Saskia Goes

ACSE-2
Modelling Dynamical Processes

Matthew Piggott

Stephen Neethling

Aims

- ACSE-2: introduce mathematical essentials and physical equations for modelling a range of dynamic processes

- ACSE-3 provides complementary background on numerical methods that can be used to solve the equations of these physical systems

Structure of course

- ***Week 1*** *Mathematical essentials for modelling, linear algebra, introduction to ordinary differential equations*

- ***Week 2*** *Conservation principles in continuum mechanics and equations that are used to describe motion and mechanical behaviour of materials*

- ***Week 3*** *Solving several fundamental problems: non-dimensionalisation, potential flow, fluid flow*

Some of you may already be familiar with the basic background that will be covered in part of the lectures, but may have been taught to you in different way, review may be useful, and everyone will have same background (and notation) for rest of course(s).

Outline of course

- *Matthew Piggott*
  1. Introduction to mathematical/numerical modelling
  2. Linear algebra I
  3. Linear algebra II, Ordinary differential equations
  4. Verifying models
- *Saskia Goes*
  5. Intro to Vector and Tensor Calculus
  6. Stress Principles
  7. Kinematics and strain
  8. Rheology and conservation equations
- *Stephen Neethling*
  9. Dimensional Analysis
  10. Potential flow
  11. Fluid flow
  12. Fluid flow & Turbulence

Schedule & Assessment

- **Week 1** and **week 3**
  - Morning (9:00-12:00): **lectures**, live and will be recorded
  - Afternoon (13:00-16:00): **workshop** for analytical/numerical exercises, with GTA assistance
- **Week 2**: **reversed class room** (lectures pre-recorded, class time for exercises and questions)
  - Morning: **workshop** with live intro and wrap up, teacher + GTA assistance with exercises
  - Afternoon: prepare by watching pre-recorded **lectures** for next day. GTAs available for further questions.

- **3 timed assessments** – Each of equal weight, released Fridays at 9:00, finish by 11:00 + 30 min. upload time (due by 11:30).

Course Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
02-Nov	03-Nov	04-Nov	05-Nov	06-Nov
lecture workshop	**lecture workshop**	**lecture workshop**	**lecture workshop**	**timed coursework**
09-Nov	10-Nov	11-Nov	12-Nov	13-Nov
reversed classroom	**reversed classroom**	**reversed classroom**	**reversed classroom**	**timed coursework**
16-Nov	17-Nov	18-Nov	19-Nov	20-Nov
lecture workshop	**lecture workshop**	**lecture workshop**	**lecture workshop**	**timed coursework**

lectures will be live and recorded. **workshop** will be GTA assisted.
for **reversed class room**, lectures have been pre-recorded and scheduled class time is used for teacher + GTA assisted exercises & questions
Every week is wrapped up with a **timed coursework**