

Using Numbas for 1st-Year Thermofluids

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Motivation and Module Overview

- ENG1005 Thermofluid Mechanics
 - ▶ Fundamental Engineering module; not strictly Maths, but mostly numerical
- Large first-year module
 - ▶ 400-500 Engineers (of all flavours)
- Most students find it a challenging module
 - ▶ Combination of unfamiliar concepts and high numerical content
- Module delivery:
 - ▶ Year-long
 - ▶ Weekly recording(s) (short, ~10 min each)
 - ▶ Weekly in-person problem class (lecture, solving example problems)
 - ▶ Weekly in-person tutorial (PGR demonstrators help with individual questions)
 - ▶ Experimental labs (6 over the year)
- Numbas is used for tutorials, lab sheets, and all assessments
- Mostly quite conventional (randomisation, carry-forward marking)
- Interesting functionalities: property tables, lab sheets

Assessment Strategy

- Assessment (as it's been run up to and including this year)
 - ▶ Semester 1 in-course formative
 - ▶ Semester 2 in-course summative (20%)
 - ▶ End-of-year exam (80%)
- In-course assessment
 - ▶ Available all semester; one attempt, but can come and go as often as they like
 - ▶ One or two short questions per week
 - ▶ Straight from the corresponding tutorial sheet (where there are worked solutions)
 - ▶ Idea is that it should take about 10-15 minutes per week
 - ▶ Low-stakes, low-stress
 - ▶ Designed to offer easy marks in exchange for continual engagement
- End-of-year exam
 - ▶ In-person online
 - ▶ Questions can be taken from any part of module
 - ▶ Similar style to the tutorial sheets, but unseen
 - ▶ Partially open-book; access to the module on Canvas, and 2 pages of own notes

- Tutorials

- ▶ Idea: practise applying knowledge gained in lectures to simple Engineering problems
- ▶ Straightforward sets of typical Numbas questions
- ▶ Multiple attempts allowed, randomised numbers
- ▶ Detailed worked solutions provided, including the randomised numbers

- Lab sheets

- ▶ Idea: take the students through the whole laboratory experiment
- ▶ Instructions (including any H&S) how to conduct the lab
- ▶ Data collection and subsequent calculations and graph plotting
- ▶ Numbas “Exam” where individual “questions” exploit “explore mode”

Summary: Things that have worked well

- Feedback from students has been positive
 - ▶ Clear expectations
 - ▶ They find Numbas easy to use
 - ▶ Particularly like the worked solutions in the tutorial sheets
- Lab sheets are a winner
 - ▶ Well-liked by students and technicians
 - ▶ Sessions could actually be run with very little supervision
- In-course assessment
 - ▶ Those who engage do very well
 - ▶ Good preparation for end-of-year exam
- End-of-year exam
 - ▶ Instant marking of very large cohort
 - ▶ Zero paper scripts this year
- Module is running well; little maintenance required
- Numbas has enabled a better experience for everyone involved

Summary: Things have have not

- Biggest challenge is with student engagement
 - ▶ Assessment framework has ended up being end-of-year heavy
- Changes for next year:
 - ▶ Broken down into smaller chunks
 - ★ In-course assessment has two deadlines per semester; worth 6% each
 - ★ First deadline in semester 1 is still formative
 - ▶ Included the labs in assessment
 - ★ Short set of questions based on the labs
 - ★ Three deadlines through the year (two labs each); also worth 6% each
 - ▶ Constructed in a way that missed assessment can be exempted (any 3 from 6)
 - ▶ Reduced the contribution of the exam (64% from 80%)
- Time will tell...