數學系課程核心教材內容

課程名稱：(中文）幾何學 (英文）Geometry				開課單位	學士班
				課程代碼	2103301
學分數	3	必/選修	必選	開課年級	3

教學目標：Understanding and the ability of performing calculation of the differential geometric properties of curves and regular surfaces in the Euclidean spaces.

課程概述：This is a one-semester introductory course to the differential geometry of curves and surfaces in the Euclidean spaces.

先修科目或先備能力：Calculus (I, II), Linear algebra, Vector analysis

建議參考書目	1. A. Pressley, *Elementary differential geometry* (主要參考書), Springer 2. M. P. do Carmo, *Differential geometry of curves and surfaces*

課程大綱

單元主題	內容綱要	上課週數
1. Curves in the plane and in space	Arc-length, Reparametrization, Level curves vs. parametrized curves, Curvature, Plan curves, Space curves, simple closed curves, the isoperimetric inequality, the four vertex theorem	3
2. Surfaces in three dimensions	Smooth surfaces, Tangents, Normals and Orientability, Quadric surfaces, Triply orthogonal systems, Applications of the inverse function theorem, Lengths of curves on surfaces, Isometries and conformal mappings of surfaces, Surface area	4
3. Curvature of surfaces	The second fundamental form, The curvature of curves on a surface, The normal and principal curvatures, The Gaussian and mean curvatures, The pseudosphere, Flat surfaces, Surfaces of constant mean curvature, Gaussian curvature of compact surfaces, The Gauss map, Minimal surfaces (optional)	4
4. The intrinsic geometry of surfaces	Geodesic equations, Geodesics on surfaces of revolution, Geodesics as shortest paths (optional), Geodesic coordinates (optional), Gauss's remarkable theorem, Isometries of surfaces, The Codazzi-Mainardi equations, Compact surfaces of constant Gaussian curvature (optional), The Gauss-Bonnet theorem, Singularities of vector fields (optional), Critical points (optional)	5