

數學系課程核心教材內容

課程名稱：(中文) 科學計算導論：曲線與曲面之模型化 (英文) Introduction to Scientific Computing： Modeling of Curves and Surfaces			開課單位	學士班	
			課程代碼	2104554	
學分數	3	必/選修	選修	開課年級	四
<p>教學目標： This course provides an introduction to theoretical foundation of the modeling of curves and surfaces. The primary objective is to learn the mathematical concepts needed in tackling problems arising in geometric modeling which is used to describe the shape of an object or to simulate dynamic processes in computer graphics, computer vision, and motion planning.</p> <p>課程概述： polynomial curves, spline curves, polynomial surfaces, spline surfaces, theory of curves and surfaces</p> <p>先修科目或先備能力： Calculus, Linear Algebra</p>					
建議參考書目	<ol style="list-style-type: none"> 1. B. Farin, <i>Curves and Surfaces for CAD: A Practical Guide</i>, 5th ed., Academic Press, 2002 2. J. Gallier, <i>Curves and Surfaces in Geometric modeling: Theory and Algorithms</i>, Morgan Kaufmann, 2000 3. Mortenson, <i>Geometric Modeling</i>, 2nd ed., Wiley, 1997 				

課程大綱

單元主題	內容綱要	上課週數
Preliminaries	<ul style="list-style-type: none"> ● Polynomial interpolation: Lagrange formula and Newton's form, Hermite interpolation ● Parametric curves: examples and arc length ● Basics of affine geometry: affine spaces, affine subspaces, affine independence and affine frames, affine maps 	2~4
Polynomial curves and spline curves,	Hermite curves, Cubic Spline curves, Bezier curves, B-Spline curves ,	4-6
Polynomial surfaces and spline surfaces,	Parametric surfaces, bicubic Hermite surfaces, Bezier surfaces, B-spline surfaces, subdivision algorithms	4~6
Theory of curves and surfaces*	Frenet frame, osculating circle, arc element, local frame, curvature of a surface curve, Gaussian and mean curvature	2~3
Rational B-spline and B-spline curves*	Rational Bezier curves, derivatives, rational cubic B-spline curves, interpolation with rational cubics	2~3

*: optional