Shankar P. Bhattacharyya was educated at IIT Bombay and Rice University. His contributions to Control Theory include the first solution of the servomechanism problem, a numerically efficient pole assignment algorithm, a generalization of Kharitonov's theorem, a new approach to PID controllers, the demonstration of the fragility of high order controllers and a measurement based approach to linear systems. He is an IEEE fellow, an IFAC Fellow and an elected Foreign Member of the Brazilian Academy of Sciences and the Brazilian Academy of Engineering.

Modern Design of Classical Controllers

S. P. Bhattacharyya

Texas A & M University

This lecture will first describe historical reasons for the recent resurgence of interest in classical controllers. The latter class of controllers are the Proportional-Integral-Derivative (PID) controllers and the First Order (FO) controllers also known as Lag-Lead controllers and Three Term Controllers. It turns out that it is this class of controllers, and not high order modern controllers that account for 99% of controllers in use in diverse industries such as Motion Control, Process Control, Robotics, Aerospace Controls and Biomedical Engineering and in new Technologies such as driverless cars, multiagent systems and UAV's. Therefore, any progress in design theory for such controllers should have a significant impact on the Control industry. Our emphasis will be on Computer Aided automated procedures for the design of classical controllers to satisfy multiple specifications. The key result facilitating such an approach is our calculation of the stabilizing set of such controllers. With this set in hand we can construct achievable design surfaces in the space of gain margin, phase margin and bandwidth. These surfaces have the property that each point on this surface can be attained by at least one controller of the specified class. The last part of the lecture will show how these single-input single-output results can be extended to multivariable systems.