Department: Mathematics and Computer Sciences **Division:** Pure Mathematics **Level and Major:** Graduate

Course Title: Geometry of Manifolds 1 **Number of Credits:** 3 **Prerequisite: Lecturer:**

Course Description:

- Definition of differential manifolds and various examples of manifolds.
- Manifold Topology,
- Differential Functions on Manifolds,
- Tangent Vector and Vector Field,
- Tangent bundle and Cotangent bundle,
- 1-Form Field,
- The rest of the subjects will be announced during the course.

Course Topics:

- Reminding topology
- Topological manifolds & differential manifolds
- Differentiable functions on manifolds and their existence
- Immersion & submersion functions and rank & inverse function theorem, product of manifolds and implicit function theorem
- Sub-manifolds and their constructions
- Tangent space at a point of a manifold & and derivations & tangent bundle & derivation of a function
- Vector fields on manifolds and their flow & derivations on functions algebra, local representation on coordinate systems
- Lie product of vector fields and lie derivation
- Tensors and alternating & symmetric tensors & tensor product & exterior algebra
- Vector bundles & associated tensor bundles to tangent bundles & fields of tensors
- Sub-bundles & distributions on manifolds & frobenious theorem
- Lie derivation of tensor fields along vector fields
- Derivations on the algebra of differential forms & exterior differential
- Orientation on manifolds and integration on manifolds
- Manifolds with boundary & compatible orientation
- Stoks theorem

Reading Resources:

Evaluation: