

MSE 4754: Electronic Packaging Assembly (required)

Catalog Description: (3-0-3)

Prerequisites: ECE 3040 Microelectronic Circuits, ECE 3710 Circuits and Electronics

The course provides hands-on instruction in electronics packaging, including assembly, reliability, thermal management, and test of next-generation microsystems. Crosslisted with ECE and MSE 4754.

Textbooks:

R. Tummala, M. Swaminathan, Introduction to System-on- Package (SOP), McGraw-Hill, 2008;
R. Tummala, Fundamentals of Microsystems Packaging, McGraw-Hill, 2001.

Prepared by: Rao Tummala

Topics Covered:

1. Introduction to System-On-Package
2. Introduction to Packaging and Assembly and its interdisciplinarity
 - a. Electrical
 - b. Mechanical
 - c. Thermal
 - d. Materials
 - e. Chemical processes
3. Thermo-mechanical modeling and design for reliability of interconnections
4. Flip-chip assembly materials and processes
5. Heat transfer and thermal management
6. Non-destructive inspection
7. Failure analysis
8. Laboratory safety

Course Outcomes: Specifically, at the end of the course the students will be able to:

1. Understand why and how any semiconductor device is packaged and assembled
2. Understand interdisciplinarity of packaging involving electrical, mechanical, thermal, materials and processes
3. Understand the role of interconnection and assembly materials to meet electrical and mechanical requirements
4. Understand the need for thermal management and various heat transfer mechanisms
5. Understand the electrical failure mechanisms due to fatigue behavior of metals
6. Understand chemical safety in handling a variety of chemicals

Correlation between Course Outcomes and Student Outcomes:

Course Outcomes	Student Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
1. Understand why and how any semiconductor device is packaged and assembled	X		X		X						
2. Understand interdisciplinarity of packaging involving electrical, mechanical, thermal, materials and processes	X	X	X	X	X						
3. Understand the role of interconnection and assembly materials to meet electrical and mechanical requirements	X		X		X						
4. Understand the need for thermal management and various heat transfer mechanisms	X	X	X		X						
5. Understand the electrical failure mechanisms due to fatigue behavior of metals	X		X		X						
6. Understand chemical safety in handling a variety of chemicals			X			X					
Entire Course	3	2	3	1	3	1	0	0	0	0	0
0 = None or insignificant; 1 = Some; 2 = Moderate; 3 = Strong											

School of Materials Science and Engineering Student Outcomes:

- a) an ability to apply knowledge of mathematics, science and engineering
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) an ability to function on multidisciplinary teams
- e) an ability to identify, formulate, and solve engineering problems
- f) an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice