity and Sustainability	10	TBA
Markov Processes	12	Irene Crimaldi
Network Reconstruction	20	Tiziano Squartini
Numerical Methods for the Solution of Partial Differential Equations	20	Marco Paggi
Numerical Optimization	20	Alberto Bemporad

Advanced courses

Course Title	Hours	Lecturer(s)
Advanced Methods for Complex Systems	20	Diego Garlaschelli
Maximum-Entropy Models of Complex Systems I	20	Diego Garlaschelli
Maximum-Entropy Models of Complex Systems II	20	Tiziano Squartini
Numerical Methods for Optimal Control	30	Mario Zanon
Stochastic Processes	20	Irene Crimaldi

Soft skills

Course Title	Hours	Lecturer(s)
Funding opportunities and management of intellectual property (no exam)	10	Marco Paggi
Publication Strategies and Scientific Dissemination (no exam)	10	Rocco De Nicola/Mirco Tribastone/Paolo Prinetto/Gabriele Costa
Fundamentals of academic entrepreneurship (no exam)	10	Marco Paggi (5)
		Massimo Riccaboni (5)

PhD students may choose courses related to a different PhD Program/Track.

Track in Learning and Control

Basic courses

Course Title	Hours	Lecturer(s)
Fundamentals of Numerical Analysis	20	Andrea Mola
Reduced Order Models and Applications	20	Andrea Mola (10)
		Mirco Tribastone (5)
		Marco Paggi (5)
Applications of Stochastic Processes	20	Mirco Tribastone
Principles of Programming with Python	30	Mirco Tribastone
Dynamics on Complex Networks	10	Rossana Mastrandrea
Foundations of Probability and Statistical Inference	30	Irene Crimaldi
Game Theory	20	Ennio Bilancini
Introduction to Machine Learning	20	Alberto Bemporad
Introduction to Network Science	20	Tiziano Squartini
Markov Processes	12	Irene Crimaldi
Network Reconstruction	20	Tiziano Squartini
Numerical Methods for the Solution of Partial Differential Equations	20	Marco Paggi
Numerical Optimization	20	Alberto Bemporad
Concurrent Programming (Principles)	10	Rocco De Nicola
Python for Data Science (no exam)	20	Fabio Pinelli

Advanced courses

Course Title	Hours	Lecturer(s)
Advanced Topics in Machine Learning	10	Giorgio Gnecco
Model Predictive Control	20	Alberto Bemporad
Numerical Methods for Optimal Control	30	Mario Zanon
Optimal Control and Differential Games	20	Giorgio Gnecco
Reinforcement Learning	30	Mario Zanon
Stochastic Processes	20	Irene Crimaldi

Soft skills

Course Title	Hours	Lecturer(s)
Funding opportunities and management of intellectual property (no exam)	10	Marco Paggi
Publication Strategies and Scientific Dissemination (no exam)	10	Rocco De Nicola/Mirco Tribastone/Paolo Prinetto/Gabriele Costa
Fundamentals of academic entrepreneurship (no exam)	10	Marco Paggi (5)
		Massimo Riccaboni (5)

PhD students may choose courses related to a different PhD Program/Track.

Track in Software Quality

Basic courses

Course Title	Hours	Lecturer(s)
Fundamentals of Numerical Analysis	20	Andrea Mola
Reduced Order Models and Applications	20	Andrea Mola (10)
		Mirco Tribastone (5)
		Marco Paggi (5)
Applications of Stochastic Processes	20	Mirco Tribastone
Basics of Technological, Social, and Legal Aspects of Cybersecurity	20	Paolo Prinetto
Principles of Programming with Python	30	Mirco Tribastone
Dynamics on Complex Networks	10	Rossana Mastrandrea
Game Theory	20	Ennio Bilancini
Introduction to Machine Learning	20	Alberto Bemporad
Introduction to Network Science	20	Tiziano Squartini
Concurrent Programming (Principles)	10	Rocco De Nicola
Python for Data Science (no exam)	20	Fabio Pinelli
Introduction to Formal Methods	20	Rocco De Nicola/Mirco Tribastone

Advanced courses

Course Title	Hours	Lecturer(s)
Software Security	20	Gabriele Costa
Vulnerability Assessment and Penetration Testing	20	Gabriele Costa
Modelling and Verification of Reactive Systems	20	Rocco De Nicola
Optimal Control and Differential Games	20	Giorgio Gnecco
Reinforcement Learning	30	Mario Zanon
Research Topics in Software Quality	20	Gabriele Costa
Software Verification	20	Gabriele Costa
		Letterio Galletta

Soft skills

Course Title	Hours	Lecturer(s)
Funding opportunities and management of intellectual property (no exam)	10	Marco Paggi
Publication Strategies and Scientific Dissemination (no exam)	10	Rocco De Nicola/Mirco Tribastone/Paolo Prinetto/Gabriele Costa
Fundamentals of academic entrepreneurship (no exam)	10	Marco Paggi (5)
		Massimo Riccaboni (5)

PhD students may choose courses related to a different PhD Program/Track.