Computational Physics

Topic 00 : Module Overview and Introduction

Lecture 01 : Module Overview

Dr Kieran Murphy

Computing and Mathematics, SETU (Waterford).
(kieran.murphy@setu.ie)

Autumn Semester, 2022/23

Outline

- Aim and motivation for this module
- Administration trivia — Contact hours, Assessment structure, ...
- Tools and resources
- Changes due to COVID

Motivation for this Module

Computational Physics

1. Solve problems that cannot be solved analytically.
2. Check the validity of approximations and effective theories.
3. Quantitatively compare theories to experimental measurements.
4. Visualise complex data sets.
5. Control and perform experimental measurements.

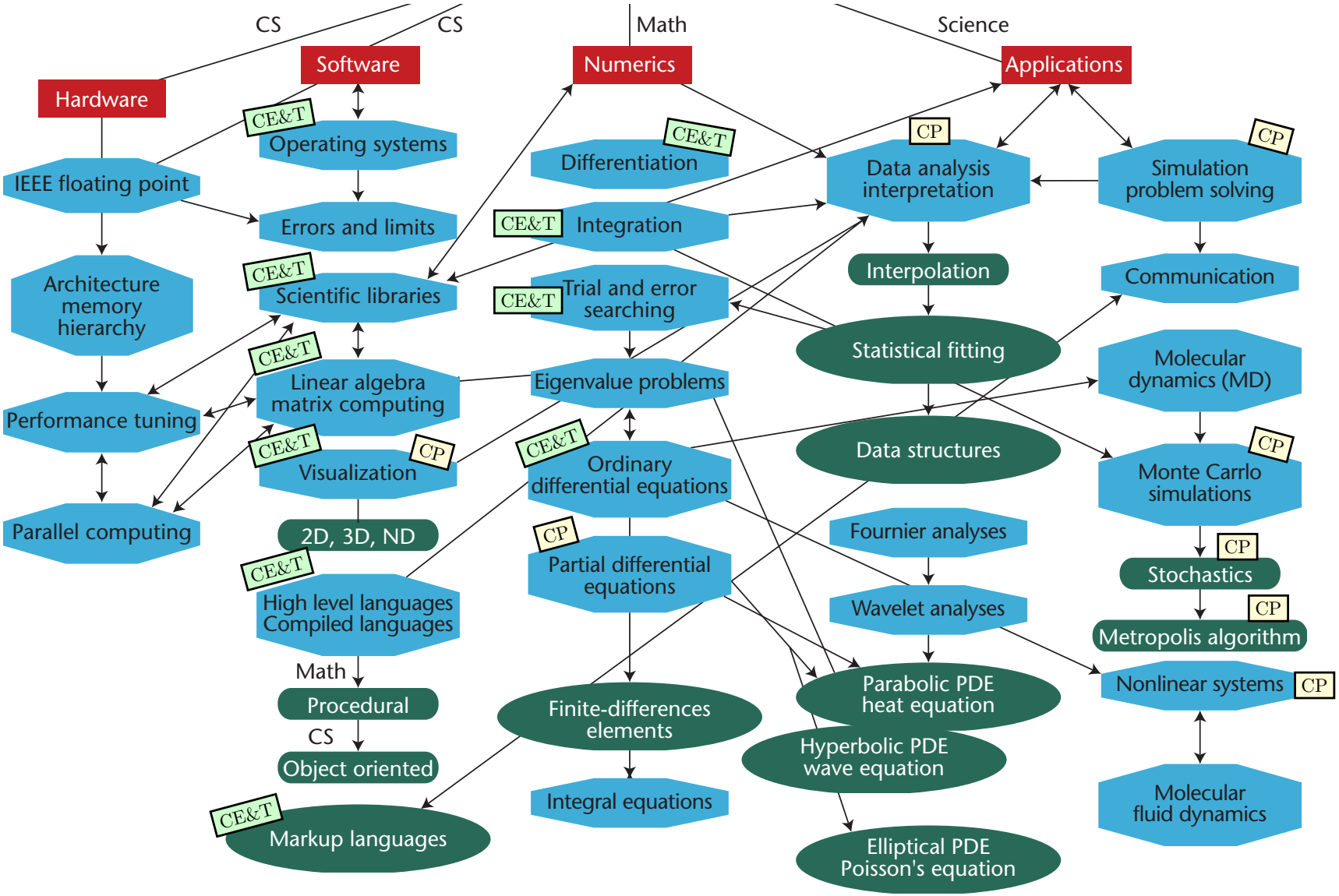
Comp. Env. & Toolchains

1. Environments and toolchains.
2. Deterministic processes — ODE, curve fitting, visualisation.
3. Short, introductionary problems.

Computational Physics

1. Stochastic processes — basic probability, Markov chains, Monte Carlo simulation
2. More advanced problems.
3. Generating results for documentation.

A Computational Physicist needs to Know Everything …



Module Delivery

Pre-/Post- COVID

- Two sessions in W06: 12:15–2:15 Wed, 9:15-10:15 Friday.
- Theory presented on white board, development on student's own laptops.

COVID (2021…)

- We will keep to same time slots, but I'm happy to move them around to suit the class as long as it does not clash with other commitments — *there has to be some advantage to being online.*
- Theory will presented via video and slides
  - some material will be required reading before sessions.
  - aim to minimise lecture time and maximise coding time.

Learning Technologies

Moodle: (moodle.wit.ie)

- Launch point for module material.
- All assignments and module deliverables.
- Will copy-post from slack important message here.

Website: kmurphy.bitbucket.io/modules

- Location of module content.
- Links to deliverables.

Google's Colab: colab.research.google.com/notebooks/intro.ipynb

- You can use your own instance of python (I prefer anaconda) and the Jupyter interface. However, to simplify things this semester I'm going to use Google's colab interface when working with python notebooks.

Slack: computational-ifr2571.slack.com

- Used for instant messaging, one-on-one sessions, etc.

Assessment Structure (Draft)

Participation, 20%

1. Hand-up up student notes after sessions.
2. Moodle quizzes (Theory)

Computational Tasks, 80%

1. Moodle quizzes (Computational)
2. 4–5 Computational tasks (current plan).
3. Grade based on:
   - Level of specification that was satisfied.
   - Analysis/programming quality.