

NOC: Curves and Surfaces - Video course

COURSE OUTLINE

This course is intended for undergraduate students in Indian Universities with a background in Differential Calculus of Several Variables. Such a course was broadcasted in March 2016 under MOOC (NPTEL- IV) and that background will be enough to follow that course. It is kind of a threshold level compilation of lectures to Differential Geometry on which there is hardly any standard course at under graduate level in most universities.

There are few references listed with the template. However I wish to write the lectures notes myself to avoid vocabularies which usually companion such a course in Differential Geometry. I will upload my lecture notes (unfortunately hand written) after each module.

COURSE DETAIL

Week No.	Topics
1.	Module-I: Curves in \mathbb{R}^2 and \mathbb{R}^3 Lecture-1: Level curves and locus, definition of parametric curves, tangent, arc length, arc length parametrisation. Lecture-2: How much a curve is 'curved', signed unit normal and signed curvature, rigid motions, constant curvature. Lecture-3: Curves in \mathbb{R}^3 , principal normal and bi-normal, torsion. Lecture-4: Frenet-Serret formula. Lecture-5: simple closed curve and isoperimetric inequality.
2.	Module-II: Surfaces-1: Smooth surfaces Lecture-1: Surfaces and parametric surfaces, examples, regular surface and non-example of regular surface, transition maps. Lecture-2: Transition maps of smooth surfaces, smooth function between surfaces, diffeomorphism. 1 Lecture-3: Construction of smooth surfaces. Lecture -4: Tangent, normal and orientation. Lecture -5: Mobius band.
3.	Module-III: Surfaces -2: First Fundamental Form Lecture-1: Surfaces of revolution, quadratic surfaces. Lecture-2: First Fundamental Form, isometry. Lecture-3: Isometry versus conformal maps. Lecture-4: Conformal maps. Lecture-5: Examples.
4.	Module-IV: Surfaces -3: Curvature and Geodesics Lecture-1: Curvature, normal curvature. Lecture -2: Principal curvatures, Euler's Theorem. Lecture -3: Geometry of principal curvatures. Lecture -4: Geodesics. Lecture -5: Clairaut's Theorem , Pseudosphere.

References:

1. Differential Calculus of Several Variables, NPTEL course.



NP-TEL

NPTEL

<http://nptel.ac.in>

Mathematics

Pre-requisites:

A course in one variable calculus and knowledge of Differential Calculus of Several variables. The course offered by NPTEL-IV In March 2016 will be a sufficient back ground.

Coordinators:

Prof. Sudipta Dutta
 Department of
 Mathematics and
 Statistics IIT Kanpur

2. Elementary Differential Geometry, A Pressley.
3. Lectures notes which will be posted.