# lmat1342

*2021*

# Geometry 3

| 5.00 credits | 30.0 h + 30.0 h | Q1 |
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| Teacher(s) | Lambrechts Pascal ; |
| Language : | French |
| Place of the course | Louvain-la-Neuve |
| Prerequisites | LMAT1141 "Geometry 1" and LMAT1241 "Geometry 2" are prerequisites.<br>Mastery of the French language at the level of the last year of secondary school.<br>*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.* |
| Main themes | The course will cover the study of various topics in geometry.<br>For example : Riemann surfaces, geometric group theory, projective geometry.<br>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 :**<br><br>**Contribution of the course to the learning outcomes of the bachelor's degree program in mathematics.**<br>**By the end of this activity, the student will have progressed in his/her ability to :**<br><br>• (a) Know and understand a fundamental foundation of mathematics. In particular, he/she will have developed the ability to:<br><br>I. Select and use fundamental computational methods and tools to solve mathematics problems.<br>II. Recognize the fundamental concepts of some current mathematical theories.<br>III. Establish the major connections between these theories, explain and motivate them with examples.<br><br>• (b) Identify, through the abstract and experimental approach of the exact sciences, the unifying aspects of different mathematical situations and experiences.<br>• (c) Demonstrate abstraction and critical thinking skills. In particular, the student will have developed the ability to:<br><br>I. Reason within the framework of the axiomatic method.<br>II. Recognize the key arguments and structure of a demonstration.<br>III. Construct and write a demonstration independently.<br>IV. Distinguish between intuition about the validity of a result and different levels of rigorous understanding of that same result.<br><br>• (d) Be clear, precise and rigorous in communication activities. In particular, the student will have developed the ability to:<br><br>I. Write mathematical text according to the conventions of the discipline.<br>II. Structure an oral presentation, highlight key elements, distinguish techniques and concepts and adapt the presentation to the level of expertise of the audience.<br>**Course-specific learning outcomes.**<br>**At the end of this activity, the student will be able to :**<br><br>• (a) For the selected topic of geometry, present the problems motivating the theory.<br>• (b) State and prove theorems and propositions in the topic.<br>• (c) Solve problems related to the chosen topic. |
| Evaluation methods | 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.<br>**Depending on the time available, the following topics or others may be covered :**<br>Differential varieties and subvariety.<br>Tangent spaces.<br>Differential forms, Stokes-Cartan theorem and applications. |

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| | Transversality.<br>Sard's theorem, degree of a differentiable application and applications.<br>Poincaré-Hopf theorem.<br>Global proof of the Gauss-Bonnet theorem. |
| Inline resources | Reserved space on the moodle platform |
| Bibliography | "Differential topology"  V. Guillemin, A. Pollack<br>"Differential forms and applications", M. Do Carmo<br>"Differential geometry of curves and surfaces" , M. Do Carmo<br>"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 |
|---|---|---|---|---|
| Minor in Mathematics | MINMATH | 5 | | 🔍 |
| Bachelor in Mathematics | MATH1BA | 5 | LMAT1141 AND LMAT1241 | 🔍 |
| Additionnal module in Mathematics | APPMATH | 5 | | 🔍 |