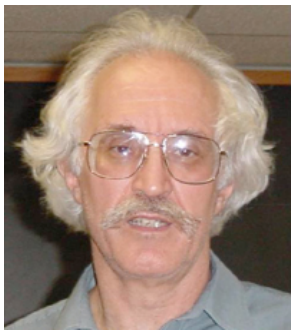
ELECTRICAL & COMPUTER ENGINEERING BIO-SEMINAR Fall 2016

Dwight Look College of ENGINEERING TEXAS A&M UNIVERSITY

When: **Friday 15:00 – 16:00**
Where: **ETB 1003**
Coordinator: **Xiaoning Qian** (xqian@ece.tamu.edu)



Speaker: **Prof. Edward R. Dougherty**

Robert M. Kennedy '26 Chair Professor
Distinguished Professor
Department of Electrical & Computer Engineering
Dwight Look College of Engineering
Texas A&M University

Title: **Intrinsically Bayesian Robust Operators and Optimal Experimental Design Based on Uncertainty Quantification**

Date: **09-02-2016**

Abstract: Many applications involve constructing an optimal operator on a system to satisfy a desired objective, such as removing noise or altering system dynamics to prevent unwanted states, such as those associated with cancer. With complex systems, the system is rarely completely known but one may have partial knowledge. The best way to proceed is to codify existing knowledge in such a way as to build an uncertainty class of possible systems and find an intrinsically robust Bayesian (IBR) operator that performs best on average. New data can be used to update the prior to a posterior distribution and then find an IBR operator.

In practice, data are limited owing to availability, cost, and time. Hence, one should add data that best reduces system uncertainty, but not simply general uncertainty (entropy), rather, the uncertainty directly related to the operational objective. The mean objective cost of uncertainty (MOCU) is the average increased cost over the uncertainty class from using an IBR operator rather than an optimal operator for a particular model. For optimal experimental design, from among the space of possible experiments, chose the experiment that produces the largest expected decrease in MOCU. Create a new posterior distribution using the new data point and find a new IBR operator along with its cost. Repeat the process a given number of times or until the decreasing cost curve flattens out.

Biography: Dougherty holds a Ph.D. in mathematics from Rutgers University and an M.S. in Computer Science from Stevens Institute of Technology, and has been awarded the *Doctor Honoris Causa* by the Tampere University of Technology. He is Distinguished Professor at Texas A&M, a fellow of both IEEE and SPIE, has received the SPIE President's Award, and served as the editor of the SPIE/IS&T Journal of Electronic Imaging. At Texas A&M, he has received the Association of Former Students Distinguished Achievement Award in Research, been named Fellow of the Texas Engineering Experiment Station and Halliburton Professor of the Dwight Look College of Engineering. He is author of 16 books and author of more than 300 journal papers.