UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematical Methods For Physics

2122-1-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 (available on Google Books)
Van Dijk, Gerrit, "Distribution Theory", De Gruyter 2013 (eBook EBSCO accessible online through the University Library).
Georgiev, Svetlin G., "Theory of Distributions", Springer, 2016, accessible online through the University Library.

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 mattia.bruno@unimib.it