

# 應用數學（科號：11220PHYS211000）

Applied Mathematics (I) — Spring, 2024

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- 教科書 (Textbook)

**Riley, Hobson & Bence ~ Mathematical Methods for physics and engineering (3rd Edition)**

- 主要參考書 (Main Reference)

**Erwin Kreyszig ~ Advanced Engineering Mathematics (10th Edition)**

**S. C. Chapra ~ Applied Numerical Methods with MATLAB for Engineers and Scientists (4th Edition)**

- 教學進度 (Syllabus)：一或兩週介紹一子題。

- ◆ Review of Elementary Algebra and Calculus
- ◆ Vector Algebra and Curvilinear Coordinate System
- ◆ Matrices and Vector Spaces
- ◆ Normal Modes
- ◆ Vector Calculus Test-1, Week 6
- ◆ First-order Ordinary Differential Equations
- ◆ Higher-order ordinary differential equations
- ◆ Frobenius Method
- ◆ Laplace Transforms Test-2, Week 11
- ◆ Fourier Series and Fourier Transforms
- ◆ Eigenfunction Methods for Solving ODE
- ◆ Methods of Green's Functions for ODE
- ◆ Systems of ODEs Test-3, Week 17

- 成績考核 (Evaluation)：期初公布原則性計分方式、學期中採機動性加分調整。

考試 75% (三次段考各佔 25%)，作業 25%；Extra Credits (外加 10%)。

考試未到者除病假（需醫師、藥單證明）或公假外，該次以零分計。

積極參加晚間問題解課的同學，可獲得助教的加分推薦，最高 5%。

勉勵：題解課全勤者得參加期中段考的補考；勤做筆記和作業者，學期成績從優加分。

- 題解課演習 (Course Tutoring)：暫定 3/27、5/1、6/12 改為段考時段，時間延長半小時。

週二 19:00 – 20:30，助教作業提示、範例補充，並解釋課堂疑難（物理館 124 講堂）。

週三 19:00 – 20:30，數值分析教學與習作，並配合習題補充範例（物理館 124 教室）。

- 尊重智慧財產權，請使用合法教科書！電子檔案教材限於課程內使用，請勿複製外傳。
- 善用 Matlab 數學軟體；完全開放使用 AI 工具。

## Brief Course Description

Applied Mathematics is a two-semester course, emphasizing the basic mathematical training encountered in physics and engineering. Facing the modern frontiers with brand-new challenges, the course in this semester contains the following key modules:

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|---|--------------------------------------|
| (1) Preliminary Algebra and Calculus,   | Chapters 3~5;                        |
| (2) Linear Algebra and Vector Analysis, | Chapters 7~10;                       |
| (3) ODE-I,                              | Chapters 14~15 and Section 13.2;     |
| (4) ODE-II,                             | Chapters 16~17, 12 and Section 13.1. |

Besides the analytical approach to deal with equations, numerical methods are also introduced to lead an insight into the problem solving.

## Key Words

**applied mathematics** (應用數學),  
**vector analysis** (向量分析),  
**linear algebra** (線性代數),  
**ordinary differential equations** (常微分方程),  
**eigenfunction methods** (本徵函數方法),  
**Green's function** (格林函數).