數學系課程核心教材內容

課程名稱：(中文) 微積分(一) (英文) Calculus (I)				開課單位	學士班
				課程代碼	2101019
學　分　數	3	必 / 選修	必	開課年級	一
教學目標： (一)主要目標：使學生清楚的了解微積分的基本概念、法則及數學證明的要求，透過各種實例的介紹，讓學生能對微積分有更多的認識，以備學生研習理工相關領域專業課程，能有充分而紮實的數學基礎。 (二)次要目標：經由微積分的實作演算，培養學生應用微積分解決相關數學問題的能力及數學嚴密性的要求。					
建議參考書目	1. Calculus: One and Several Variables, Salas, Hille and Etgen. 2. Calculus: Early Transcendental, James Stewart. 3. Thomas' Calculus, Early Transcendentals, G. B. Thomas, R. L. Finney, M. D. Weir and F. R. Giordano. 4. Applied Calculus for Scientists and Engineers, F. Blume and C. E. Piston.				

課程大綱

單元主題	內容綱要	上課週數
函數	函數的定義、常見函數、指數與對數函數、反函數	1 week
極限	極限之定義、連續函數、單邊極限	2 weeks
微分	導數之定義、微分之規則與技巧、鏈鎖律、隱函數微分、指數對數之微分、三角函數之微分	3-4 weeks
微分之應用	函數之極值、平均值定理、l'Hospital's Rule、函數圖形之描繪	3 weeks
反導數與積分	反導數、面積與定積分、微積分積本定理、不定積分、積分公式	2-3 weeks
積分技巧及應用	變換變數、分部積分、有理函數之積分、三角函數之積分、三角代換、曲線間的面積、瑕積分	3-4 weeks

數學系課程核心教材內容

課程名稱：(中文) 微積分(二) (英文) Calculus (II)				開課單位	學士班
				課程代碼	2101020
學　分　數	3	必 / 選修	必	開課年級	一
教學目標： (一)主要目標：使學生清楚的了解微積分的基本概念、法則及數學證明的要求，透過各種實例的介紹，讓學生能對微積分有更多的認識，以備學生研習理工相關領域專業課程，能有充分而紮實的數學基礎。 (二)次要目標：經由微積分的實作演算，培養學生應用微積分解決相關數學問題的能力及數學嚴密性的要求。 先修科目或先備能力：微積分(一)					
建議參考書目	1. Calculus: One and Several Variables, Salas, Hille and Etgen. 2. Calculus: Early Transcendental, James Stewart. 3. Thomas' Calculus, Early Transcendentals, G. B. Thomas, R. L. Finney, M. D. Weir and F. R. Giordano. 4. Applied Calculus for Scientists and Engineers, F. Blume and C. E. Piston.				

課程大綱

單元主題	內容綱要	上課週數
數列與級數	無窮數列與無窮級數、無窮級數之收斂判定、積分審斂法、比較審斂法、比值審斂法、根式審斂法、交錯級數、冪級數、泰勒及麥克勞林級數、泰勒展開式及其應用	4 weeks
參數式、極座標與向量值函數	平面曲線之參數式、極座標、極座標弧長與面積、向量值函數之微分與積分	2 weeks
多變數函數之微分	多變數函數、極限與連續、偏導數及其性質、梯度及方向導數、極值、Lagrange 乘數	4 weeks
多重積分	二重積分、極座標變換、二重積分之應用、表面積、變數變換	4 weeks
*向量微積分	線積分及其基本定理、曲面積分及曲面面積、弧長積分、Green 定理	1-2 weeks

*：Optional topics

數學系課程核心教材內容(例)

教科書：Calculus: Early Transcendental, by James Stewart.

課程綱要		上課週次
Chapter 1	**Functions and Models**	1 week
1.1	Four ways to represent a function	
1.2	Mathematical models: a catalog of essential functions	
1.3	New functions from old functions	
1.4	Exponential functions	
1.5	Inverse functions and Logarithms	
Chapter 2	**Limits and Derivatives**	2-3 week
2.1	The tangent and velocity problems	
2.2	The limit of a function	
2.3	Calculating limits using the limit laws	
2.4	The precise definition of a limit	
2.5	Continuity	
2.6	Limits at infinity; Horizontal asymptotes	
2.7	Derivatives and rates of change	
2.8	The derivative as a function	
Chapter 3	**Differentiation Rules**	3.5 weeks
3.1	Derivatives of polynomials and exponential functions	
3.2	The product and quotient rules	
3.3	Derivatives of Trigonometric functions	
3.4	The chain rule	
3.5	Implicit differentiation	
3.6	Derivatives of logarithmic functions	
3.7	Rates of change in the natural and social sciences	
3.8	Exponential growth and decay	
3.9	Related rates	
3.10	Linear approximations and differentials	
Chapter 4	**Applications of Differentiation**	3 weeks
4.1	Maximum and minimum values	
4.2	The mean value theorem	
4.3	How derivatives affect the shape of a graph	
4.4	Indeterminate forms and l'Hospital's rules	
4.5	Summary of curve sketching	
4.6	Optimization problems	
4.7	Antiderivatives	
Chapter 5	**Integrals**	2 weeks
5.1	Areas and distances	
5.2	The definite integral	
5.3	The fundamental theorem of Calculus	
5.4	Indefinite integrals and thenet change theorem	
5.5	The substitution rule	
Chapter 6	**Applications of Integration**	
6.1	Areas between curves	
Chapter 7	**Techniques of Integration**	3-4 weeks
7.1	Integration by parts	
7.2	Trigonometric integrals	
7.3	Trigonometric substitution	
7.4	Integration of rational functions by partial fractions	
7.5	Strategy for integration	
7.6	Improper integrals	

課程綱要		上課週次
Chapter 11	**Infinite sequences and series**	4 weeks
11.1	Sequences	
11.2	Series	
11.3	The integral test and estimates of sums	
11.4	The comparison tests	
11.5	Alternating series	
11.6	Absolute convergence and the ratio and root tests	
11.7	Strategy for testing series	
11.8	Power series	
11.9	Representations of functions as power series	
11.10	Taylor and Maclaurin series	
11.11	Applications of Taylor polynomials	
Chapter 10	**Parametric equations and polar coordinates**	2 weeks
10.1	Curves defined by parametric equations	
10.2	Calculus with parametric curves	
10.3	Polar coordinates	
10.4	Areas and lengths in polar coordinates	
Chapter 13	**Vector functions**	
13.1	Vector functions and space curves	
13.2	Derivative and integrals of vector functions	
13.3	Arc length and curvature	
Chapter 14	**Partial derivatives**	4 weeks
14.1	Functions of several variables	
14.2	Limits and continuity	
14.3	Partial derivatives	
14.4	Tangent planes and linear approximations	
14.5	The chain rule	
14.6	Directional derivatives and the gradient vector	
14.7	Maximum and minimum values	
14.8	Lagrange multipliers	
Chapter 15	**Multiple integrals**	4 weeks
15.1	Double integral over rectangles	
15.2	Double integrals over general regions	
15.3	Double integrals in polar coordinates	
15.4	Applications of double integrals	
15.5	Surface area	
15.9	Change of variables in multiple integrals	
Chapter 16	**Vector Calculus***	1-2 weeks
16.1	Vector fields	
16.2	Line integrals	
16.3	The fundamental theorem for line integrals	
16.4	Green’s theorem	