Engineering Tripos Part IB, Sustainable Engineering, 2025-26

Coordinator

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Timing and Structure

5 in-person lectures in Michaelmas Term. Lectures will be recorded but all students are expected to attend in person.

Aims

The aims of the course are to:

- Introduce some of the key engineering challenges to promote global sustainability

Objectives

As specific objectives, by the end of the course students should be able to:

- Recognise the scale of the global challenges in energy production and control of climate change, and the importance of identifying, quantifying and pursuing developments which will have significant impact.
- Understand a range of opportunities to reduce energy consumption and to implement lower carbon technologies, in different sectors of engineering, in both developed and developing economies.
- Complete a technical investigation into an aspect of Sustainable Engineering.

Content

Students follow up 5 lectures with an individual assignment over the Christmas vacation, submitted as a poster. This is will be followed by a presentation and discussion during Lent term.

Climate Change Mitigation: an Engineering challenge

- Climate Change: review and targets
- What makes a difference and what progress has been made to date?

- Net Zero vs Absolute Zero
- The need for electrification of energy uses

Technology implementation to step up climate change mitigation

- Why can't technology solve everything? Pace of deployment and change
- How to make sure we are doing the right thing? Life-cycle thinking
- How fast can we go? What may limit our desired pace of deployment?

Pathways for climate change mitigation

- Buildings
- Transportation
- Industry: steel, cement, plastics, fertilisers

Critical minerals for the energy transition

- Why do we need critical minerals for decarbonisation?
- What are the challenges associated with securing critical minerals globally?
- The role of circularity and opportunities for development associated with critical minerals

Water engineering for climate change adaptation

- Will the world run out of water?
- Will water cause the next world war?
- Opportunities for climate change adaptation through water engineering

Coursework

The coursework assessment for Sustainable Engineering comprises two stages:

1. preparation of a **technical poster** about a topic discussed in the Sustainable Engineering lectures. The poster should:

· present an activity or service that can't happen in 2050 in the same way as today;

· discuss how that service or activity might be delivered in 2050 and what needs to happen to make it possible.

2. **presentation and discussion** of your poster during a 1-hour lab session to take place between weeks 1 and 4 of Lent term.

Booklists

Allwood, J. M., Cullen, J. M., Carruth, M. A., Cooper, D. R., McBrien, M., Milford, R. L., Moyniham, M. C., & Patel, A. C. H. (2012). Sustainable Materials with Both Eyes Open. UIT Cambridge. www.withbotheyesopen.com [4]

Ashby, M. F. (2013) Materials and the Environmental — Eco-informed Material Choice. Elsevier. https://www.sciencedirect.com/book/9780123859716/materials-and-the-environment [5]

IPCC — Intergovernmental Panel on Climate Change (2021). 6th Assessment Report. https://www.ipcc.ch [6]

MacKay, D. (2008). Sustainable Energy — Without the Hot Air. UIT Cambridge. http://www.withouthotair.com/Contents.html [7]

UN — United Nations (2015). Sustainable Development Goals. https://sdgs.un.org/goals [8]

Examination Guidelines

Please refer to Form & conduct of the examinations [9].

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