



11220PHYS401300  
Computational Physics Lab  
計算物理實作

## Syllabus

### Instructor

Associate Prof. Kuo-Chuan Pan (潘國全)  
Office: General building II, R506  
Email: [kuochuan.pan@gapp.nthu.edu.tw](mailto:kuochuan.pan@gapp.nthu.edu.tw)  
Phone: 03-5742563  
Web: <https://kuochuanpan.github.io/>  
Office hours: by appointment

### Teaching assistant (TA)

TBA

### Class schedule

Lectures on Monday from 13:20 - 16:20  
General building II, R521

### Preface

The goal of this course is to let undergraduate students know how to solve common physical problems numerically. Students will learn basic numerical algorithms through a few Lab projects in the course. Basic knowledge of classical mechanics, quantum physics, electrodynamics, and thermal physics are required. Previous experience with Python or other computing languages is preferred. A Unix-like system (e.g. Linux, Mac OS X, or Windows 10 subsystem for Linux) is required. Students must bring their own laptop to class. AI-assisted softwares (chatGPT or Github copilot ) are encouraged to use in the class.

### Tentative topics

Topics
1 Command Line Interface / Editors / Shell / Version control
2 Basic programming with Python
3 Data Visualization
4 Lab 1: Simple Harmonic Oscillator (damped systems / forced oscillations)
5 Lab 2: N-body systems (Stars / Molecular dynamics)
6 Lab 3: Laplace & Poisson equation (EM potential / Gravitational potential)
7 Lab 4: Gas dynamics (Explosions / Shock / Turbulence)