

Engineering Tripos Part IB, Sustainable Engineering, 2021-22

Coordinator

[Dr A Gonzalez Cabrera Honorio Serrenho](#) [1]

Timing and Structure

5 online lectures in Michaelmas Term.

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.

1. 28 October. Dr André Cabrera Serrenho — Climate Change Mitigation: an Engineering challenge

- Climate Change: review and targets
- What makes a difference and what progress has been made to date?
- What does this mean for transport, buildings, and industry?

2. 4 November. Dr André Cabrera Serrenho — 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?

3. 11 November. Prof David Cebon — Sustainable Freight Transport

Long-haul road freight is said to be one of the 'difficult to decarbonise' sectors of the economy. Heavy vehicles require large amounts of power for long periods of time, making battery electric technologies challenging. There are

two main alternatives to battery-electric vehicles: fuel-cell electric vehicles powered by hydrogen and 'electric roads' technology: like electric trains or trolley buses. The heavy vehicle industry is currently divided over which technology to back. The government is planning to spend £500m on demonstration trials to help it decide which way to go. This talk will consider the basic numbers associated with these issues and will show that one option makes sense, while the other doesn't.

4. 18 November. Peter Harris — Sustainable Logistics

- How to move goods around the world in a way that is consistent with the long-term success of both society and business?
- The top priorities in making logistics sustainable: emissions and equality — the problem, examples, and goals

5. 25 November. Dr Kristen MacAskill — Sustainable Development Goals

- Historic review of international coordination and policy
- Responsibilities for achieving Sustainable Development Goals and implications for the engineering profession
- Examples of evolving engineering practices in response to the sustainability agenda

Coursework

The coursework assessment for Sustainable Engineering comprises two stages:

1. preparation of a **technical poster** about a topic of Sustainable Engineering. 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.

Full details about this assignment are given in the assignment document on Moodle (under section 'Assignment').

The deadline for submitting the poster on Moodle is **Fri. 21st January 2022 at 15:00.**

This assignment awards a standard credit (10 marks, with a maximum of 14 marks). Penalty of 1 mark per day or part of day for late submission.

Booklists

Allwood, J. M., Cullen, J. M., Carruth, M. A., Cooper, D. R., McBrien, M., Milford, R. L., Moynihan, M. C., & Patel, A. C. H. (2012). Sustainable Materials with Both Eyes Open. UIT Cambridge. www.withbotheyesopen.com [2]

Ashby, M. F. (2013) Materials and the Environmental — Eco-informed Material Choice. Elsevier. <https://www.sciencedirect.com/book/9780123859716/materials-and-the-environment> [3]

IPCC — Intergovernmental Panel on Climate Change (2021). 6th Assessment Report. <https://www.ipcc.ch> [4]

MacKay, D. (2008). Sustainable Energy — Without the Hot Air. UIT Cambridge. <http://www.withouthotair.com/Contents.html> [5]

UN — United Nations (2015). Sustainable Development Goals. <https://sdgs.un.org/goals> [6]

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [7].

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[1] <mailto:ag806@cam.ac.uk>

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[5] <http://www.withouthotair.com/Contents.html>

[6] <https://sdgs.un.org/goals>

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