

## Engineering Tripos Part IIA Project, GD5: River Hydraulics and Surveying, 2021-22

### Leader

[Dr D Liang](#) [1]

### Timing and Structure

Thursdays 2-6pm, Mondays 9-1pm plus afternoon and Wednesdays 2-6pm

### Prerequisites

Part IIA Surveying Engineering Extension Activity

### Aims

The aims of the course are to:

- Introduce the principles of river modelling, including the Saint-Venant equations, shallow water equations and their numerical solutions.
- Introduce the flood risk management strategies, such as risk assessment, structural and non-structural mitigation measures, Sustainable Drainage Systems (SuDS), and cost-benefit analyses.
- Introduce the river modelling software widely used in the UK.
- Conduct hydraulic modelling of River Cam and its tributaries.
- Further familiarise students with the use of the principal surveying instruments: total stations (including reflectorless), digital levels and GNSS (Global Navigational Satellite Systems).
- Develop the main techniques of field survey (traversing, levelling, resectioning, detail collection and setting-out) and of survey management (planning, adjustment, projection and mapping).

### Content

This project is intended for students interested in civil engineering, **who have already done the Surveying Extension Activity in Part IIA**. It covers the fundamentals of river modelling methods and flood risk management strategies, together with some practical exercises concerning the hydraulics and flood risk management of River Cam and its tributaries. This will be followed by some more advanced surveying than was offered in the ExA.

### FORMAT

- In Exercise 1, students will calculate water surface profiles in steady river flows.
- In Exercise 2, students will use flood modelling software to simulate unsteady river flows and examine the effectiveness of flood mitigation measures.
- In Exercise 3 (Final Report), students will undertake advanced surveying fieldwork on Coe Fen, including traverse, levelling, point fixing, detailing and setting out.

### Week 1

Introduction to river modelling methods and flood risk management strategies; carry out steady river flow modelling.

### Week 2

Introduction to flood modelling software, hydrology and historical floods in River Cam catchment; carry out unsteady river flow modelling.

### Week 3

Traverse, detailing, point fixing and levelling.

### Week 4

Adjustment, mapping, setting out and final report.

## Coursework

| Coursework   | Due date                  | Marks                                     |
|--------------|---------------------------|-------------------------------------------|
| Exercise 1   | Wednesday 20 May 2020     | 15 (individual)                           |
| Exercise 2   | Monday 25 May 2020        | 20 (individual)                           |
| Final report | 4pm, Thursday 4 June 2020 | 45 (20 for group, 25 for individual work) |

## Examination Guidelines

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

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### Links

[1] <mailto:dl359@cam.ac.uk>

[2] <https://teaching23-24.eng.cam.ac.uk/content/form-conduct-examinations>