Course: Sedimentology
Lecturer: Massimo Moretti
Year: 2019-2020

Course	Sedimentology
SSD	GEO/02
Year	2019-2020
Code of Teaching	007900
Semester	II
Lecturer	Massimo Moretti
CFU	6 (4 lessons + 1 laboratory + 1 field activity)
Semester	from March 1st to June 15th
Prerequisites	Geology
Prerequisites	The achievement of the training objectives requires the previous knowledge of i) topics of the first year of lessons (essentially Geology) and ii) generic skills in scientific subjects. Workers and non-attending students possess these prerequisites in a way that is similar to those who attend.
Formative objectives	***Knowledge and understanding skills*** The training objectives concern both the assimilation of the basic concepts of Sedimentology and the ability to apply such concepts. Training is aimed at understanding the processes that govern the sedimentation dynamics. Learning of sedimentary processes using a rigorous scientific approach, supporting each concept with field data, analog models and numerical models. ***Ability to apply knowledge and understanding*** Students learn how to apply the basic concepts of sedimentology (grain-size, morphology of sediments, fluid dynamics rules, kind of sedimentary flows, sedimentary structures, etc.) to the complex environmental systems such as sedimentary environments; furthermore, students learn to apply the knowledge of sedimentary processes in present-day continental/transition/marine contexts and, through the basic principles of geology, to the "fossil" deposits. It allows to acquire the ability to predict volumes, geometries and lithological features of sedimentary bodies. ***Judgment autonomy*** The ability to identify approaches and techniques that are suitable for solving procedures of specific issues. This skill is verified and stimulated in laboratory and field activities through discussion and first

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	confrontation on educational cases and, later, on real environmental issues of increasing complexity. ***Communicative Skills*** Ability to express the theoretical and practical aspects related to study topics, with particular reference to the description of the techniques and procedures for measuring, processing and interpreting data collected in the campaign or on samples using specific language properties. The ability to describe, in a direct and logical way, the relationships between the various learned concepts and topics through oral and written tutorial exercises and collective. ***Learning ability*** Acquiring the ability to analyze complex issues through linear learning pathways. The integration of these basic pathways takes place through autonomous arguments aimed at recognizing interactions between different environmental matrices (eg biological activity). This ability is verified by discussing the topics of examination.

Didactic methods	**Lessons**	**Laboratory activities + Field Trip**	**Tot**
Assisted teaching	*36*	*40*	*76*
Individual study hours	*64*	*10*	*74*
CFU	*4*	*1+1*	*6*

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Evaluation Methods	Student exam is mainly an oral test. ***EVALUATION CRITERIA*** ***Knowledge and understanding skills*** The student must know in detail the processes of erosion, transport and sedimentation in the different sedimentary environments He must show demostrate to have the masterhood of main the tools for the evaluation of the relationship between sediment processes and products. ***Ability to apply knowledge and understanding*** The student must be able to apply the theoretical principles that govern the interaction between fluid dynamics, granulometry and sediment morphometry. The knowledge gained about the interactions between different depositional processes and the understanding of the factors that govern the evolution of depositional systems over time should be applied to known examples. ***Judgment autonomy*** The student must demonstrate how to opt for a methodological approach that describes, measures, interprets the main physical processes that govern the dynamics of sedimentary environments. ***Communicative Skills*** The student must demonstrate the ability to show his level of knowledge and understanding achieved with clarity and specific language properties. ***Learning ability*** The student must demonstrate the ability to learn the course topics through a reasoned path that will help his problem solving skills. The student must also demonstrate that he has acquired individual learning experiences through the computer tools for the treatment of sedimentary data.
Program of the Course	**Introduction** What does sedimentology study? The main applications of Sedimentology to the Environmental Issues. **Clastic sediments** Grain-size analysis and statistical procedures on the grain-size distributions **Fluid dynamics** Fluid motion (steady, non-stationary, uniform and not uniform); laminar flows and turbulent flows; the number of Reynolds and the transition between laminar and turbulent regime; the boundary layer; Bagnold equation; suspended load and bed load; Hjulstrom diagram; Traction and in mass flows and the recognition of their sedimentary products.

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	Sedimentary structures *Traction structures* Froude number and Leeder diagram; ripples and cross-lamination; types of ripples (asymmetric, symmetrical, interference, climbing); parallel lamination; bars and sand wave; scour and fill; hummocky and swaley; flaser, lenticular and wavy lamination. Debris flows, gravitative flows and their products. Graded lamination and bedding. *Erosional structures* Scale and distribution. The nature of erosional surfaces. Mark and Cast *Chemical, physical and biogenic structures* *Soft-sediment deformation structures* **Stratigraphy and Sedimentology** Definition of Bed and Bedding. Bed sets. thinning e thickening upward and fining-coarsening-upward sequences. Facies definition: the Walther's Law. **Sedimentary environments** Facies associations, sub-environments, sedimentary environments and depostional systems. *Continental environments* Alluvial fans, braided, meander and anastomosing rivers, lacustrine and eolian environments *Transitional environments* Wave-dominated beaches and deltas *Marine environments* Passive margins and continental shelf/slope/abyssal plain systems. Trench and foreland basins in subduction setting. *Carbonate platforms* *Sequence stratigraphy and evolution of sedimentary environments*
Textbooks	*Ricci Lucchi F., Sedimentologia. 3 volumi, Bologna,* CLUEB*, 1980.* Bosellini B., Mutti E., Ricci Lucchi F. Rocce e successioni sedimentarie. UTET. 1989. Ricci Lucchi, F. Sedimentografia. Atlante fotografico delle strutture dei sedimenti. Zanichelli 1992.
Other course materials	*Slide presentations*

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