# AN INTRODUCTION TO SMOOTH MANIFOLDS

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**TYPE OF COURSE** : Rerun | Elective | PG
**COURSE DURATION** : 12 weeks (18 Jan' 21 - 09 Apr' 21)
**EXAM DATE** : 24 Apr 2021

**PRE-REQUISITES :** Real analysis, linear algebra and multi-variable calculus, topology.

**INTENDED AUDIENCE :** Masters and PhD students in Mathematics, Physics, Robotics and Control Theory, Information Theory and Climate Sciences.

**COURSE OUTLINE :**
The goal of this course is to introduce the student to the basics of smooth manifold theory. The course will start with a brief outline of the prerequisites from topology and multi-variable calculus. After that a large class of examples, including Lie groups, will be presented. The course will culminate with a proof of Stokes' theorem on manifolds.

**ABOUT INSTRUCTOR :**
Prof. Harish Seshadri is currently working as an Assistant Professor in the Department of Mathematics in IISC Banglore. He completed his M.Sc from IIT Kanpur and Ph.D from SUNY Stony Brook. He likes to work in Riemannian geometry (Einstein manifolds, Ricci flow, etc) and in questions related to invariant metrics in complex analysis.

**COURSE PLAN :**

**Week** 1**:** Review of topology and multi-variable calculus

**Week** 2**:** Definition and examples of smooth manifolds

**Week** 3**:** Smooth maps between manifolds, submanifolds

**Week** 4**:** Tangent spaces and vector fields

**Week** 5**:** Lie brackets and Frobenius theorem

**Week** 6**:** Lie groups and Lie algebras

**Week** 7**:** Tensors and differential forms

**Week** 8**:** Exterior derivative

**Week** 9**:** Orientation

**Week** 10**:** Manifolds with boundary

**Week** 11**:** Integration on manifolds

**Week** 12**:** Stokes Theorem