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This lecture will focus on specific research topics in the area of river engineering. It will include examining the nature of flow in river bends, numerical modelling of hydraulic structures used to mitigate river erosion, and acoustic instruments used to measure flow velocity, sediment transport, and discharge in the field.

River bends occur naturally in rivers, but are subject to complex flow patterns that are not fully understood. Such flow patterns make them subject to excessive erosion along their outer banks that eventually leads to bend migration. River engineers are challenged with how to prevent bank erosion, as it poses risks to infrastructure, and buildings, and can lead to the loss of valuable land. The first part of the lecture examines how numerical modelling is used as a tool to understand the effect of bend geometry on areas which may be prone to erosion.

River structures called submerged groynes are often used to mitigate erosion in bends. Little is understood, however, about how they work, and their performance is often variable in river bends. This second section of the lecture investigates the use of high resolution numerical modelling, called Large Eddy Simulation (LES), to better understand the nature of flow around submerged groynes in a channel bend.

Acoustic Doppler Current Profilers (ADCPs) are the most common instrument used in medium- to large-sized rivers to measure boat/water velocity and river discharge. However, their measurements can be biased when sediment is moving at the bottom of the river. In such cases, GPS is used to correct for the bias in the measurements. This part of the lecture examines using a statistical method called a Kalman Filter to help improve measurements taken with an ADCP under conditions with high sediment transport.