Basic/Essential Course Information	
Course title	Physics Applications of Group Theory
Degree Course title	Physics
ECTS	4
Compulsory attendance	No
Course teaching language	ENGLISH

Teacher	Antonio Marrone	antonio.marrone@uniba.it

ECTS Details	Disciplinary area/broad field:	SSD	ECTS
		FIS/02	4

Time management and teaching activity type	Period	Year	lesson type
	1st semester	2	Lessons (32h)

Time management	Total hours	in-class/in-lab study hours	out-of-class study hours
	100	32	68

Course calendar	Starting date	Ending date
	First week of October	Third week of December

Syllabus	
Prerequisites	**Basic Pysics and Mathematics knowledge**
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** Understanding the concept of symmetry in physics **Applying knowledge and understanding:** Implementation of a symmetry in physical models **Making judgements:** Ability to proceed autonomously in the study of physical symmetries **Communication:** Ability to express the acquired knowledge properly **Lifelong learning skills:** Ability to study independently from texts and scientific literature

Course contents summary	**Knowledge of basic concepts of Group Theory and Lie Algebras. Applications of this knowledge to physical models**
detailed syllabus	Introduction to Symmetry in Physics; Groups and Representations

Definitions and examples

Group of Permutations Sn

General properties of groups

Conjugation classes

Subgroups. Normal subgroups. Homomorphisms.

Group representations

Schur Lemmas. Orthogonality theorem. Characters. Character table. Direct product and decomposition

Symmetric group Sn and its representations. Young tableaux. Irreps of SU(N) and Sn. Tensorial method.

Lie groups.

SO(2),SO(3) and SU(2).

SU(N)

Young tableaux.

Lie Algebras

Simple Lie Algebras. Killing form. Root quantization. Dynkin diagrams. Weights and representations. |
| books | H.F. Jones, *Groups, Representations and Physics*, Taylor & Francis; 2 edition
H. Georgi, *Lie Algebras In Particle Physics: from Isospin To Unified Theories* (Frontiers in Physics),Westview Press; 2 edition (October 22, 1999)

F. Stancu, *Group Theory in Subnuclear Physics*, Oxford Studies in Nuclear Physics |
notes	
Teaching methods	Lessons on the board
Assessment % of final mark	Oral test (100%)
Evaluation criteria	Adequate comprehension and global knowledge of concepts and arguments described throughout the course.