BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
HYDERABAD CAMPUS
SECOND SEMESTER 2018-2019

07-01-2019

Course Handout Part II

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. **: MATH F342**
Course Title **: DIFFERENTIAL GEOMETRY**
Instructor-in-charge **: B. MISHRA**

1. Scope and Objective of the Course:

The objective of this course is to provide a systematic exposition of the essential concepts of modern differential geometry, and an understanding and appreciation for the intrinsic beauty of these concepts, as well as their deep relationships to computer and physical sciences. The under current is to generalize and reinforce the classical subject in a modern way.

2. Text Book: Andrew Pressley: Elementary Differential Geometry, Springer (India), 2001.

3. Reference Books:

1. Vaisman - A First course in Differential geometry Marcel Dekker Inc. (1984).
2. Barrett O'Neill – Elementary differential geometry, 2/E, A Harcourt Science and Technology Company (1997).
3. Gray – Modern differential geometry of curves and surfaces with MATHEMATICA, 2/E, CRC Press (1999).

4. Lecture Plan:

Lecture	**Learning Objectives**	**Topics to be covered**	**Chapter in the Text Book**
1-4	Understanding of Curves in the plane and in space.	Description of Curve, Arc-length, Parameterization, Level Curves.	1.1-1.4
5-8	To gain knowledge on curvature and torsion.	Curvature, Plane curves, Space Curves.	2.1-2.3
9-11	To know the global results of curves	Simple Closed Curve, Isoperimetric Inequality, Four Vertex Theorem	3.1-3.3
12-16	To know different ways to formulate mathematically the notion of surface.	Definition of surface, Smooth Surface, Tangents, Normal Orientability, Quadratic surfaces, Triply orthogonal systems.	4.1-4.6
17-20	To learn the process to compute the lengths, angles and area in the surface	Lengths of Curves on Surfaces, Isometries of surfaces, Conformal Mappings of surfaces.	5.1-5.4
21-25	To learn the different ways to measure on how a surface is curved.	The Second Fundamental Form, The Curvature of Curves on a Surface, The Normal and Principal Curvatures, Geometrical Interpretation of Principal Curvatures	6.1-6.4
26-31	To know few more measures of	The Gaussian and Mean Curvatures,	7.1-7.6

	curvature of a surface.	The Pedosphere, Flat Surfaces, Surfaces of Constant Mean Curvature, Gaussian Curvature of Compact Surfaces, The Gauss map	
32-35	To learn the Gauss's most important discovery on surfaces pertaining to the curvature.	Gauss's Remarkable Theorem, Isometries of Surfaces, The Codazzi-Mainardi Equations, Compact Surfaces of Constant Gaussian Curvature.	10.1-10.4
36-40	To know various methods to find the geodesics on surfaces.	Definition and basic properties, Geodesic Equations, Geodesics on surface of Revolution, Geodesics as Shortest Paths, Geodesic Coordinates.	8.1-8.5

5. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of Component**
Mid-Semester	1 Hour 30 Minutes	30	12/3 3.30 - 5.00 PM	Closed Book
Assignments (Three)	To be announced in the class	20		Open Book
Quizzes (Two)	To be announced in the class	10		Closed Book
Comprehensive Exam	3 Hours	40	04/05 AN	Closed Book

5. Chamber consultation Hour: To be announced in the class.

6. Notice: Notice, if any, concerning this course will be displayed only in CMS.

7. Make up: Prior permission is needed for make up; make up will only be given if enough evidence is there for not being able to take regular test.

8. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
MATH F342