UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

CONSIGLIO INTERCLASSE IN MATEMATICA

COURSE OF STUDY THREE-YEAR BACHELOR PROGRAMME IN MATHEMATICS

ACADEMIC YEAR 2023-2024

ACADEMIC SUBJECT MATHEMATICAL PHYSICS 1

General information	
Programme year	Second
Term	Second semester (February 26, 2024 – May 31, 2024)
European Credit Transfer and Accumulation System credits (ECTS)	8
SSD	MAT/07 – Mathematical Physics
Language	Italian
Mode of attendance	Not mandatory

Lecturers		
Name and surname	Marilena Ligabò (instructor of record)	Arcangelo Labianca
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Telephone	+39 080 544 2695	+39 080 544 2656
Department and office	Department of Mathematics room 13 second floor	Department of Mathematics room 7 second floor
Virtual meeting room		
Web page	https://www.dm.uniba.it/it/members/ligabo	https://www.dm.uniba.it/it/members/labianca
Office hours	by appointment via email	by appointment via email

Work schedule				
	Total	Lectures	Hands-on learning (recitations)	Self-study
Hours	200	56	15	129
ECTS credits	8	7	1	

Learning objectives

	Mathematical formulation, understanding and resolution of problems of a physical nature concerning the statics and dynamics of particle systems in the Lagrangian formulation.

Course prerequisites	
	The topics covered in the first year of a degree in class L-35 are prerequisites for this course. In particular: differential and integral calculus for functions of one variable and linear algebra.

Syllabus	
Course contents	Principles of dynamics, Energy theorem, Work of conservative forces, Conservation of momentum, Conservation of angular momentum, System of material points, Constraints and constraint equations, Deduction of Euler-Lagrange equations from Newton's equation, Conservation of 'mechanical energy, First integrals of motion, One-dimensional motions (period formula, phase portrait), Equilibrium and small oscillations, Noether's theorem in the Lagrangian context, Mathematical pendulum, Huygens pendulum, Motions in central force fields, problem of two bodies and Kepler's laws.Hamilton equations. Hamilton's principle, the problem of the brachistochrone.
Reference books	A. Fasano, S. Marmi, "Meccanica analitica", Bollati Boringhieri, 2002 Jorge V. José, Eugene J. Saletan, "Classical Dynamics: A Contemporary Approach" Cambridge University Press (1998) Dispense "Appunti di Meccanica Analitica" di A. Carati e L. Galgani, disponibili sulla pagina web di A. Carati: http://users.mat.unimi.it/users/carati/
Additional course materials	
Repository	Microsoft Teams

Expected learning outcomes	
Knowledge and understanding	Acquisition of fundamental concepts and strategies for the study of equations of motion. Acquisition of the relative demonstration techniques.
Applying knowledge and understanding	The theoretical knowledge acquired is used in a large part of the differential equations of physics.
Soft skills	*DD3 Making judgments:* - Ability to evaluate the consistency of logical reasoning used in a proof. - Ability to identify the right mathematical tools and the right techniques to tackle complex problems.

	DD4 Communication skills: - Acquisition of advanced physical/mathematical language and formalism, necessary for consulting and understanding texts. - Exposure of the knowledge acquired through the description, analysis and resolution of problems.
	DD5 Learning skills: Acquisition of an adequate study method, supported by the consultation of texts and by the resolution of exercises and questions proposed periodically during the course.

Teaching methods	
	Frontal lessons

Assessment	
Assessment methods	Oral exam
Evaluation criteria	*Knowledge and understanding:* acquisition and mastery of the definitions and theoretical results covered by the course. *Applied knowledge and understanding:* ability to apply the acquired theoretical knowledge to the study of partial differential equations; *Making judgments:* critical approach to concepts, ability to choose solution methods and ability to provide examples and counterexamples. *Communication skills:* mastery of language and quality of presentation. Ability to learn: ability to organize knowledge, critical reasoning and possible independent study.
Grading policy	The final mark is expressed out of thirty. The exam is passed if the final mark is greater than 17.

Further information	
	Attendance at lectures and tutorials is strongly recommended.