# 數學系課程核心教材內容

| 課程名稱：(中文) 微積分(一) (管院) | | | | 開課單位 | 學士班 |
|---|---|---|---|---|---|
| (英文) Calculus (I) | | | | 課程代碼 | 2101003 |
| 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，以備學生研習管理及社會科學相關數理課程時能有充分而紮實的數量基礎。
(二) 次要目標：經由微積分的實做演算，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。

課程概述：(1) 函數之極限概念；(2) 函數之微分及其應用；(3) 指數與對數函數之微分及應用 。

先修科目或先備能力：無

| 建議參考書目 | 1. "Applied Calculus for the Managerial, Life, and Social Sciences: A Brief Approach (8th edition)", by Soo T. Tan. <br> 2. "Applied Calculus", by Geoffrey C. Berresford and Andrew M. Rockett. <br> 3. "Applied Calculus (3th edition)", by Deborah Hughes-Hallett, Patti Frazer Lock, Andrew M. Gleason, and Daniel E. Flath. |
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課程大綱

| 單元主題 | 內容綱要 | 上課週數 |
|---|---|---|
| Introduction to limits and continuous functions | limit of a function, limit laws, asymptotes, continuity, root location property of continuous functions <br> 相關應用： cost-revenue functions, break-even analysis, demand-supple functions, market equilibrium.…等 | 3-4 weeks |
| Derivatives | rate of change, slope of a tangent, differentiability and continuity, techniques of differentiation, composite functions and chain rules, differential and linear approximation, implicit differentiation and related rates, higher-order derivatives <br> 相關應用：marginal analysis…等 | 4-5 weeks |
| Applications of the Derivative | curve sketching with first derivative, concavity and the second derivative, relative and absolute extreme, critical points, first derivative test and second derivative tests for relative extreme, practical optimization problems <br> 相關應用：marginal analysis criterion for maximum profit and for minimal average cost, elasticity of demand, elasticity and the total revenue…等 | 4-5 weeks |
| Exponential and logarithmic functions | algebra of exponents, irrational exponents, the number $e$, curve sketching for function involving powers of e, exponential models, the natural logarithm, concept of inverse functions, logarithms with other bases, derivatives of exponential and logarithmic functions, logarithmic differentiation <br> 相關應用：compound interest, continuously compounded interest, effective interest rate, present value, annuity, exponential growth and decay, logistic curve…等 | 4 weeks |

# 數學系課程核心教材內容

| 課程名稱：(中文) 微積分(二) (管院) | | | | 開課單位 | 學士班 |
|---|---|---|---|---|---|
| (英文) Calculus (II) | | | | 課程代碼 | 2101004 |
| 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，以備學生研習管理及社會科學相關數理課程時能有充分而紮實的數量基礎。

(二) 次要目標：經由微積分的實做演算，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。

課程概述：(1) 函數之微分及應用；(2) 多變量函數之微分及多重積分及其應用；(3) 無窮級數及泰勒展開式。

先修科目或先備能力：微積分(一)

| 建議參考書目 | 1. "Applied Calculus for the Managerial, Life, and Social Sciences: A Brief Approach (8th edition)", by Soo T. Tan. <br> 2. "Applied Calculus", by Geoffrey C. Berresford and Andrew M. Rockett. <br> 3. "Applied Calculus (3th edition)", by Deborah Hughes-Hallett, Patti Frazer Lock, Andrew M. Gleason, and Daniel E. Flath. |
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課程大綱

| 單元主題 | 內容綱要 | 上課週數 |
|---|---|---|
| Integrals | Anti-derivatives and indefinite integral, integration rules (power function, $e^x$), integration by substitution, area and definite integral, area between curves, integration by parts <br> 相關應用：consumers' demand curve and willingness to spend, consumers' surplus…等 | 4 weeks |
| Further topics in integration | the definite integrals as the limit of a sum, concept of fundamental theorem of calculus, average value of a function, volume of a solid of revolution, improper integrals <br> 相關應用：amount of an income stream, present value of an income stream, probability density functions, expectation, variance…等 | 4-5weeks |
| Functions of two variables | level curves, partial derivatives, second-order partial derivatives, chain rule, slope of a level curve, linear approximation and total differential, critical points and relative extreme, second partials test, method of Lagrange multipliers, significance of the Lagrange multiplier, double integrals, simple regions described in terms of vertical or horizontal strips, integration over simple and complex regions, change the order of integration, average value of a function of two variables, <br> 相關應用：marginal analysis for functions of two variables…等 | 4-5weeks |
| Infinite series | convergence and divergence, geometric series, power series, convergence of power series, Taylor series, Taylor polynomials, integration of infinite series <br> 相關應用：present value of annuity…等 | 3 weeks |
| Trigonometric Functions* | derivatives of trigonometric functions, integral of trigonometric functions | 1 week |

＊：Optional topics