



### **The Newnham Engineering Prize 2021-22**

The Newnham Engineering Prize is open to all **female students currently in Year 12** (Lower Sixth) at a **UK state school**. The prize may be of particular interest to those studying Physics, Mathematics, Further Mathematics, Chemistry, Biology, Design and Technology or Economics, but we welcome entries from interested students studying any combination of subjects.

Entrants are invited to submit an essay on **one** of the topics overleaf. You can write broadly about the topic, or you can choose to go into greater detail on a specific aspect. Some ideas are given under each topic area to help you to start thinking, but feel free to explore the topics and choose your own examples to discuss.

The essay should be 2000-2500 words in length including footnotes and figure captions, but lists of references and bibliography can be additional to this. All sources must be appropriately acknowledged and cited and the bibliography should include websites that you have consulted. Up to **four** entries may be submitted per school.

There is no rigid requirement for the structure and format of the essays, but good submissions will present clear arguments, include illustrations (which might be graphs, plots and diagrams as well as pictures), and where possible provide some specific examples or cases. A good level of technical content is expected, but you should aim to make the essay interesting and accessible to an intelligent non-specialist audience.

Newnham will be running a programme of essay writing skills advice and guidance webinars in the new year. Dates and information can be found [here](#).

Each of the Newnham Essay Prizes have a first prize of £400, a second prize of £200 and a third prize of £100. Prize money is split 50:50 between the Essay Prize winner and the funding of resources for their school.

The [completed cover sheet](#) must also be submitted. Please ensure that a school/college representative has completed the appropriate section before submission. Entries without an appropriately completed coversheet will be invalid.

Entrants should submit their entry to the webform, found here:  
[https://cambridge.eu.qualtrics.com/jfe/form/SV\\_cHgegVW9EBBIKTpY](https://cambridge.eu.qualtrics.com/jfe/form/SV_cHgegVW9EBBIKTpY)

The deadline for submission is **12pm on Friday 11 March 2022**. For any queries not answered here, please contact [essayprizes@newn.cam.ac.uk](mailto:essayprizes@newn.cam.ac.uk).



**The Engineering Prize Questions: 2021-22**

**I. What can engineers do to mitigate climate change?**

Atmospheric levels of CO<sub>2</sub> are increasing and the world is waking up to the problem of climate change brought about by human-generated greenhouse gas emissions. As engineers, we have the skills and expertise to make a difference, providing technological solutions to reduce global carbon emissions. All engineering disciplines have a role to play and some areas are suggested below.

**(a) Electric Power Generation and consumption.** What are 'renewable sources' of electric power generation? How do they work and what are their strengths and limitations? Are there any new sources being researched and developed that might provide solutions for the future? Could the UK generate all its electricity from renewable sources?

How can we reduce our demand for electric power so that we don't need to generate so much? There may be opportunities in both domestic and commercial/industrial consumption, e.g. energy-efficient homes, energy-efficient manufacturing, low power consumer electronics.

**(b) Transport.** Modern lifestyles involve a lot of transport, of people as well as goods. How energy-efficient are different modes of transport, and what is the potential for reducing their carbon footprint?

**(c) Construction.** This sector is one of the biggest emitters of carbon globally. The carbon emissions arise from many sources, especially the huge amount of concrete used in construction projects but also including the energy to power machines. Do we have any alternatives for materials or technology strategies to reduce these emissions?

**(d) Other engineering areas.** Technological solutions can be found in all engineering disciplines. You are encouraged to choose for the topic of your essay an example that interests you.

**2. Data and information engineering**

Data and information engineering is being used everywhere around us. Our life increasingly relies on data analysis, from the recent developments in the automotive sector to social media, from machine assisted surgery to law forensics. The data deluge provided by recent technological advances has made automation in data analysis necessary to identify hidden patterns of information within the considered datasets. It is also true that a fully automated world could bring new risks and dangers that did not exist even just a few years ago (e.g., the ethical dilemmas of self driving cars). Write an essay on the major aspects of social awareness in AI development, and how this could impact:

- a) The health sector.
- b) Government, democracy and policing.
- c) Sustainable development.
- d) Another major topic of your interest.

You are encouraged to think about the engineering considerations related to some of these topics as well as the ethical considerations. What makes an algorithm particularly helpful or harmful?