

## Engineering Tripos Part IA, 1P4: Computing, 2023-24

### Lecturer

[Prof G Wells](#) [1]

### Lab leader

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### Timing and Structure

Michaelmas Term: week 1, 1 introductory lecture; weeks 1-, 12 independent exercises: Lent Term: week 1, 1 lecture; weeks 1-, group project

### Prerequisites

None

### Aims

The aims of the course are to:

- Introduce students to computing for engineering applications.
- Introduction to programming in Python.
- Enable students to devise and implement algorithms to compute solutions to problems.
- Develop good software engineering skills.
- Develop skills for team-based software development, including use of version control.

### Objectives

As specific objectives, by the end of the course students should be able to:

- Describe using text and mathematics the purpose and flow of a program.
- Write and run Python programs in (i) Jupyter notebooks and (ii) from multiple source files.
- Understand variables, assignment, simple operators and precedence.
- Appreciate the importance of types and the pitfalls of round-off error and floating point arithmetic.
- Use of data structures and libraries.
- Understand the concept of an algorithm and algorithmic complexity.
- Apply error handling and unit testing as part of good software engineering practice.
- Develop skills for numerical computing for engineering applications.
- Be able to develop simple object-oriented data structures.
- Fetch data from different sources, and manipulate the data and display graphically.

### Content

#### Michaelmas Term

The Michaelmas Term part of the course involves 12 activities for self-study, and each activity has exercises to be completed. The exercises for *at least* the first six activities must be completed by the middle of the Term and will be

checked at a sign-up session, and the remainder must be completed by the sign-up session at the end of the Term.

- Familiarisation with the Jupyter environment for Python, including use of LaTeX for displaying mathematics
- Variables and assignment of values
- Control statements (if, for and while)
- Types and floating point arithmetic
- Functions
- Libraries
- Numerical computation, including array processing
- Data plotting
- Code testing and error handling
- Algorithms
- Complexity
- Data structures
- Object oriented design

### Lent Term

The Lent Term activity is a group exercise, with students working in pairs. Each student takes charge of writing part of a software solution. A modular design and unit testing are required to ensure that the two parts work together correctly.

- Problem solving using abstraction and modularisation
- Structured programming and program modularisation using functions
- Using data structures
- Using library functions and handling exceptions
- Developing and running programs written in multiple source files
- Use of git for version control

### Further notes

There are separate web pages associated with each Term's coursework:

<https://github.com/CambridgeEngineering/PartIA-Computing-Michaelmas> [3]

<https://cued-partia-flood-warning.rtfid.io/> [4]

### Examples papers

There are two examples papers: the first one is issued over the Christmas vacation, the second over the Easter vacation.

### Booklists

Please refer to the Booklist for Part IA Courses for references to this module, this can be found on the associated Moodle course.

### Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [5].

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### Links

[1] <mailto:gnw20@cam.ac.uk>

[2] <mailto:tpl@eng.cam.ac.uk>

[3] <https://github.com/CambridgeEngineering/PartIA-Computing-Michaelmas>

[4] <https://cued-partia-flood-warning.rtf.d.io/>

[5] <https://teaching.eng.cam.ac.uk/content/form-conduct-examinations>