Uncertainty quantification (UQ) lies at the confluence of many fields, including probability, statistics, data analysis, computational mathematics, and mathematical modeling. It touches upon almost any field that involves models, whether of natural or engineered systems, and data. The objective of the course is to help participants from different backgrounds obtain the basic understanding and tools needed to use UQ in their fields of interest. In addition, the course will present snapshots of current research and examples of UQ in different application areas, so that participants are aware of the types of methods that are in current use. This course will be of interest to people involved in science and engineering applications and information-based decision making, and it will also be of interest to people who want to understand the fundamental mathematical ideas and tools underlying this endeavor.

The following lectures will be delivered over the two-week summer school:

**Core Material**
- Probability and statistical inference for UQ
- Sensitivity analysis
- Gaussian processes and computer model emulation
- Spectral methods for UQ
- High-dimensional approximation
- Monte Carlo and MCMC methods
- Model validation

**Advanced Topics & Applications**
- Bayesian methods for geophysical applications
- Large-scale statistical inverse problems
- Data assimilation
- Model inadequacy
- Optimal experimental design