

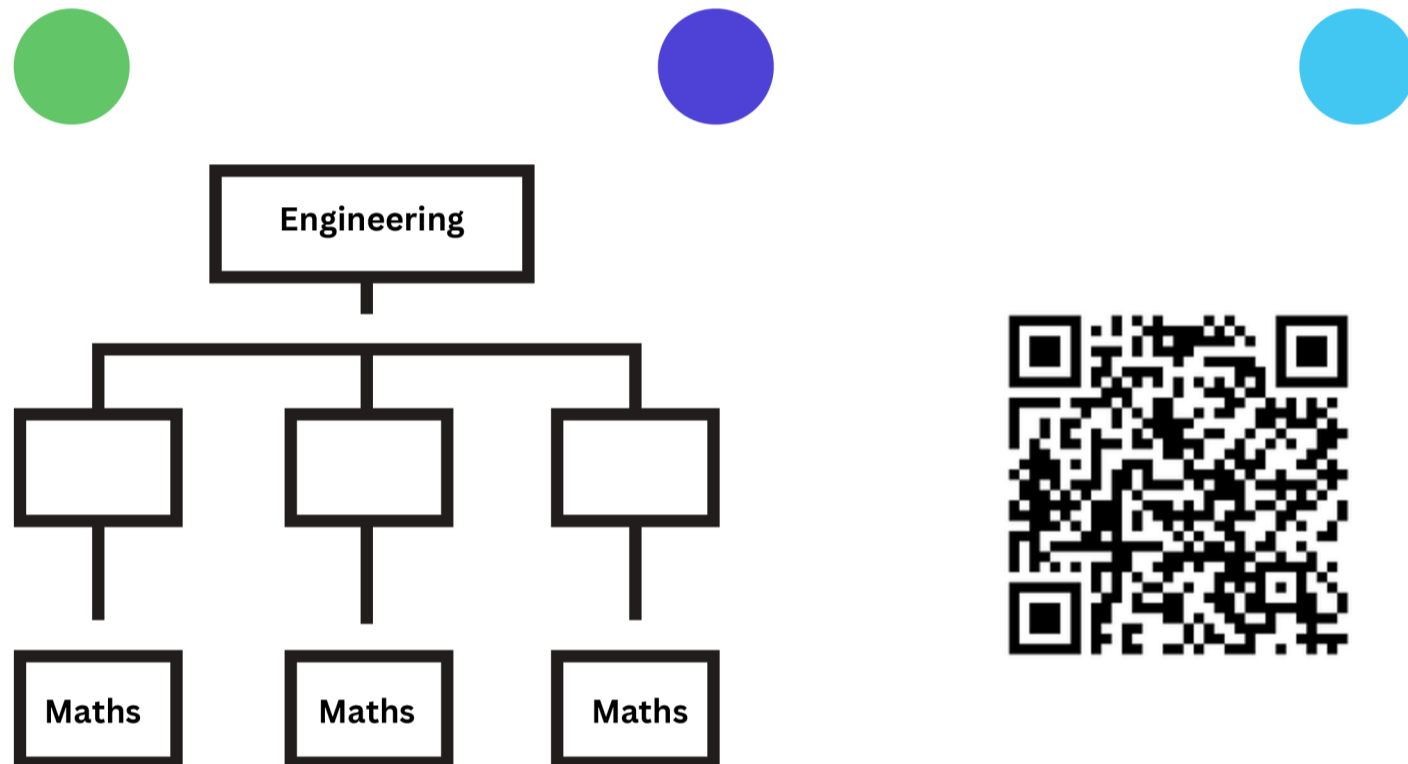


Building a Mathematical Foundation for Engineers

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The challenge: Mathematics is a rite of passage for engineering students. Those with non-traditional backgrounds and learning needs tend to struggle the most. The content area we created demystifies how the knowledge will be applied thus improving student experience in the Engineering Programmes at Trinity.

Aim: to make first year students aware of how the mathematics they are learning in a first year module will be applied in their subsequent engineering studies so that they retain the material better and can more easily transfer that knowledge.



Scan the QR code to download the poster!



Approach:

A recent mathematics graduate was supervised to create a content area on the Blackboard site of the “Engineering Mathematics I” (module code MAU11E01). The content area details which modules in the engineering curriculum use the mathematics taught in the module via a flow chart. For each unit in the module, there is a folder outlining various applications of the concepts to engineering, examples of problems with solutions from homework sets, and final exams of the modules that apply this knowledge.



THE PROBLEM:

Service teaching in mathematics, in Engineering for example, faces a couple of major challenges such as:

1. **Retention of knowledge** — students forget the information after only a few months.
2. **Transfer of knowledge** — students may know the techniques but not how to translate it into the context of their discipline.

THE GOAL:

We wish to create a Blackboard content area for each first-year service module with examples of how material gets applied in future modules. This will hopefully:

1. **Highlight the importance of mathematics** for students to encourage retention for future use.
2. Show how the **concepts they study can be transferred into their discipline** within relevant contexts.

The content area will be ready in advance of Michaelmas term for incoming students to try it out.

OUR SOLUTION:

We began with MAU11E01: Engineering Mathematics I. After examining the engineering curriculum, we:

- **Contacted lecturers** in the School of Engineering.
- **Collated online resources** highlighting applications.
- **Found examples of how the mathematics is applied** in future modules, such as exam questions.
- **Created an interactive flowchart** which shows how the mathematics weaves through the course.

EXAMPLE: THE MATHS BEHIND A CAPACITOR

Voltage across capacitor???

What value does the voltage approach?

$$C \frac{dV}{dt} + \frac{V}{R} = 0$$

How do I evaluate this integral?

$$\int \frac{dV}{V} = - \int \frac{dt}{RC}$$

What does the voltage look like?

$$V(t) = V_0(1 - e^{-\frac{t}{RC}})$$