Title	**Medical Ultrasound Transducers**
Instructor(s) and Affiliation	**David Mills & Scott Smith, GE Research**
Course Outline	Medical ultrasound imaging principles Array types: determined by the needs & constraints of the clinical applications Transducer design methods and models: fundamentals, equivalent circuits, finite elements, acoustic field models Advanced arrays: multi-row, 2D, catheters, MUTs Materials, fabrication, characterization and testing
Abstract	Ultrasound has become the most commonly performed medical imaging procedure in the world because it provides real-time imaging with high clinical value while being portable, non-ionizing and inexpensive. This course will provide an introductory survey of ultrasound imaging focused on the design, fabrication, and testing of medical ultrasound transducers. Starting from an overview of the basic types of phased-array transducers (linear, convex, sector), we will show how the probe's design is derived from its target application. We will describe how engineering tools, like equivalent-circuit, finite-element, and acoustic field models, can be used to predict transducer performance accurately, and then to optimize the design. A discussion of the structure of an ultrasound probe will lead to a survey of the different types of materials used in probes and their critical properties. Typical fabrication processes will be reviewed and common problems in probe manufacturing will be summarized. Methods for evaluating completed transducers will be described. The course will include recent developments in probe technology, including single crystal piezoelectrics, cMUT transducers, catheters, 2D arrays, and electronics in probes, and will address some of the performance advantages and fabrication difficulties associated with them.