Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT457	Theory of Manifolds	7	3	0	0	3	5

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Elective
Course Level	Bachelor Degree
Objective	-
Content	-
References	

Theory Topics

Week	Weekly Contents
1	Review of multivariable differential calculus: differentiability, inverse function theorem, and constant rank theorem.
2	Differentiable manifolds: charts, atlases, changes of coordinates, and dimension.
3	Fundamental examples of manifolds: spheres, tori, projective spaces, and matrix groups.
4	Smooth maps between manifolds and diffeomorphisms.
5	Tangent spaces: definitions using curves and derivations; examples.
6	Tangent maps, chain rule, and the inverse function theorem on manifolds.
7	Submanifolds; immersions, submersions, embeddings, and the regular value theorem.
8	Midterm
9	Tangent and cotangent bundles; vector fields and integral curves.
10	Exterior algebra and differential forms; pullbacks of differential forms.
11	Exterior derivative; closed and exact forms.
12	Orientation, manifolds with boundary, and integration of differential forms.
13	Stokes' theorem and classical applications.
14	Introduction to de Rham cohomology; applications to curves and surfaces; general review.