## 課程詳細資訊

| | | | |
|---|---|---|---|
| 年度 | 111 | 授課方式 | 實體授課 |
| 大學院校名稱 | 國立中央大學 | 系所名稱 | 數學系 |
| 課程領域 | 微積分課程 | 課程編號 | MA1001-7 |
| 課程中文名稱 | 微積分 | 課程英文名稱 | Calculus |
| 授課教師 | 黃榮宗教授 | 課程學分 | 4 |
| 課程學分費(單一學分費) | 1000元 , 總學分費 : 4000元 | 非本校學生課程學分費(單一學分費) | 1000元 , 總學分費 : 4000元 |
| 其他費用 | 200 | | |
| 授課地點 | 國立中央大學教研大樓TR-A003 | | |
| 開放修課人數上限 | 120 | 最低修課人數門檻 | 40 |
| 非本校生修課人數上限 | 20 | 高中生修課人數上限 | 0 |
| 授課起日 | 20220711 | 授課訖日 | 20220819 |
| 實體上課時間 | 星期一 Monday 09:00-11:50<br>星期二 Tuesday 09:00-11:50<br>星期四 Thursday 09:00-11:50<br>星期五 Friday 09:00-11:50 | | |
| 成績呈現方式 | 百分制 | 成績結果說明 | 0~100分 |
| 使用開課學校自建的報名系統 | 否 | | |

## 課程概述

從多項式函數的微積分基本觀念與典型應用開始，遞次發展代數函數、指對函數、三角函數的微積分知識與技術。整體課程符合中央大學「理地工資電」學院微積分聯合教學的第一學期課程內容。

We will start with basic concepts and applications of Calculus for polynomial functions. Then extend the knowledge and skills to cover algebraic functions, exponential and logarithmic functions, and trigonometric functions. The overall content will be equivalent to that of the  first semester United Courses of Calculus for the Engineering/Science colleges in NCU.

## 課程目標

學習微分與積分的基本知識和見識微積分的一些應用, 透過本學科的技巧來培養學生的思考和解決問題的能力。

The objective of the course is to learn the basic techniques and ideas in calculus such as limits, differentiation and integration and apply these techniques in formulating and solving problems. The theoretical aspect of calculus is also emphasized.

## 課程要求

課程時間緊密，數學學習也需要多時間去吸收，本班學生需高度專注。因採取國際標準教科書，筆記，考試等文件都是用英文（以華語授課），學生須準備好閱讀英文教材。為了提升學習效率，學生應在開課前自行備妥教科書。在課堂外，學生每週約需投入約12小時研習本課程。

Since the course is held on a tight schedule, and the learning of mathematics requires time to digest, students taking this class have to be highly focused.  Course materials, including textbook, lecture notes, quiz and exam items, are in English (though lectures will be given in Chinese). Students should prepare themselves for reading English materials.For a quick start, students shall have the textbook ready before the first lecture.

Students are expected to devote approximately 12 hours per week to study for this course. Meeting hours excluded.

## ▌指定閱讀

Thomas' Calculus 14/e in SI Units, Thomas.

同學可在校園內的敦煌書局採購。

## ▌評量方式 (修課證明)

平時測驗25%，三次段考各佔25%

## ▌評量方式 (課程認證考試)

## ▌課程大綱

| 週次 | 日期 | 單元主題 | 備註欄 |
|---|---|---|---|
| 1 | 7/11-7/15 | Chapters 1 and 2. | |
| 2 | 7/18-7/22 | Chapters 3 and 4. | 段考一 |
| 3 | 7/25-7/29 | Chapter 5. | |
| 4 | 8/1-8/5 | Chapter 6. | 段考二 |
| 5 | 8/8-8/12 | Chapter 7. | |
| 6 | 8/15-8/19 | Chapter 8. | 段考三 |

In this course, we will study the following topics:
1. Functions and Models.
2. Limits: definition of a limit, continuity.
3. Derivatives: differentiation rules, derivatives of trigonometric functions, chain rule, implicit differentiation, etc.
4. Applications of Differentiation: extreme values, mean-value theorem, monotonic functions, concavity, optimization problems, Newton method, antiderivatives, etc.
5. Integrals: definite integral, fundamental theorem of calculus, indefinite integrals, substitution rule, etc.
6. Applications of Integration: areas, volumes, arc length, area of a surface of revolution, work, etc.
7. Inverse Functions: natural logarithms, exponential functions, inverse trigonometric functions, hyperbolic functions, etc.
8. Techniques of Integration: integration by parts, partial fractions, trigonometric integrals, trigonometric substitutions, improper integrals, etc.

Contents of Textbook

1 Functions

1.1 Functions and Their Graphs

1.2 Combining Functions; Shifting and Scaling Graphs

1.3 Trigonometric Functions

1.4 Graphing with Software

2 Limits and Continuity

2.1 Rates of Change and Tangents to Curves

2.2 Limit of a Function and Limit Laws

2.3 The Precise Definition of a Limit

2.4 One-Sided Limits

2.5 Continuity

2.6 Limits Involving Infinity; Asymptotes of Graphs

3 Derivatives

3.1 Tangents and the Derivative at a Point

3.2 The Derivative as a Function

3.3 Differentiation Rules

3.4 The Derivative as a Rate of Change

3.5 Derivatives of Trigonometric Functions

3.6 The Chain Rule

3.7 Implicit Differentiation

3.8 Related Rates

3.9 Linearization and Differentials

4 Applications of Derivatives

4.1 Extreme Values of Functions

4.2 The Mean Value Theorem

4.3 Monotonic Functions and the First Derivative Test

4.4 Concavity and Curve Sketching

4.5 Applied Optimization

4.6 Newton ' s Method

4.7 Antiderivatives

5 Integrals

5.1 Area and Estimating with Finite Sums

5.2 Sigma Notation and Limits of Finite Sums

5.3 The Definite Integral

5.4 The Fundamental Theorem of Calculus

5.5 Indefinite Integrals and the Substitution Method

5.6 Definite Integral Substitutions and the Area Between Curves

6 Applications of Definite Integrals

6.1 Volumes Using Cross-Sections

6.2 Volumes Using Cylindrical Shells

6.3 Arc Length

6.4 Areas of Surfaces of Revolution

6.5 Work and Fluid Forces

6.6 Moments and Centers of Mass

7 Transcendental Functions

7.1 Inverse Functions and Their Derivatives

7.2 Natural Logarithms

7.3 Exponential Functions

7.4 Exponential Change and Separable Differential Equations

7.5 Indeterminate Forms and L ' Hopital ' s Rule

7.6 Inverse Trigonometric Functions

7.7 Hyperbolic Functions

7.8 Relative Rates of Growth

8 Techniques of Integration

8.1 Using Basic Integration Formulas

8.2 Integration by Parts

8.3 Trigonometric Integrals

8.4 Trigonometric Substitutions

8.5 Integration of Rational Functions by Partial Fractions

8.6 Integral Tables and Computer Algebra Systems

8.7 Numerical Integration

8.8 Improper Integrals

## ▌聯絡資訊

| | |
|---|---|
| **開課學校連絡窗口** | |
| **姓名、職稱** | **蔡宛螢行政專員** |
| **連絡電話** | 03-4227151*57166 |
| **電子信箱** | Candytsai@g.ncu.edu.tw |
| **開課學系連絡窗口** | |
| **姓名、職稱** | **吳昭穎專任人員** |
| **連絡電話** | (03)4227151#65167 |
| **電子信箱** | wucy@math.ncu.edu.tw |
| **授課教師連絡方式** | |
| **姓名、職稱** | **黃榮宗教授** |
| **連絡電話** | |
| **電子信箱** | rthuang@math.ncu.edu.tw |

## ▌課程 / 認證考試連結

## ▌備註

***每門課另需繳交200元的報名登記費，隨學分費一同繳交。**

***報名前，請務必詳閱本校簡章，**
**請至『國立中央大學準大一新生暑期預修平台』下載** https://pdc.adm.ncu.edu.tw/Course/fresh/fresh_i.asp