

## Teaching plan - PhD programme in Chemical, Geological and Environmental Sciences

39°Cycle a.y. 2023/2024

Course	Teacher(s)	SSD	hrs	credits	Educational form*	Type of activity**	
Science: Observation and Prejudice	Eduardo Garzanti	GEO/02	8	1	Lecture	Intercurricular	Chosen activity
Communication of Climate Change	Claudia Pasquero	GEO/12	8	1	Lecture	Intercurricular	Chosen activity
The Climatic Role of Atmospheric Aerosol in the Arctic	Luca Ferrero	CHIM/12	8	1	Lecture	Intercurricular	Chosen activity
Ice Core Science	Barbara Delmonte	GEO/04	8	1	Lecture	Intercurricular	Chosen activity
Scanning and Transmission Electron Microscopy, Principles and Applications	Giancarlo Capitani, Paride Mantecca, Giovanni Maria Vanacore,	GEO/06	28	3	Lecture & laboratory training	Intercurricular	Chosen activity
Raman Spectroscopy: A Flexible Tool for an Integrated Research Approach	Sergio Andò, Maria Luce Frezzotti + didattica seminariale	GEO/02	16	2	Lecture	Intercurricular	Chosen activity
Scanning Probe Microscopy: Principles, Applications, and Image Handling	Marcello Campione	FIS/01	12	1	Laboratory training	Intercurricular	Chosen activity

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Sustainable Chemical Processing Technologies	Heiko Lange, Luca Zoia	CHIM/06	16	2	Lecture	Intercurricular	Chosen activity
New Lignin-Based Sustainable Materials: Science and Technological Aspects	Luca Zoia, Ruggero Barni	CHIM/06	8	1	Lecture	Intercurricular	Chosen activity
Critical Raw Materials and Their Environmental Impact	Alessandro Cavallo	GEO/09	16	2	Lecture	Intercurricular	Chosen activity
Isotopes as Environmental Tracers	Barbara Leoni, Marco Rotiroti	BIO/07	20	2	Lecture & laboratory training	Intercurricular	Chosen activity
Enhancement of Fragile Cultural Heritage	Ezio Bolzacchini, Chiara Rostagno, Luca Ferrero	CHIM/12	20	2	Lecture & laboratory training	Intercurricular	Chosen activity
Machine Learning for Multivariate Data Analysis	Davide Ballabio	CHIM/01	20	2	Lecture & laboratory training	Intercurricular	Chosen activity

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Open-Source Software for Spatial Data Analysis	Micol Rossini	GEO/04	16	2	Lecture	Intercurricular	Chosen activity
Spatial Variability of Environmental Characteristics and Mapping Methodologies	Chiara Ferrè	AGR/14	16	2	Lecture	Intercurricular	Chosen activity
Time Series Analysis of Environmental Data	Tullia Bonomi + didattica seminariale	GEO/05	20	2	Lecture & laboratory training	Intercurricular	Chosen activity
Advanced Techniques for Sample P	Veronica Termopoli, Fabio Gosetti	CHIM/01	16	2	Lecture	Chemistry Curricular	Mandatory activity
NMR spectroscopy applications to ligand-receptor studies	Cristina Airoidi	CHIM/06	20	2	Lecture	Chemistry Curricular	Chosen activity
NMR spectroscopy of molecular Inorganic and Organometallic Compounds	Roberto Della Pergola	CHIM/03	8	1	Lecture	Chemistry Curricular	Chosen activity
Advanced Theoretical Chemistry	Piercarlo Fantucci	CHIM/03	16	2	Lecture	Chemistry Curricular	Chosen activity
Crystallography and Laboratory of X-ray powder diffraction	Massimo Moret, Chiara Ferrara	CHIM/03, CHIM/02	20	2	Lecture & laboratory training	Chemistry Curricular	Chosen activity

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Introduction to photochemistry	Luca Bertini, Claudio Greco, Antonio Papagni	CHIM/02, CHIM/03, CHIM/06	24	3	Lecture	Chemistry Curricular	Chosen activity
Detrital geochronology and thermochronology	Marco G. Malusà + didattica seminariale	GEO/02	16	2	Lecture	Geology Curricular	Chosen activity
Provenance analysis: how to integrate single grain and bulk techniques	Sergio Andò, Alberto Resentini	GEO/02	16	2	Lecture	Geology Curricular	Chosen activity
Fluids in the Earth	Robert Bodnar, Maria Luce Frezzotti, Rosario Esposito	GEO/07	16	2	Lecture	Geology Curricular	Mandatory activity
Monte Carlo Approach to Geophysical Inverse Problem: An Introduction	Nicola Piana Agostinetti	GEO/11	20	2	Lecture & Laboratry training	Geology Curricular	Chosen activity
Advanced Field and Remote-Sensed Characterization of Rock Fractures in Outcrops	Federico Agliardi, Andrea Bistacchi	GEO/05	18	2	Lecture & Laboratry training	Geology Curricular	Chosen activity
Introduction to geodynamic and landscape evolution numerical modeling	Pietro Sternai	GEO/03	20	2	Lecture, computer work	Geology Curricular	Chosen activity

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UAV/ROV and Immersive Virtual Reality for Research in Earth Sciences	Fabio Luca Bonali, Luca Fallati	GEO/03	18	2	Lecture & Field activity	Geology Curricular	Chosen activity
Geoenergy and Geomechanics	Giovanni Battista Crosta, Riccardo Castellanza	GEO/05	16	2	Lecture	Geology Curricular	Chosen activity
Advanced Experimental Testing and Monitoring on Geomaterials	Giovanni Battista Crosta, Riccardo Castellanza	ICAR/07	20	2	Lecture & Laboratory training	Geology Curricular	Chosen activity
Geotechnical Modelling for Slope Stability and Underground Geostuctures	Giovanni Battista Crosta, Riccardo Castellanza	ICAR/07	20	2	Lecture & Laboratory training	Geology Curricular	Chosen activity
Native Plant Assemblages to Restore Degraded Lands	Sandra Citterio, Rodolfo Gentili	BIO/01	8	1	Lecture	Environment Curricular	Chosen activity
Non-Animal Testing and Research: Ethical Issues and Scientific Applications	Chiara Urani	BIO/06	8	1	Lecture	Environment Curricular	Chosen activity
Ecological Baseline and Conservation Paleobiology	Daniela Basso, Valentina Bracchi	GEO/01	16	2	Lecture	Environment Curricular	Chosen activity

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Next Generation Sequencing and Bioinformatic Tools for Ecological Studies	Andrea Franzetti, Isabella Gandolfi	BIO/19	20	2	Lecture & Laboratory training	Environment Curricular	Chosen activity
Advanced Human Ecology	Emilio Padoa-Schioppa	BIO/07	16	2	Lecture	Environment Curricular	Chosen activity
Ecosystem Services	Emilio Padoa-Schioppa + didattica seminariale	BIO/07	16	2	Lecture	Environment Curricular	Chosen activity
Acoustics Applied to the Environment: Soundscape as Environmental Quality Index	Giovanni Zambon	FIS/07	8	1	Lecture	Environment Curricular	Chosen activity
39			616	70			

### Altre attività

Seminar Course	Seminari didattici obbligatori durante i quali i dottorandi presentano argomenti scientifici al fine di favorire il confronto interdisciplinare tra dottorandi ed esercitare le capacità di esporre temi scientifici anche ad un pubblico di non esperti (secondo anno, 1 cfu)		12	1	Seminar		
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Giornata del Dottorato SCGA	Evento a cadenza annuale organizzato dai dottorandi in collaborazione con la Giunta di Dottorato, che prevede seminari con relatori di calibro internazionale, tra cui i membri stranieri del Collegio dei docenti, e una sessione poster a cura dei dottorandi (1 cfu)			1			
Climate Journal Club	Attività seminariali opzionali sui temi relativi al cambiamento climatico (2 cfu, 20 ore)		20	2	Seminar		
4th School of Heavy Mineral Analysis	Scuola avanzata sull'analisi di minerali pesanti mediante metodi ottici classici e spettroscopia Raman per lo studio di provenienza dei sedimenti (3 cfu, 16 ore di lezioni frontali e 12 ore di laboratorio; 5 posti gratuiti per dottorandi SCGA)		30	3	Lecture & Laboratory training		