Course unit English denomination	Advanced tools for hydrology in a changing climate
SS	CEAR-01/B
Teacher in charge (if defined)	Gianluca Botter, Matteo Camporese, Marco Marani, Pietro Teatini
Teaching Hours	24
Number of ECTS credits allocated	3
Course period	May-June
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (75% minimum of presence) ☐ No
Course unit contents	• Climate change and the hydrologic cycle (6 hours - Marani): processes regulating the water cycle and energy balance at global and various scales of hydrological interest, acceleration of the hydrological cycle produced by increasing greenhouse gas concentrations, and considerations of the implications for extreme and drought events. • Observation and modeling approaches in hydrology of non-perennial streams (6 ore - hours): challenges in monitoring non perennial streams, monitoring approaches including high tech sensors, general theoretical framework for describing wetting and drying cycles in intermittent streams, spatial patterns and temporal fluctuations of river network dynamics, extrapolation of empirical data in space and time. • Integrated surface-subsurface hydrological models (ISSHMs) as tools to understand processes driving shifts in river catchments (6 hours - Camporese): theoretical foundations, tutorial and application example of an open-source ISSHM. • Data assimilation for hydrological modeling (6 hours - Teatini): quantification of uncertainty (and parameter calibration) in large scale systems using Monte-Carlo based methods and surrogate modelling approaches.
Learning goals	To gain skills and knowledge that will be useful for the PhD candidate to tackle complex issues, develop innovative study methodologies, and

	propose original solutions in various fields of hydrological research.
Teaching methods	Theoretical lectures and hands-on exercises
Course on transversal, interdisciplinary, transdisciplinary skills	☒ Yes ☐ No
Available for PhD students from other courses	☒ Yes ☐ No
Prerequisites (not mandatory)	
Examination methods (if applicable)	Discussion of exercises developed in class
Suggested readings	Lecture notes and relevant scientific papers
Additional information	