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	**DIFFERENTIAL GEOMETRY**

General information	
Programme year	Third
Term	Second semester (February 26, 2024 – May 31, 2024)
European Credit Transfer and Accumulation System credits (ECTS)	7
SSD	MAT/03 – Geometry
Language	Italian
Mode of attendance	Not mandatory

Lecturer	
Name and surname	Mauricio Barros Correa Junior
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Department and office	Department of Mathematics, room 6 second floor
Virtual meeting room	
Web page	https://www.dm.uniba.it/it/members/correa
Office hours	

Work schedule				
	Total	Lectures	Hands-on learning	Self-study
Hours	175	56		119
ECTS credits	7	7		

Learning objectives	
	Acquisition of the concepts of intrinsic and extrinsic differential geometry of surfaces and their analytical and topological aspects. With particular reference to studies of curvature, connections, moving frames, vector field indices, integration of differential forms on surfaces and curves, and applications.

Course prerequisites	
	Differential calculus of tensors, Concepts of differential curves and surfaces and their curvatures.

Syllabus	
Course contents	Christoffel symbols; Intrinsic formula for Gauss curvature; Gauss' Theorema Egregium; Geodesic equation; Geodesic curvature; Exponential map and Gauss' lemma; Minimizing property of geodesics; Differential forms; Stokes Theorem; Index of a vector field; Gauss-Bonnet Theorem; Poincaré-Hopf Theorem; Conformal applications; Isothermal coordinates and Riemann surfaces.

Reference books	Manfredo do Carmo, *Differential geometry of curves and surfaces*. Prentice-Hall,1976. Manfredo do Carmo, *Differential Forms and Applications,* Springer-Verlag, 1994. M. Spivak, *A Comprehensive Introduction to Differential Geometry,* volumes 1 and 2. Publish or Perish, 1979.
Additional course materials	Bott, R., and Tu, L., *Differential Forms in Algebraic Topology.* Springer-Verlag, 1982. Kobayashi, S. and Nomizu, K., *Foundations of Differential Geometry* vols. 1 and 2, John Wiley & Sons 1963. L. Bers, *Riemann Surfaces*, New York University, Institute of Mathematical Sciences, New York, 1957–1958, pp. 15–35
Repository	Educational material uploaded on the Microsoft Teams platform.

Expected learning outcomes	
Knowledge and understanding	Acquisition of basic concepts of differential surface geometry. Acquisition of the relative demonstration techniques.
Applying knowledge and understanding	The theoretical knowledge acquired constitutes the necessary basis for understanding and using the techniques to be used in the applications of mathematics.
Soft skills	*Making judgments*: Ability to evaluate the coherence of logical reasoning in demonstrations and ability to choose mathematical tools suitable for the complexity of the problems to be solved.
	Communication skills: Acquisition of the basics of mathematical language and formalism, necessary both for consulting and understanding texts and for exposing, analyzing and solving problems.
	Learning skills: Acquisition of an adequate study method that systematically makes use of the consultation of texts and the commitment to solving exercises and questions connected to the contents of the course.

Teaching methods	
	The modality of the course will be in-person. At the end of the course, there will be a lesson to review the main points, examples, counterexamples and salient points of the proofs in order to help prepare for the oral exam.

Assessment	
Assessment methods	The assessment consists of an oral examination.
Evaluation criteria	● *Knowledge and understanding*: acquisition and mastery of the definitions and theoretical results covered by the course. ● *Applying knowledge and understanding*: ability to apply the acquired theoretical knowledge to the study of surfaces.

	● *Making judgement*: critical approach to concepts, ability to choose differential geometry methods to solve geometric and topological problems. ● *Communication skills*: mastery of the language of differential geometry, quality of exposure. ● *Learning skills*: ability to organize knowledge, critical reasoning and possible independent study
Grading policy	The examination consists of an oral test. Successful completion of the written test requires the student to demonstrate mastery of the language, methodological rigor, and acquisition of the fundamental notions and concepts of the course. Evaluation is based on the achievement of the intended learning outcomes. To achieve a high grade, the student must have developed independent judgment and adequate skills in argumentation and presentation. The examination is graded on a scale of thirty, and it is considered passed if the final grade is equal to or higher than 18/30. Honors may be awarded for further in-depth exploration of specific topics within the program.

Further information	
	Attendance at lectures and tutorials is strongly recommended.