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