UCLouvain

lmat2945

2024

Advanced topics in mathematics 8

5.00 credits	0 h + 22.5 h	Q1

This biannual learning is being organized in 2024-2025

Teacher(s)	Campanini Federico ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Depending on the subject, mathematics skills at the level of the end of the Bachelor in Mathematics or first year Master in Mathematics.
Main themes	The topic considered varies from year to year depending on the research interests of the course instructor.

Learning outcomes	**At the end of this learning unit, the student is able to :**
	1 Contribution of the course to learning outcomes in the Master in Mathematics programme. By the end of this activity, students will have made progress in:
	• Show evidence of independent learning.
	• Analyse a mathematical problem and suggest appropriate tools for studying it in depth.
	• Begin a research project thanks to a deeper knowledge of one or more fields and their problematic issues in current mathematics. He will have made progress in:
	  • Develop in an independent way his mathematical intuition by anticipating the expected results (formulating conjectures) and by verifying their consistency with already existing results.
	  • Ask relevant and lucid questions on an advanced mathematical topic in an independent manner.
	Learning outcomes specific to the course.
	The course aims to initiate research in the field under consideration. Specific learning outcomes vary depending on the field.

Content	***Thèmes abordés :*** *Commutative algebra is essentially the study of commutative rings and their modules. It is one of the foundation stones in algebraic geometry and algebraic number theory. For instance, the central notion in commutative algebra is that of prime ideal, which is a common generalization of primes in arithmetic and points in geometry. Roughly speaking, we can also say that commutative algebra provides the local tools for algebraic geometry in the same way as differential analysis provides the tools for differential geometry.* ***Contenu :*** *This course is meant to provide a strong foundation in commutative algebra, in order to build the tools to address more advanced topics in commutative algebra, homological algebra, algebraic geometry and algebraic number theory.* *Sketch of the program:* *- Rings and modules of fractions. Localizations. Tensor product.* *- Prime spectrum of a ring and the Zariski topology.* *- Noetherian rings.* *- Finitely generated modules, Nakayama's Lemma.* *- Modules over Noetherian rings.* *- Topological methods in ring and module theory: the Zariski and the constructible topology, Gabriel topologies, ultrafilters, completions.* *Other topics to be chosen with the class. The list may include: Integral dependence, Cohen-Seidenberg theorems; Primary decomposition; Dimension Theory; Discrete valuation rings; Valuation theory; Dedekind and Prufer domains; Boolean rings and algebras; Something on non-commutative rings.*
Bibliography	*- M. Atiyah, and I. MacDonald, "Introduction to commutative algebra", Addison-Wesley-Longman, 1969.* *- R.Y. Sharp, "Steps in Commutative Algebra", London Math. Soc. Sudent Texts 51, Cambridge University Press, 2000.* *- B. Stenstrom, "Rings of Quotients", Grundlehren der Mathematischen Wissenschaften 217, Springer-Verlag, New York-Heidelberg, 1975.* *- Notes of the course.*

Faculty or entity in charge	MATH

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mathematics	MATH2M	5		🔍