



**EE1004A**  
**CALCULUS(II)**

Szu-Chi Chung

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# Lectures

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- ▶ Class hours: Thur. (9:10-12:00)
  - ▶ Classroom: 工EC 2010
- ▶ Lecture: Szu-Chi Chung (鍾思齊)
  - ▶ Office: 理 SC 2002-4
  - ▶ Office hour: Mon. 16:10~18:10 and Wed. 16:10~18:10
- ▶ T.A.: 蔡羽涵
  - ▶ Office: 理SC 1011-2
  - ▶ TA hour: Thur. 15:00~17:00
- ▶ Facebook
  - ▶ <https://www.facebook.com/groups/314913597074836>

# Textbook and requirement

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- ▶ Textbook : *Calculus, 11th Ed (Metric Version)*
  - ▶ Authors: Larson, Ron and Edwards, Bruce H
  - ▶ <https://www.cengage.co.uk/books/9781337616195/>
- ▶ Graphical tools
  - ▶ <https://www.wolframalpha.com/> (Wolframalpha)
  - ▶ <https://wolfreealpha.github.io/input/index.html> (Wolfreealpha)
  - ▶ Mobile app

# Textbook and requirement

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- ▶ Resources provided by authors
  - ▶ <https://www.larsoncalculus.com/calc11/>
- ▶ For the odd number of exercises of each chapter, the solution is at the end of the book
- ▶ The assignment and related material will be available on the course webpage
  - ▶ <https://phonchi.github.io/nsysu-EE1004A/>

# Resources

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- ▶ Visual introduction to the core ideas in calculus
  - ▶ <https://www.3blue1brown.com/topics/calculus>
- ▶ Precalculus
  - ▶ [寫給高中生的微積分簡介-第五版](#)
- ▶ Calculus
  - ▶ [微積分\(黃文璋老師\)](#)
  - ▶ [微積分總棟員](#)
  - ▶ [微積分\(嚴國勇老師\)](#)
  - ▶ [微積分\(朱樺老師\)](#)
  - ▶ [微積分\(李國偉老師\)](#)

# Grading policy

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- ▶ Grading
  - ▶ Weekly Homework 20%
  - ▶ Participants: 5% (participates at least 10 times can get the full score)
  - ▶ Take home Quiz: 5% (2 times)
  - ▶ Midterm exam 30%
  - ▶ Final project 40%
  - ▶ Suggested exercises will be available at our website
- ▶ Midterm
  - ▶ Will be held on 2022/04/14 at  $\perp$ EC 2011
- ▶ Final:
  - ▶ Will be held on 2022/06/09 at  $\perp$ EC 2011

# Relate to other courses

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- ▶ **Required courses**
  - ▶ Differential equations
  - ▶ Circuit theory (I)(II)
  - ▶ Electromagnetic theory (I)(II) – Vector Calculus
  - ▶ Signals and systems
  - ▶ Probability theory, Complex variables....
- ▶ **Related fields**
  - ▶ General physics (I)(II)
  - ▶ Machine learning, statistics
  - ▶ Applied mathematics
  - ▶ ...

# What we are going to study in this semester

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- ▶ This semester
  - ▶ Infinite series
  - ▶ Parametric Equations and Polar Coordinates (10.3~10.5)
  - ▶ Vectors and Geometry of space (11.6,11.7)
  - ▶ Vector valued function (12.1,12.2)
  - ▶ Functions of Several Variables (13.1~13.8)
  - ▶ Multiple integration



# WolframAlpha

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- ▶ **WolframAlpha is a computational knowledge engine or answer engine developed by Wolfram**
  - ▶ It is an online service that answers factual queries directly by computing the answer from externally sourced "curated data", rather than providing a list of documents or web pages that might contain the answer, as a search engine might.
  - ▶ WolframAlpha has been used to power some searches in the Microsoft Bing and DuckDuckGo search engines. With the first release on July 21, 2017, Brave web browser featured WolframAlpha as one of its default search engines. For factual question answering, it is sometimes queried by Apple's Siri and Amazon Alexa for math and science queries.
  - ▶ Can be used for math, physics, chemistry, earth science, engineering, weather, ....

## Some examples you may encounter this semester

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### ▶ Sequence

- ▶ 1, 4, 9, 16, 25, ... (Sequence Recognition)
- ▶  $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$
- ▶  $\lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n$

### ▶ Infinite sum

- ▶  $\sum_{i=0}^n (\frac{3}{4})^i$
- ▶  $\sum_{i=0}^{\infty} (\frac{3}{4})^i$
- ▶  $\sum \frac{1}{n^2}$  (infinite sum)

### ▶ Sum convergence

- ▶ convergence of  $n^{-2}$
- ▶ sum convergence of  $n^{-2}$
- ▶ does the sum of  $1/(n!)$  converge

## Some examples you may encounter this semester

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- ▶ Radius of convergence
  - ▶ radius of convergence of  $(3x-2)^n/n$
- ▶ Taylor and Maclaurin series
  - ▶ Taylor series  $\sin x$
  - ▶ series  $\sin x$  at  $x=\pi/4$
  - ▶ series  $\sin x$  to order 20
- ▶ Parametric and polar plots
  - ▶ parametric plot  $(\cos^3 t, \sin^3 t)$
  - ▶ polar plot  $r=1+\cos \theta$
- ▶ Arc length and area
  - ▶ length of the curve  $\{x=2\cos(t), y=2\sin(t)\}$  from 0 to  $\pi$
  - ▶ length of the curve  $\{x=2\cos(t), y=2\sin(t), z=t\}$  from 0 to  $\pi$

## Some examples you may encounter this semester

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### ▶ Functions of several variables

- ▶ is  $3xy^2 - x^3$  a differentiable function?
- ▶  $d/dx x^2 y^4$ ,  $d/dy x^2 y^4$  (Partial derivative )
- ▶ derivative of  $x^2 y + x y^2$  in the direction  $(1,1)$  (Directional derivative)
- ▶ maximize  $x y$  on  $x^2 + 2 y^2 = 4$  (Extrema)

### ▶ Multiple integration

- ▶ integrate  $x^2 \sin y \, dx \, dy$ ,  $x=0..1$ ,  $y=0..pi$
- ▶  $\int \sin^2 x + y \sin z \, dx \, dy \, dz$ ,  $x=0..pi$ ,  $y=0..1$ ,  $z=0..pi$
- ▶  $\int e^{-(x^2+y^2)} \, dx \, dy$ ,  $x=-\infty$  to  $\infty$ ,  $y=-\infty$  to  $\infty$