



[30h+15h exercices] 5 credits

This course is taught in the 1st semester

**Teacher(s):** Yves Félix, Luc Haine, Pierre Van Moerbeke  
**Language:** french  
**Level:** 2nd cycle course

### Aims

The course presents the fundamental notions of differential geometry. It serves as a basis to other course of geometry in the masters' years of mathematical sciences.

### Main themes

The course contains three parts:

- 1: A description of the basic objects of geometry: manifolds, fiber bundles, vector fields, differential forms, Lie bracket, differential of an application, immersion, submersion. Various examples: Lie groups, homogeneous spaces, projective spaces and Grassmannian manifolds.
- 2: A presentation of the basic elements of Riemann geometry: parallel transport, particular case of surfaces, curves, geodesics, etc.
- 3: Applications to mechanics and an overview of important theorems of geometry; Arnold-Liouville, tores geometry, Hamilton mechanics, etc.

### Other credits in programs

<b>MAP21</b>	Première année du programme conduisant au grade d'ingénieur (5 credits) civil en mathématiques appliquées		
<b>MATH21/E</b>	Première licence en sciences mathématiques (Economie mathématique)	(5 credits)	Mandatory
<b>MATH21/G</b>	Première licence en sciences mathématiques (Général)	(5 credits)	Mandatory
<b>MATH21/S</b>	Première licence en sciences mathématiques (Statistique)	(5 credits)	Mandatory