

| General information                                       |               |                                |
|---|---------------|--------------------------------|
| Academic subject  | Evolutionary  | Paleoecology                   |
| Degree course   | Science of Na | ature and Environment          |
| Academic Year   | 2021-2022     |                                |
| European Credit Transfer and Accumulation System (ECTS) 6 |               |                                |
| Language  | Italian       |                                |
| Academic calendar (starting and ending date)              |               | 4 October 2021-21 January 2022 |
| Attendance  | Strongly reco | ommended                       |

| Professor/ Lecturer     |  |
|-------------------------|--|
| Name and Surname        | Maria Marino   |
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| Telephone               | 0805443454 - 3397429003  |
| Department and address  | Dipartimento di Scienze della Terra e Geoambientali, Campus universitario, via |
|                         | Orabona 4 -70125 Bari  |
| Virtual headquarters    |  |
| Tutoring (time and day) | Monday h 15-17, Thuesday h 15-17, Palazzo di Scienze della Terra, Universitary |
|                         | Campus. Always after appointment by email                                      |

| Syllabus             |   |
|----------------------|---|
| Learning Objectives  | To knowledge the history of Life evolution through time combined with the             |
|                      | evolution of Earth and its components. To knowledge the cultural value of             |
|                      | paleontological heritage of the Earth.  |
| Course prerequisites | Geologic Time Scale, Plate tectonics  |
| Contents             | General introduction on the course teaching   |
|                      | 5 CFU/ECTS of oral teaching, 0,5 CFU/ECTS class exercises, 0,5 CFU/ECTS field         |
|                      | exercise  |
|                      | Main topics   |
|                      | Basic elements of Paleoecology and Paleobiogeography. Evolution of marine and         |
|                      | terrestrial ecosystems through Phanerozoic by examining the main biological           |
|                      | changes provided by fossil record.  |
|                      | Paleozoic   |
|                      | Paleogeography and Climate from Cambrian to Permian. Cambrian Life Radiation.         |
|                      | Lagerstatten of Burgess Shales, Chengjiang, Hunsruck, Rhynie, Mazon Creek,            |
|                      | Karoo. Marine invertebrates. First vertebrates, evolution from fish to amphibious     |
|                      | and reptiles. First plants. Failure of Carboniferous forests. Changes at the end of   |
|                      | Paleozoic and Permian mass extinction.  |
|                      | Mesozoic  |
|                      | Paleogeography and Climate from Trias to Cretaceous. Increase of biodiversity.        |
|                      | Lagerstatten of Holzmaden Shale, Morrison, Jehol. Marine invertebrates. Rudists,      |
|                      | Ammonoids. Marine vertebrates, first avial reptiles. First dinosaurs, their evolution |
|                      | and "extinction". First Mammalia. Dinosauria-Birds. Archaeopteryx and other new       |
|                      | findings on dinosaur-bird transition. Vegetation, radiation of angiosperms, co-       |
|                      | evolution of insects. Phytoplankton evolution   |
|                      | Cenozoic  |
|                      | Paleogeography and Climate. Paleocene-Eocene Thermal maximum. Antarctic               |
|                      | glaciation (Eocene-Oligocene). Lagerstatten of Grube Messel, Bolca. The big           |
|                      | benthic foraminifera and new planktonic foraminifera. Radiation of mammal             |
|                      | fauna. Gigant birds. Equid and climate evolution. Messinian salinity crisis. Panama   |

## DIPARTIMENTO DI BIOLOGIA



|                        | Isthmus closure. The Gulf Current. Thermohaline circulation, Arctic ice sheet and    |  |
|------------------------|--|--|
|                        | biotic consequence in marine and terrestrial flora and fauna.                        |  |
|                        | Quaternary   |  |
|                        | Paleogeography and Climate. Calcareous plankton and climate changes at orbital       |  |
|                        | and sub-orbital scale (Heinrich and D-O events). Extinction of mega-fauna. Main      |  |
|                        | changes of mollusc fauna in Mediterranean Sea.                                       |  |
|                        | Class exercises  |  |
|                        | Study of samples with different invertebrate fossil content based on macroscopic     |  |
|                        | and microscopic analyses. Paleoecological indices, cluster analysis, PCA. Basic      |  |
|                        | spectral analysis.   |  |
|                        | Field activity   |  |
|                        | Field location is chosen year by year to improve paleontological methods of          |  |
|                        | investigation or to visit paleontological site/museum.                               |  |
| Books and bibliography | Palaeoecology: Ecosystems, environments and Evolution. Brenchley P.J. and            |  |
|                        | Harper D.A.T., Chapman & Hall Editors (available online).                            |  |
|                        | Cause of Quaternary Megafauna extinction by Marianne Lehnert (available online)      |  |
|                        | Evolution of fossil ecosystems. Selden P. & Nudds J., II Edition, 2012. ISBN: 987-1- |  |
|                        | 84076-160-3 (available online)   |  |
|                        | The first Vertebrate, oceans of the Paleozoic Era. Holmes T. 2008. ISBN ISBN 978-    |  |
|                        | 0-8160-59584 (available online).   |  |
|                        | MANUALE di PALEONTOLOGIA FONDAMENTI – APPLICAZIONI. Edizioni Idelson                 |  |
|                        | Gnocchi 1908 Srl, aprile 2020. 472 pp. ISBN: 9788879477147                           |  |
| Additional materials   | Other scientific papers from online literature. Electronic lectures performed in the |  |
|                        | classroom  |  |

| Work schedule              |               |             |  |                        |
|----------------------------|---------------|-------------|--|------------------------|
| Total                      | Lectures      |             | Hands on (Laboratory, working groups, seminars,                      | Out-of-class study     |
|                            |               |             | field trips)   | hours/ Self-study      |
|                            |               |             |  | hours                  |
| Hours                      | _             |             |  |                        |
| 157.5                      | 40            |             | 7.5+10   | 100                    |
| ECTS                       |               |             |  |                        |
| 6                          | 5             |             | 0.5 exercise +0.5 field trip   |                        |
| Teaching strategy          | /             |             |  |                        |
|                            |               | Lectures    | and exercises as blended learning, field trip                        |                        |
| Expected learning          | g outcomes    |             |  |                        |
| Knowledge and u            | Inderstanding | The stud    | ent has to know all topics developed during the semester in order to |                        |
| on:                        |               | understa    | nd evolution of Earth's terrestrial and marine eco                   | systems through the    |
|                            |               | Cambriar    | n - Recent time by scrutinizing the most important Li                | fe evolutionary steps  |
|                            |               | documer     | ited in the fossil record. The knowledge of main phy                 | sical modifications of |
|                            |               | Earth thr   | ough geologic time and the comprehension of relation                 | onships among all the  |
|                            |               | compone     | ents of our planet including marine and terrestrial                  | Biota represent the    |
|                            |               | most imp    | portant issue of the teaching. The taught class is the               | main didactic tool to  |
|                            |               | acquire t   | his knowledge.   |                        |
| Applying knowle            | dge and       | The stud    | ent has to improve its ability to connect the mod                    | ifications of physical |
| understanding on: paleoenv |               | paleoenv    | rironmens with Life evolution during the Phanerozoic. He must to     |                        |
|                            |               | recognize   | e the evolutionary processes, which drove the most i                 | important changes of   |
|                            |               | terrestria  | I and marine organisms during the different clin                     | nate phases, diverse   |
|                            |               | paleogec    | graphic and geological settings characterizing the                   | past 600 Ma. Such      |
|                            |               | abilities a | are acquired through taught class and class discussic                | on on paleoecological  |



|             | and paleoenvironmental key topics concerning crucial changes of Earth's history.  |
|-------------|---|
| Soft skills | <ul> <li>Making informed judgments and choices         At the end of course, the student has to be able to: critically argue and discuss the meaning of the fossils for the reconstruction of Earth's history and past ecosystems; interpret the evolutionary innovations of Life and their relations with past paleoenvironments. These abilities are improved during class discussion of paleobiological problems.     </li> <li>Communicating knowledge and understanding         At the end of course, the student has to have acquired the scientific glossary to carefully describe concepts on the past ecosystems evolution by means of specific paleontological terminology. The student is stimulated to work and discuss together with other colleagues during class teaching in order to improve the communication skills.     </li> <li>Capacities to continue learning         At the end of course, the student has to have acquired i) the capability to obtain additional scientific information and integration with different disciplines; ii) the ability to recognize the main evolutionary phases of biodiversity changes and the     </li> </ul> |
|             | relations between biotic and abiotic factors, which acted through time; iii) the ability to provide deeper knowledge on some paleontological topics of crucial interest by means of personal bibliographic research.  |

| Assessment and feedback       |   |
|-------------------------------|---|
| Methods of assessment         | Oral exam concerning the topics of the course + a free lecture (15 minutes, by ppt)<br>on a scientific article from open literature concerning a topic of the course and<br>indicated by the teacher                                |
| Evaluation criteria           | Knowledge and understanding   |
|                               | The student has to demonstrate to know all the themes of the course. This is necessary to achieve a positive evaluation.  |
|                               | Ability to apply knowledge and understanding  |
|                               | The student has to discuss carefully the complex relationships between abiotic and biotic factors, which controlled the Life evolution. This is necessary to achieve a positive evaluation.   |
|                               | Autonomy of judgment  |
|                               | The student has to show ability to discuss evolutionary problematics by connecting information from many integrated disciplines such as geology, botanic, ecology, zoology. This is necessary to obtain a very positive evaluation. |
|                               | A very positive evaluation is based on the student skill concerning good and  |
|                               | appropriate scientific terminology and clear exposition of complex concepts.<br>Capacities to continue learning   |
|                               | The student has to document its ability to acquire independent advanced   |
|                               | knowledge and critical thinking during discussion of paleontological themes. This may provide an excellent evaluation.  |
| Criteria for assessment and   | Appropriate scientific terminology and clear exposition of complex concepts   |
| attribution of the final mark | related to contents of the course and other disciplines such as Geology, Ecology,   |
|                               | Zoology. Degree of participation to lecture, discussion and exercises performed in  |
|                               | classroom.  |
| Additional information        |   |
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UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO DI BIOLOGIA