UNIVERSITÀ DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Argomenti di Geometria e Topologia

2021-1-F4001Q083

Aims

The aim of the course is to take some classic topics in algebraic topology of simplicial complexes, introducing homology theory, cohomology theory and some aspects of homotopy theory, with some recent applications.

(Further verbose details in the Italian version.)

Contents

Simplicial complexes, homology and cohomology of polyhedra, triangulable manifolds, homotopy groups, applications to data analysis and dynamical systems.

Detailed program

Fundamental concepts: topological spaces, connectedness, compactness, function spaces, general ideas on Categories, push-out diagrams. Euclidean and abstract simplicial complexes. Introduction to homological algebra. Homology with coefficients. Category of polyhedra. Cohomology of polyhedra. Cohomology ring, cap product. Triangulable manifolds. Surfaces and classification. Poincaré Duality. Fundamental group of polyhedra. Fundamental group and homology. Homotopy groups. Obstruction theory. Applications to: computational homology, persistent homology, data analysis and dynamical systems.

Prerequisites

Basic topics covered in bachelor courses of geometry and algebra

Teaching form

Lectures: 8 ECTS credits.

Due to the COVID-19 emergency, classes will be online until further notice.

 (Google translated) Until the current health emergency is exhausted, the lessons of this course will take place completely remotely, through synchronous and / or asynchronous videotaped lessons, which will be available to students on the e-learning platform. In order to facilitate student involvement, remote lessons will be integrated by scheduling some events that may take place remotely in synchronous videoconference, or in presence, with students divided into groups, where appropriate.

Textbook and teaching resource

Ferrario, Piccinini, "Simplicial structures in topology". CMS Books in Mathematics, Springer, New York, 2011. xvi+243 pp. ISBN: 978-1-4419-7235-4

Semester

1S

Assessment method

Oral examination on the topics covered in the course, with in-depth analyis and re-elaboration of them with a personal perspective. The date and the content of the seminar, which is part of the exam, have to be first discussed with the teacher.

Until the end of the health emergency, the oral exam will be held on the webex videoconferencing platform (link available in the elearning page).

(google translated) Until the current medical emergency is exhausted, the oral exam will take place remotely through the WebEx platform, with access made available on the e-learning page of the course.

Office hours

By appointment, or Mondays 15:30.