

Department of Materials Science and Engineering
MSE 485 Materials Science & Engineering
Introduction to Electronic Packaging and Materials (3 credits)

Catalog Description:

The governing equations of transport phenomena: mechanical, thermal, and electromagnetic behavior, thermomechanical and electromagnetic properties of packaging materials, electromagnetic characteristics of circuit and transmission lines, thermal management and reliability analysis of packaging, interconnect and material processing technology. Offered jointly with Mechanical Engineering.

Prerequisites: Senior standing.

Text (required):

Electronic Packaging, Design and Materials, Process and Reliability, by Lau, et al., McGraw-Hill, 1998

Course Objectives: By the end of this course, the student will be able to:

- 1) Relate the interdisciplinary aspect of electronic packaging to product performance and manufacturing
- 2) Apply governing relations of transport phenomena: mechanical, thermal and electromagnetic behavior to design of electronic packages.
- 3) Using analysis provided by application of the governing relations, analyze the performance of electronic packages by incorporating thermomechanical and electromechanical properties and performance of packaging materials.
- 4) Analyze the electromagnetic characteristics of circuit and transmission lines
- 5) Evaluate the thermal management aspects of electronic packages and their relation to other components in the circuit
- 6) Perform reliability analysis of the entire electronic package including the package itself as well as the interconnect.
- 7) Relate the electronic package performance to the manufacturing process.

Class Schedule

3, one hour periods weekly

Topics Covered:

Package hierarchy, design, applications
Processing issues, metalization, ceramic packaging, polymer packaging, lithography
Electrical design as related to packaging issues
Thermal management, heat transfer, cooling processes, design
Mechanical design, creep and diffusion, electron migration effects
Electronic composites and their properties
Reliability and failure analysis case studies

Contribution of Course to Professional Component:

Satisfies preparation for engineering practice by incorporating basic engineering science, engineering/professional standards, technical communication, and economic, environmental, manufacturability, and health/safety constraints

Relationship of Course to Program Objectives:

Directly addresses the following Programmatic Outcomes:

- Background in mathematics, science and engineering principles
- Ability to apply this knowledge to the formulation and solution of electronic packaging problems
- Understanding of the necessary professional abilities of a practicing engineer including ethical conduct, teamwork in the pursuit of a goal and effective communication.
- Realization of the business environment in which engineering is practiced.

Prepared by: M. Taya, May 15, 2001