Engineering Tripos Part IIA Project, GC3: Mechanics of Natural Materials, 2022-23

Leader

Prof S Huang [1]

Timing and Structure

Easter Term Timing: Thursdays 9-11am plus afternoons; and Mondays 11-1pm.

Prerequisites

3G5 Biomaterials provides fundation but not essential

Aims

The aims of the course are to:

- Understand how microstructure contributes to the mechanical properties of natural materials;
- Consider the most appropriate measurement techniques based on the material property of interest;
- Appreciate the design principles of biological tissues in nature from a mechanics prospective.

Content

Natural materials have evolved structures that are fit for their functions. Plant tissues, for example, illustrate nature's remarkable engineering ingenuity, ranging from resilience in external forces from the environment, to providing dynamic regulation in water intake. This laboratory exercise investigates the mechanical behaviour of a variety of natural materials, and how it is influenced by their microstructure on a range of scales. Microscopy and mechanical testing techniques will be utilised to study tissue mechanics at different length scales, from hard and strong wood specimens, to micro fibrous materials.

Students will work in groups, with detailed investigations within each group carried out by three separate pairs. Each group will examine a different natural material system. After an initial training exercise each group will propose a specific investigation and plan how the detailed tasks will be allocated between pairs. Students will submit individual reports, but will also participate in a final group presentation pulling together what has been learned by the whole group.

Week 1

Training exercise, to introduce relevant testing methods for the particular natural materials to be studied. Write first interim report, and produce group-based proposal for the main study.

Weeks 2-4

Carry out detailed studies on the chosen theme. Write final report, and prepare final group presentation.

Coursework

Coursework	Due Date	Marks
Interim report and project plan	TBA (PM)	10 (individual)
Group presentation	TBA (AM)	30 (group)
Final report	8th June 2023 (AM)	40 (individual)

Examination Guidelines

Please refer to Form & conduct of the examinations [2].

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Links
[1] mailto:yysh2@cam.ac.uk
[2] https://teaching22-23.eng.cam.ac.uk/content/form-conduct-examinations