Flipped mathematics for engineers

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Recent experiments blending online and classroom-based teaching seem promising.

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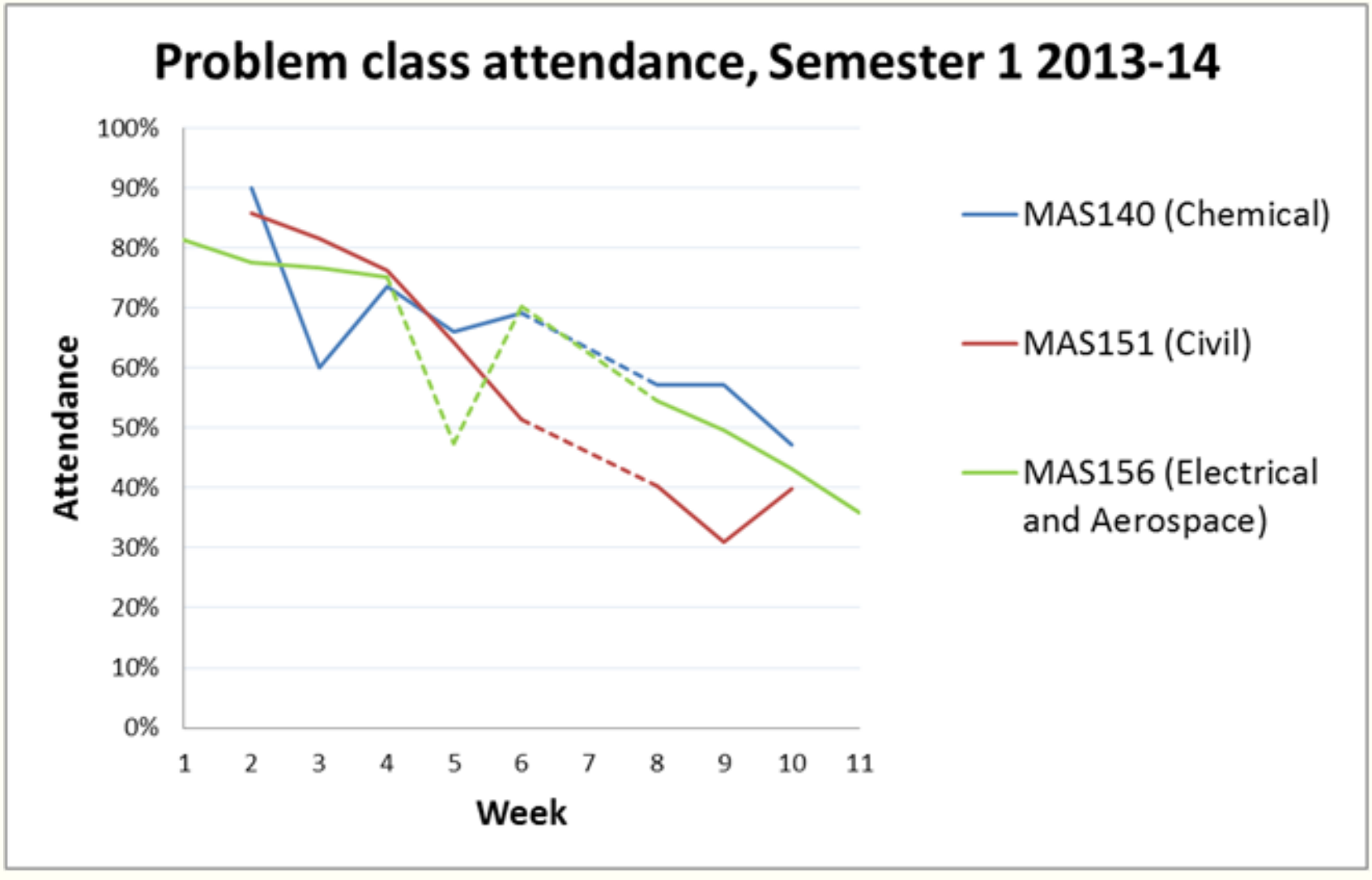
We'd often see attendance taper off; some students disengaged and failed badly.



- Week 7 was a reading week;
- MAS156 was affected by strike action in Week 5.

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We'd double the frequency of problem classes and change their character (more demonstration and peer discussion).

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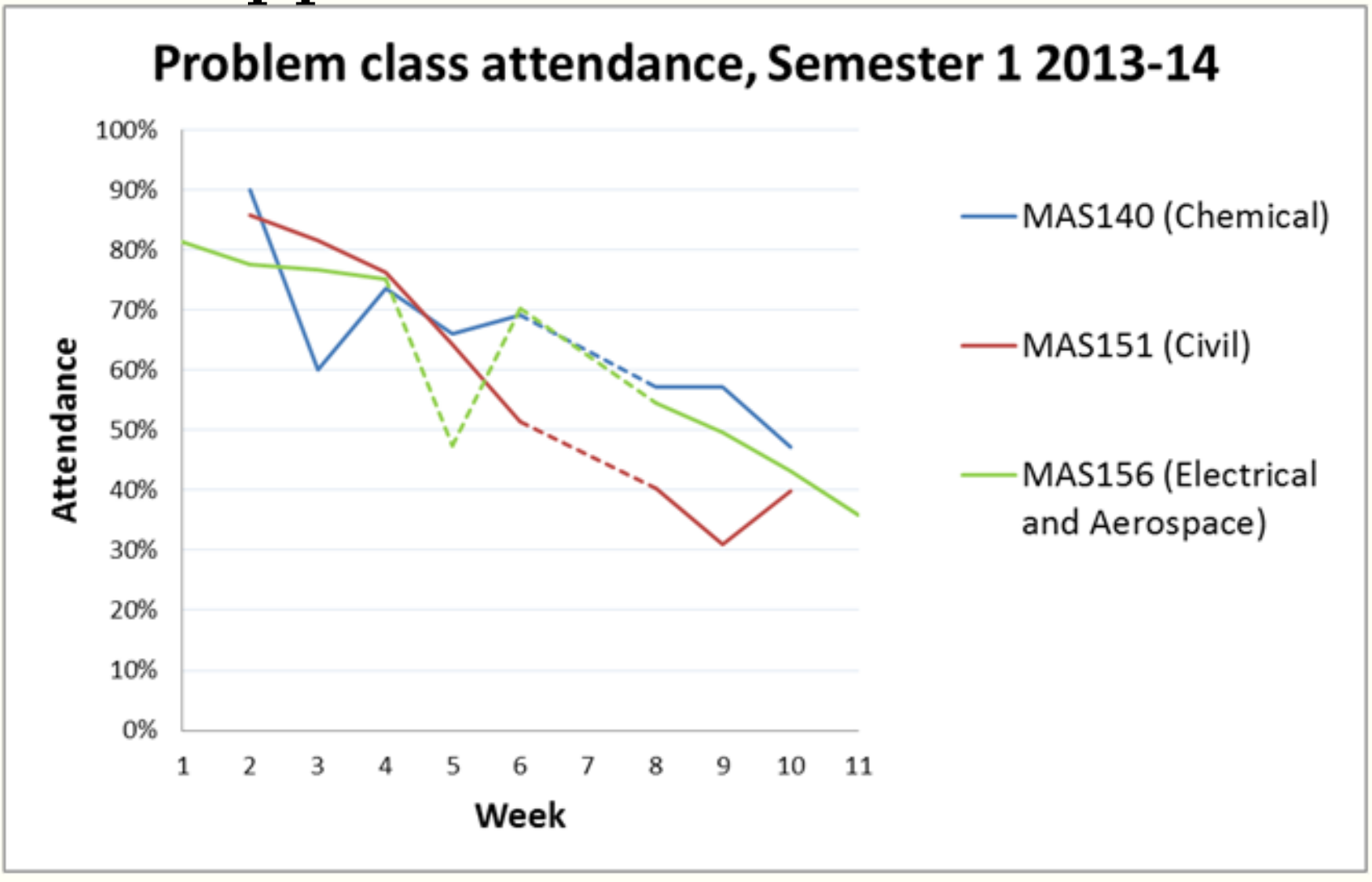

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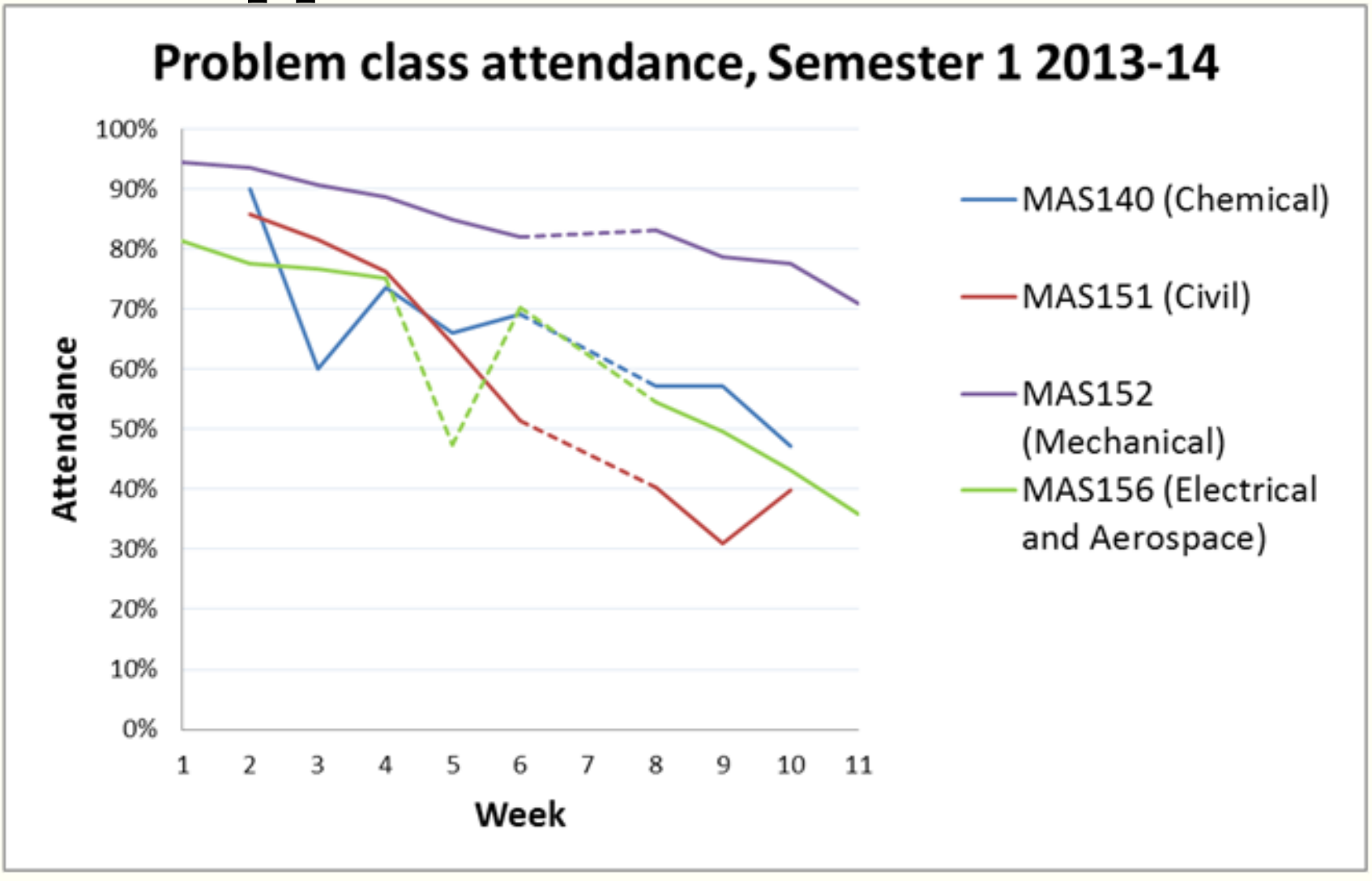

- MAS152 is our new format module.

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- Number of 'bad fails' reduced by two-thirds.
- 92% satisfied or very satisfied in end-of-semester questionnaires (198 responses).

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Demo: `http://goo.gl/M8WwZp`

username:`engineering`, password:`letmein`

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The tutor is given a lesson plan for each class.

EULER'S RELATION

5 minute review. Review Euler's relation, $e^{i\theta} = \cos\theta + i\sin\theta$, commenting briefly on how it follows from the Maclaurin series of exp, sin and cos. Also cover the exponential forms of sin and cos, namely

$$\sin\theta = \frac{e^{i\theta} - e^{-i\theta}}{2i} \quad \text{and} \quad \cos\theta = \frac{e^{i\theta} + e^{-i\theta}}{2}.$$

Class warm-up. Let $z = -1 - \sqrt{3}i$. Write z in polar form, $r(\cos\theta + i\sin\theta)$, and exponential form, $re^{i\theta}$. What is $\overline{z}$ in exponential form? What's the general rule here (i.e. what is $\overline{re^{i\theta}}$)?

Problems. Choose from the below.

1. **Multiplication and division formulae.**

   (a) Suppose z has modulus 5.5, argument 1.67 and w has modulus 0.5, argument 1.17. What is the real part of z/w? And the imaginary part?

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- Depth of understanding: problem classes recap the material, reinforcing learning.
- Student experience: the students are effectively in a group of 40 rather than 240 and get to know their tutor well.

More information

- More detail in our application for the Guardian University Awards.
- A Guardian discussion piece 'Are lectures the best way to teach students?' written by me and Dr Nick Gurski.
- Full pedagogical paper to follow.
- The course webpage.