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| Academic subject: Geometry 4 | | | |
| Degree Class: L-35 | | Degree Course: Mathematics | Academic Year: 2018/2019 |
| | | Kind of class: mandatory | Year: 2 |
| | | | Period: 2 |
| | | | ECTS: 8 divided into ECTS lessons: 5 ECTS exe: 3 |
| Time management, hours, in-class study hours, out-of-class study hours lesson: 40 exe: 30 in-class study: 70 out-of-class study: 130 | | | |
| Language: Italian | Compulsory Attendance: No | | |
| Subject Teacher: Maria Falcitelli | Tel: 39 0805442844 e-mail: maria.falcitelli@uniba.it | Office: Department of Mathematics Room 9, Floor 3 | Office days and hours: Thursday 11-13. Other days, by appointment. |
| Prerequisites: Mathematical knowledge which is usually acquired during the first three semester of the degree in Mathematics. In particular: elementary set theory, affine and projective Geometry, basic concepts of classical Analysis, such as continuous functions. | | | |
| Educational objectives: Acquiring basic concepts in general Topology, in particular the main examples of topological spaces, the main properties of continuous maps and the properties of a topological space which are invariant under homeomorphisms. | | | |
| Expected learning outcomes (according to Dublin Descriptors) | <p>Knowledge and understanding: Acquiring new fundamental concepts and new methods of proof.</p> <p>Applying knowledge and understanding: The acquired knowledge is useful in many Scientific branches, such as Topography and Graph theory.</p> <p>Making judgements: Ability in developing new methods which are useful in problem solving.</p> <p>Communication: Students should acquire the Mathematical language and the formalism which are necessary to analyze and solve problems.</p> <p>Lifelong learning skills: Acquiring suitable learning methods, relating the main concepts occurring in various Mathematical disciplines.</p> | | |
| Course program | | | |
| <p>Topological spaces.</p> <p>A topology on a set: definition and examples. Bases for a topological space. The topology generated by a base. Neighborhoods of a point, neighborhoods systems. The topology generated by a neighborhood system. Axioms of countability.</p> <p>Metric spaces.</p> <p>Definition of a metric space and examples. Open balls. The topology induced by a metric. Metric spaces satisfy the first axiom of countability. Equivalent metrics. The distance from a point to a set.</p> <p>Subsets of a topological space.</p> <p>The interior, the exterior and the boundary of a set. Closed sets. The closure of a set. The link between the closure, the boundary and the exterior. Examples. Dense sets and separable spaces.</p> <p>Continuous mappings.</p> <p>Definition, characterization and examples of a continuous mapping. Open mappings. Homeomorphisms: definition, characterization and examples. The group of homeomorphisms of a topological space. Topological properties. The glueing lemma for continuous mappings.</p> <p>Subspaces.</p> <p>The topology induced on a subset. Subspaces of a topological space. Convex sets. Subspaces and continuous mappings.</p> <p>Product, quotient spaces.</p> <p>The product topology of n topologies. The canonical projections of the product space are continuous and open mappings. A characterization for continuous mappings taking values in a product space. The quotient topology on a set relative to a map and its universal property. Identifications. The equivalence relation associated with an identification.</p> | | | |

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| <p>The canonical topology of a real or complex projective space. Topological properties of non degenerate conics. The Möbius band. Topological groups.</p> <p>Axioms of separation.</p> <p>Fréchet spaces. Hausdorff spaces. Examples. Limit point of a sequence of points. The uniqueness theorem for the limit point in an Hausdorff space. Regular spaces. Normal spaces. Examples. Continuous mappings and the axioms of separation. A characterization theorem for Hausdorff quotient spaces. Real projective spaces are Hausdorff .</p> <p>Compact spaces.</p> <p>Open covers of a topological space. Definition and characterization of a compact space. Closed subsets of a compact space. Compact subspaces of a metric space. Continuous mappings whose domain is a compact space. Examples. The normality property of a compact, Hausdorff space. Examples.</p> <p>Connected spaces.</p> <p>Definition and characterization of a connected (disconnected) space. Connected subspaces. The connected subsets of the real line. Continuous mappings whose domain is a connected space. The mean value theorem. The product space of n connected spaces. Examples. The connected component of a point: definition and properties. A characterization of connected spaces involving connected components. Examples.</p> <p>Pathwise connected spaces.</p> <p>Definition of a pathwise connected space. Pathwise connected spaces are connected. Continuous mapping whose domain is pathwise connected. Locally Euclidean spaces. The main examples of pathwise connected spaces: convex subsets of the Euclidean space, connected and locally Euclidean spaces, the product of n pathwise connected spaces.</p> |
| <p>Teaching methods: Lectures and exercise sessions.</p> |
| <p>Auxiliary teaching: Didactic material available at: www.dm.uniba.it/lotta</p> |
| <p>Assessment methods: Written and oral exam.</p> |
| <p>Bibliography:</p> <ul style="list-style-type: none"> A. Loi - Introduzione alla Topologia generale, Aracne Editrice, 2013. B. M. Manetti – Topologia, Springer-Verlag Italia, 2014. C. E. Sernesi – Geometria 2, Bollati Boringhieri, 1994. D. G. Campanella – Esercizi di topologia generale, Aracne Editrice, 1992. |