UCLouvain

lmat1342

2024

Geometry 3

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Lambrechts Pascal ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	LMAT1141 "Geometry 1" and LMAT1241 "Geometry 2" are prerequisites. Mastery of the French language at the level of the last year of secondary school.
Main themes	The course will cover the study of various topics in geometry. For example : Riemann surfaces, geometric group theory, projective geometry. The choice of the theme will depend on the teacher and if possible on the potential audience.
Learning outcomes	**At the end of this learning unit, the student is able to :** **Contribution of the course to the learning outcomes of the bachelor's degree program in mathematics.** **By the end of this activity, the student will have progressed in his/her ability to :** • (a) Know and understand a fundamental foundation of mathematics. In particular, he/she will have developed the ability to: I. Select and use fundamental computational methods and tools to solve mathematics problems. II. Recognize the fundamental concepts of some current mathematical theories. III. Establish the major connections between these theories, explain and motivate them with examples. • (b) Identify, through the abstract and experimental approach of the exact sciences, the unifying aspects of different mathematical situations and experiences. • (c) Demonstrate abstraction and critical thinking skills. In particular, the student will have developed the ability to : I. Reason within the framework of the axiomatic method. II. Recognize the key arguments and structure of a demonstration. III. Construct and write a demonstration independently. IV. Distinguish between intuition about the validity of a result and different levels of rigorous understanding of that same result. • (d) Be clear, precise and rigorous in communication activities. In particular, the student will have developed the ability to: I. Write mathematical text according to the conventions of the discipline. II. Structure an oral presentation, highlight key elements, distinguish techniques and concepts and adapt the presentation to the level of expertise of the audience. **Course-specific learning outcomes.** **At the end of this activity, the student will be able to :** • (a) For the selected topic of geometry, present the problems motivating the theory. • (b) State and prove theorems and propositions in the topic. • (c) Solve problems related to the chosen topic.
Evaluation methods	Written homework might be proposed giving a bonus to the final grade. Written exam supplemented by an oral exam.
Teaching methods	The learning activities consist of lectures and face-to-face exercise sessions.
Content	In 2021-2022, the course will cover various notions of differential geometry and topology. Differential varieties and subvariety. Tangent spaces. Differential forms, Stokes-Cartan theorem and applications. Transversality. Sard's theorem, degree of a differentiable application and applications.

	Poincaré-Hopf theorem. Global proof of the Gauss-Bonnet theorem.
Inline resources	Reserved space on the moodle platform
Bibliography	"Differential topology" V. Guillemin, A. Pollack "Differential forms and applications", M. Do Carmo "Differential geometry of curves and surfaces" , M. Do Carmo "Topology from the differential viewpoint", J. Milnor
Faculty or entity in charge	MATH

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Additionnal module in Mathematics	APPMATH	5		
Minor in Mathematics	MINMATH	5		
Bachelor in Mathematics	MATH1BA	5		