

14. Multi-Physics Modeling and Simulation in Electronic Packaging Theory, Implementation and Best Practices

Course Leader: Xuejun Fan – Lamar University

Course Description:

This course aims to present a comprehensive coverage of multi-physics modeling and simulation for mechanics related reliability issues under various loading conditions. In addition to the introduction of fundamentals, the course contents are arranged in four modules. Module 1 covers modeling under thermal loading, such as first level failure (TSV/bump/dielectric), warpage, and temperature cycling. Module 2 deals with the modeling under mechanical loading, such as drop impact. Module 3 will cover modeling under humidity/moisture loading for moisture related problems, such as failures in soldering reflow as well as under HAST. Module 4 will focus on electromigration modeling that involves with electrical, thermal, mechanical and diffusion modeling. Theoretical foundation, modeling implementation, and the best practices for simulation will be covered. Emerging trend and future perspective in reliability mechanics and modeling will be discussed.

Course Outline:

1. Introduction to mechanics related failures in electronic packaging
2. Reliability issues and modeling under thermal loading
3. Reliability issues and modeling under mechanical loading
4. Reliability issues and modeling under moisture/humidity loading
5. Reliability issues and electromigration modeling

Who Should Attend: This course is intended for technical managers and staff members, reliability engineers, scientific researchers, and graduate students who are involved in thermal/mechanical modeling, package design, material selection, qualification and reliability assessment of chip-package interaction, package, and package/board interaction.

Xuejun Fan is a Regents' Professor of Texas State University System, a Mary Ann and Lawrence E. Faust endowed chair professor in the Department of Mechanical Engineering at Lamar University, Beaumont, Texas. He received his Ph.D. degree in solid mechanics from Tsinghua University, Beijing, China in 1989. His interests and research lie in modeling, characterization, and reliability in heterogeneous integration in microelectronics. Dr. Fan had extensive experience in industry, such as with Intel Cooperation, Philips Research, and the Institute of Microelectronics (IME), Singapore. Dr. Fan received the Outstanding Sustained Technical Contribution Award in 2017, and the Exceptional Technical Achievement Award in 2011 from IEEE Electronic Packaging Society (EPS). He is an Associate Editor of IEEE Transactions on Components, Packaging and Manufacturing Technology and Microelectronics Reliability. Dr. Fan is an IEEE Fellow and a Distinguished Lecturer. He serves as chair, co-chairs, and committee members of various conferences such as ECTC, EPTC, ESTC, EuroSimE, ICEPT, ESREF, and EMPT. He has published more than 250 papers, including 4 books, over 100 journal papers, many book chapters, and numerous conference papers. Dr. Fan currently serves as a member-at-large of the IEEE Electronic Packaging Society (EPS) Board of Governors, and a co-chair of Modeling and Simulation in Heterogeneous Integration Roadmap (HIR).