COURSE OF STUDY *Physics (LM-17)*

ACADEMIC YEAR *2023-2024*

ACADEMIC SUBJECT *Physical applications of group theory*

General information	
Year of the course	2nd
Academic calendar	1st semester: September - December 2023
Credits (CFU/ECTS):	3
SSD	FIS/02
Language	English
Mode of attendance	Recommended, not compulsory

Professor/ Lecturer	
Name and Surname	Antonio Marrone
E-mail	antonio.marrone@uniba.it
Telephone	+39 080 5443463
Department and address	Dipartimento Interateneo di Fisica, via Amendola 173 - 70126 Bari
Virtual room	
Office Hours	On request

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
CFU/ECTS			
3	2	1	

Learning Objectives	Understanding Group Theory
Course prerequisites	Basic Physics and Mathematics knowledge

Teaching strategie	Lessons on the blackboard
Expected learning outcomes in terms of	
Knowledge and understanding on:	Understanding Group Theory
Applying knowledge and understanding on:	Ability to solve problems using the acquired theoretical knowledge and identifying the correct reasoning
Soft skills	• **Making informed judgments and choices** Ability to proceed autonomously in the study of group theory • **Communicating knowledge and understanding** Ability to properly express the acquired knowledge properly • **Capacities to continue learning** Ability to study autonomously from texts and scientific literature
Syllabus	
Content knowledge	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.
Texts and readings	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, additional materials	Notes from the teacher
Repository	

Assessment	
Assessment methods	Oral test
Assessment criteria	Adequate comprehension and global knowledge of concepts and topics described throughout the course. Ability to properly express the acquired knowledge.
Final exam and grading criteria	Oral test (100%)
Further information	
	.