



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematical Methods For Physics

2021-1-F1701Q098

Aims

Group theory, distributions, and their applications to theoretical physics.

Contents

Lie groups, Lie algebras; their representations. Distributions; Green's functions.

Detailed program

- Definition of group; subgroups, homomorphisms, representations.
- Sketch of abstract definition of Lie group. Lie algebras. Examples of Lie groups: orthogonal, unitary, Lorentz, Poincaré.
- Classification of Lie algebras. Semisimple algebras. Root systems. Dynkin diagrams. Classification of representations.
- Distributions as continuous linear functionals on test functions; generalized functions.
- Direct product and convolution of distributions.

- Tempered distributions and Fourier transform.
- Integral operators and Green's functions.

Prerequisites

Undergraduate degree in math or physics

Teaching form

Lessons (6 CFU), This course will be taught in English.

During the Covid-19 emergency the lectures will be delivered in streaming on the Webex platform. They will be recorded and will appear on the e-learning page on the scheduled day.

Textbook and teaching resource

Lecture notes or lecture pdfs available at <https://elearning.unimib.it/course/view.php?id=26371>

Other books (some available as pdf on the [library webpage](#)) :

Group Theory:

Georgi, *Lie Algebras in Particle Physics*.

Gilmore, *Lie Groups Lie Algebras and some of their applications*, Dover.

Gilmore, *Lie Groups, Physics and Geometry*, Cambridge.

Fulton-Harris, *Representation theory*, Springer.

Varadarajan, *Lie groups, Lie Algebras and their Representation*, Springer.

Cornwell, *Group Theory in Physics*, Academic Press.

Distributions:

Zemanian, Armen H., "Distribution theory and transform analysis: an introduction to generalized functions, with applications", Dover books 1965 ([disponibile](#) su Google Books)

Van Dijk, Gerrit, "Distribution Theory", De Gruyter 2013 (eBook EBSCO [accessibile](#) online tramite la Biblioteca di Ateneo)

Georgiev, Svetlin G., "Theory of Distributions", Springer, 2016. [accessibile](#) online tramite la Biblioteca di Ateneo)

Semester

First semester

Assessment method

Oral exam. Open questions on the course's topics.

During the Covid-19 emergency exams will be online. Dates and instructions to participate as spectators will be posted on the e-learning page.

Office hours

By appointment, by sending an e-mail to claudio.destri@unimib.it or silvia.penati@unimib.it
