

Analog Electronics Testing and Product Engineering (Full day course)



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Objectives of this Course:

- Perform basic data analysis to estimate yield of integrated circuits
- Evaluate processes for process potential, process capability, and process capability index
- Perform gauge reproducibility and repeatability analyses
- Understand and evaluate defect level – yield loss tradeoffs.
- Understand basic parametric tests for analog and mixed signal integrated circuits
- Be familiar with bench testing and automated test equipment practice and procedures
- Be able to perform simple analyses of cost effectiveness in testing

COURSE OUTLINE:

- I. Introduction
 - a. Testing and quality
 - b. Statistical process control
 - c. Design for test, BIST
- II. Goals of a testing program
 - a. First silicon and design feedback
 - b. Characterization
 - c. Understanding process excursions
 - d. Customer expectations
- III. Tools
 - a. Bench equipment
 - b. Semi-automated discrete instruments

- c. Reconfigurable systems
 - d. Full up ATE
- IV. Measurements
- a. Sanity checks
 - b. Parametrics
 - c. Functional test
 - d. At speed
- V. Limitations
- a. Defect models
 - b. Real-world instrumentation
 - c. Time to market
- VI. Data analysis and the bottom line
- a. Cp, Cpk
 - b. Defect level
 - c. Yield loss
 - d. Market analysis and balance
- VII. Conclusions
- a. Understanding your capabilities
 - b. Understanding your customers

WHO SHOULD ATTEND: Engineers, scientists and managers involved in the design, process and manufacturing of IC electronic components and hybrid packaging.

ABOUT THE INSTRUCTOR:

Richard Gale held the position of Distinguished Member, Technical Staff, and was responsible for coordinating the work of the New Applications Research and Development Group in the Technology Development section of Digital Imaging at Texas Instrument Incorporated until retirement in April, 2001. Dr. Gale holds the A.B. degree in Physics from the University of California at Berkeley (1976), and M.S. and Ph. D. degrees from Lehigh University (1979 and 1984, respectively). Dr. Gale joined the Central Research Laboratories at Texas Instruments in 1984 to apply his graduate work on electron traps in silicon dioxide to charged-coupled device imagers for space-borne applications. He moved from CCD's to more general photonics interests in 1985, in time to make several key contributions in the developing MEMS spatial light modulators at TI. He was a member of the team taking the Digital Micromirror Device (DMD™) from research into a corporate venture projects activity in 1991 after successfully managing parts of the initial customer interactions in projection displays. He contributed to the development of Corporate Venturing at Texas Instruments, and managed the demonstration/validation activity in the early stages of Digital Imaging at TI. After successfully promoting the technology internally and externally through a period of explosive growth, he took a position in Production Engineering for the development of first generation portable projectors. His final position at TI included responsibility for novel approaches and new technologies utilizing and enabling Digital Light Processing™ insertion points, providing strategic direction in understanding competitive assessment and intelligence, and coordinating the DLP™ Products Coop programs and technical

publication management. Dr. Gale is an author of more than twenty-five technical publications, and holds patents in MEMS design, processing, packaging, control circuits, and system utilization concepts.

Dr. Gale is currently pursuing new career directions that will build on and expand his experience in microelectromechanical systems, novel data analysis techniques, information creation and distribution systems, and communications technologies. He accepted a tenured Professorship in the Electrical and Computer Engineering Department at Texas Tech University in Lubbock, TX, that began 1 June, 2002. Since joining the faculty at Texas Tech Professor Gale has worked diligently to incorporate undergraduate and graduate students in the research enterprise, and to provide incentives for young people to look seriously at technical careers. In June, 2007, he took on the responsibilities of Associate Dean for Undergraduate Studies in the College of Engineering at Texas Tech.

Returning to the department of Electrical and Computer Engineering in June, 2009, Professor Gale accepted the position of Associate Chair, Graduate Studies in September, 2010. He was recognized with the President's Excellence in Teaching Award in March, 2011, and in December, 2011, was licensed as a Professional Engineer in the State of Texas.