UCLouvain

lmat1141

2018

Geometry I

7 credits	45.0 h + 30.0 h	Q2

Teacher(s)	Lambrechts Pascal ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	Euclidean geometry : affine and euclidean space, quadrics . Differential geometry : plane and skew curves ; local theory of surfaces in 3-dimensional space.
Aims	Contribution of the course to learning outcomes in the Bachelor in Mathematics programme. By the end of this activity, students will have made progress in: -recognise and understand a basic foundation of mathematics. --Choose and use the basic tools of calculation to solve mathematical problems. --Recognise the fundamental concepts of important current mathematical theories. --Establish the main connections between these theories, analyse them and explain them through the use of examples. - identify, by use of the abstract and experimental approach specific to the exact sciences, the unifying features of different situations and experiments in mathematics or in closely related fields (probability and statistics, physics, computing). - show evidence of abstract thinking and of a critical spirit. Argue within the context of the axiomatic method Recognise the key arguments and the structure of a proof. 1 Construct and draw up a proof independently. Evaluate the rigour of a mathematical or logical argument and identify any possible flaws in it. Distinguish between the intuition and the validity of a result and the different levels of rigorous understanding of this same result. Learning outcomes specific to the course. By the end of this activity, students will be able to: - Determine loci in affine and euclidean spaces and represent them graphically - Determine and characterize affine maps and isometries. - Classify quadrics, especially in dimension 2 and 3. Determine their geometric invariants : adapted frame, asymptotic directions and use them to represent graphically the quadric. - Compute and interpret differential invariants of a curve as tangent vector, curvature vector, Frenet frame, length of a curve. - Compute and interpret differential invariants of a surface as tangent plane, fundamental form, normal, principal and total curvature, area of a surface. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	Assessment is by means of a number of written tests throughout the year, by a written examination and by an oral examination relating to both exercises and theory. The examinations test knowledge and understanding of fundamental concepts and results, ability to construct and write a coherent argument, mastery of the techniques of calculation, and the ability to give a geometrical interpretation of these calculations and to represent them graphically.
Teaching methods	This course extends the skills acquired in the introductory algebra and analysis courses by situating the various concepts studied in these courses in the context of plane geometry and solid geometry. Students will be encouraged to develop geometric intuition and to express it in the formal language of algebra or analysis. Conversely, they will have to be able to interpret analytic or algebraic results in a geometrical way, and to approach problems from different points of view. Learning activities consist of lectures, exercise sessions and tutorial sessions. The tutorial sessions give students individual help and follow-up in their learning The three activities are given in presential sessions.
Content	The course has two parts. The first one, more algebraic, is focused on Euclidian and Affine Geometry, with also the classification of quadrics. In the second part, using tools of differential calculus, we study curves and surfaces. The following topics are studied : -Affine geometry : affine spaces and subspaces, affine maps, affine and barycentric coordinates.

	- Euclidean geometry : affine euclidean space, inner and vector product, measure of lengths and angles, orthonormal frames, isometries - Classification and properties of quadrics - Differential geometry of curves : parametrized curve, tangent vector, curvature vector. Length of a curve. Frenet frame in 3-dimensional space. Cartesian equations of curves. - Differential geometry of surfaces : parametric surface, tangent plane, first and second fundamental form, normal and Gauss curvature. Statement of egregium theorem. Geodesic on a surface. Area of a surface.
Inline resources	Site iCampus (http://icampus.uclouvain.be/claroline/course/index.php?cid=MAT1141). Available on the site are problems from examinations of previous years with solutions, the problems to be solved during tutorial sessions with solutions, the lecture notes, and a detailed overview of the course.
Bibliography	Syllabus disponible sur iCampus avec références bibliographiques.
Faculty or entity in charge	SC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Physics	PHYS1BA	7		
Bachelor in Mathematics	MATH1BA	7		