King Saud University
College of Science
Mathematics Department

Form (H)
Short course description

Course title: Introduction to Differential Geometry	Course number and code: MATH 473
Previous course requirement:	Language of the course: English
Course level: level 8/fourth year	Effective hours: 4 (3+2+0)

Course description **وصف المقرر :**

Geometry is the subject that study smooth manifolds. In the case of curves and surfaces, describe the relationship between their topologies and the geometric structures which they carry from the three-dimensional Euclidean space. Therefore in this course we study the local geometry (that is, the behavior) of regular curves and that of regular surfaces in the three-dimensional space. It is also an aim of this course to teach the student how to decide whether a two given curves (resp. surfaces) are locally the same or not.	

Course objectives **أهداف المقرر**

Introducing the concepts: Regular curves, arc length, and natural parametrization.	
Introducing the concepts: Serret-Fernet apparatus.	
Introducing the concepts: Simple surfaces, tangent vectors and tangent spaces, and first and second fundamental forms.	
Introducing the concepts: Normal and geodesic curvatures, Weingarten map, principal curvatures, Gaussian and mean curvatures.	

Introducing the concepts: Equations of Gauss and geodesics	

Learning outcomes (understanding, knowledge, and intellectual and scientific skills)
After studying this course, the student is expected to be able to:

Recognize advanced (i.e. graduate) courses in differential geometry.	
Recognize the concepts of curves and surfaces because they are almost essential in most branches of mathematics; therefore, it is important for the student to know and to understand these notions.	
Estimate the behavior of a regular curve and decide whether this curves looks like a cylindrical helix.	
Write the curvature and torsion of a regular curve.	
Write the geodesic equations of a surface and integrating them to find all geodesic curves of the surface.	
Evaluate the principal curvatures, the mean curvature, and Gauss curvature of a given surface.	

Textbooks adopted and supporting references

Title of the book	Author's name	Publisher's name	Date of publication
Elements of Differential Geometry	R. S. Millman and G. D. Parker	Prentice-Hall, Englewood Cliffs, NJ	1977
Differential Geometry of Curves and Surfaces	M. P. doCarmo	Prentice-Hall, Saddle River NJ,	1976
Elementary Topics in Differential Geometry	J. A. Thorpe	Springer-Verlag, New York	1979
Elementary Differential Geometry. (Revised	B. O'Neill	Elsevier/Academic Press, San Diego CA	2006

Second Edition)			