

## **Engineering Tripos Part IIB, 4D3: Environmental Engineering, 2026-27**

### **Leader**

[Prof A Al-Tabbaa](#) [1]

### **Lecturers**

Prof A Al-Tabbaa, Prof D Liang

### **Timing and Structure**

Lent term: 16 lectures. 100% exam

### **Prerequisites**

3D5 assumed

### **Aims**

The aims of the course are to:

- This module aims to provide an in-depth look at pollutant transport in water bodies (surface and groundwater) and in the ground, their transport mechanisms and associated risk assessments and available remedial strategies.
- The module is divided into two halves: the first half will address ground and groundwater contamination,
- the second half will address pollutant and sediment transport in surface water.

### **Objectives**

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

- Develop an appreciation of current and future problems and legislations related to contaminated land and waste containment;
- Understand the advective, diffusive, dispersive, reactive and sorptive processes related to pollutant transports
- Develop good understand of contaminated land remediation options and selection decisions;
- Develop an understanding of decision support tools for contaminated land management;
- Appreciate the crucial stages in dealing with and managing contaminated land;
- Estimate the mixing coefficients in uniform open channel flows;
- Understand the mechanism of soil particle motion subject to surface water flow;
- Calculate the sediment transport rate and determine the bed regime;
- Appreciate the interplay between sediment transport and pollutant transport.

### **Content**

#### **Contaminant transport in soil and groundwater (4L, Professor A Al-Tabbaa)**

Introduction to common contaminants in soil and groundwater and their interactions;

Relevant contaminant transport mechanisms advection, diffusion, dispersion and sorption;

Solutions for the advection-dispersion/diffusion-sorption equation

**Contaminated land remediation (4L, Professor A A-Tabbaa)**

Introduction to contaminated land remediation and relevant legislation;

Chemical site investigation and risk assessment;

Land contamination and remediation, sources and solutions;

Remediation of contaminated land and the different strategies available;

Decision support tools included cost-benefit and multi-criteria analyses

**Pollutant transport in uniform flows (2L Professor D Liang)**

Review of governing equations and analytical solutions;

Idealisation of practical problems.

**Turbulent mixing in open channel flows (3L, Professor D Liang)**

Plane boundary layer flow;

Turbulent diffusion coefficients;

Longitudinal dispersion coefficients;

**Sediment transport in uniform flows (3L, Professor D Liang)**

Threshold motion;

Bedform and flow resistance

Bedload and suspended load

Connotation on pollutant transport

**Booklists**

Please refer to the Booklist for Part IIB Courses for references to this module, this can be found on the associated Moodle course.

**Examination Guidelines**

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

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**Links**

[1] <mailto:aa22@cam.ac.uk>

[2] <https://teaching26-27.eng.cam.ac.uk/content/form-conduct-examinations>