Information of the graduate level course on **Introduction to geometry and geometric analysis (MAL026P6G)** at IIT Jammu, India

Course contents:

- Differentiable manifolds and tensor analysis: Definition and examples of smooth Manifolds, smooth maps, Tangents spaces, tangent and cotangent bundles, Derivative of smooth maps, tensor fields and bundles, change of coordinates, exterior derivatives, Integration on Manifolds, Stokes theorem.
- Riemannian geometry: Definition of Riemannian metric and Riemannian manifolds with examples, Isometries between Riemannian manifolds, Covariant derivatives, The Levi-Civita connection, Curvature tensor, Geodesics, Exponential maps, Normal coordinates, Gauss Lemma, convex sets.
- Calculus on Riemannian manifolds: Orthonormal system, Volume form and integration, L^p-spaces and Sobolev spaces defined on compact Riemannian Manifolds, Density and dual spaces of L^p-spaces and Sobolev spaces, Co-differentials, Divergence and Laplace-Beltrami operator in local coordinates, Hodge Laplacian, Existence, uniqueness and regularity results for the poisson equation on Riemannian Manifold.

Class and tutorial timings for the course:

- Monday, 5:00 PM to 6:30 PM
- Wednesday, 5:00 PM to 6:30 PM
- Friday, 5:00 PM to 6:30 PM (Tutorial)

Credit system for the course:

- 20 marks for class tests. There will be two class tests.
- 30 marks for Mid-Sem exam.
- 50 marks for End-Sem exam.

References for the course:

1. C. Bär, Elementary Differential Geometry, Cambridge University Press, 2017.

2. S. Kumaresan, A course in differential geometry and Lie Groups, Hindustan Book Agency, 2002.
3. S. Kumaresan, Riemannian Geometry- Concepts, examples and techniques, Published by Techno World, Kolkata, 2020.
4. K. Jänich, Vector analysis, Springer, 2000.
5. M. Salo, Lecture notes on topics in differential geometry, 2022.
6. M.P. do Carmo, Riemannian Geometry, Birkhauser, Boston, 1992.