

## Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT417	Differential Geometry	8	4	0	0	4	8

Prerequisites	MAT116, MAT202
Admission Requirements	MAT116, MAT202

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	The aim of the course is to provide the student with basic knowledge and skills in elementary differential geometry of curves and surfaces in local parametric treatment.
Content	Curves in $\mathbb{R}^3$ : Frenet formulas and Fundamental Theorem. Regular surfaces. Inverse image of regular values. Differentiable functions on surfaces. Tangent plane; the differential of a map, vector fields, the first fundamental form. Gauss map, second fundamental form, normal, principal curvatures. Manifolds, tangent spaces and Lie bracket
References	Millman, R.S. & Parker, G.D., Elements of Differential Geometry Kühnel, W., Differential Geometry: Curves, Surfaces, Manifolds Ethan D. Bloch; A first course in Geometric Topology and Differential Geometry doCarmo, M. Differential Geometry of Curves and Surfaces Montiel, S. & Ros, A. Curves and Surfaces

## Theory Topics

Week	Weekly Contents
1	Recall on smooth functions, inverse function theorem
2	Curves in the Euclidean space and their reparametrization
3	Tangent, normal and binormal vectors
4	Curvature and torsion of space curves
5	Fundamental theorem of curves
6	Surfaces in space and coordinate patches
7	Smooth surfaces
8	Tangent and normal vectors to a surface, first fundamental form and arc lengths
9	Second fundamental form and Weingarten endomorphisms
10	Normal curvature, mean curvature and Gaussian curvature
11	Theorema Egregium of Gauss and isometries
12	Gauss – Bonnet formula and its consequences
13	Manifolds and tangent spaces
14	Tangent spaces and Lie bracket