

MSE 4755: PACKAGING SUBSTRATE FAB (required)

Catalog Description: (1-6-3)

Prerequisites: MATH 2401 Calculus III, MATH 2403 Differential Equations, CHEM 1211 Chemical Principles I, PHYS 2212 Introduction to Physics

This course provides students with hands-on instruction in basic SOP concepts and techniques, including interconnect design, substrate material selection and properties, photodielectric deposition, via formation and photolithography, copper metallization, and finally, substrate testing. Laboratory instructions are augmented by an interactive multimedia educational presentation that makes the course work material remotely accessible via the internet.

Textbook: R. Tummala, Fundamentals of Microsystems Packaging, McGraw-Hill, 2001.

Prepared by: Rao Tummala

Topics Covered:

1. Introduction to Packaging (including PRC SLIM)
2. Lab Safety
3. Interconnect Design
4. Polymer Deposition
5. Via Formation
6. Metallization
7. Substrate Testing

Course Outcomes:

1. Understand why and how devices and systems are packaged
2. Understand multilayer organic Substrate Design and physical Layout
3. Understand the role polymer materials as dielectrics and copper as conductors
4. Understand how Polymers are deposited and cured
5. Understand Laser and photo processes for microvia formation in polymer dielectrics
6. Understand lithography process methods
7. Understand microvia copper metallization by electroplating technologies
8. Understand how to fabricate multi-layer wiring and build-up substrate technology
9. Understand the role of passives in forming circuits capacitors, inductors and resistors
10. Understand inspection, metrology and substrate testing
11. Learn to operate tools and handle chemicals safely

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 devices and systems are packaged	X	X	X								
2. Understand multilayer organic Substrate Design and physical Layout	X	X	X								
3. Understand the role polymer materials as dielectrics and copper as conductors	X	X	X								
4. Understand how Polymers are deposited and cured	X	X	X								
5. Understand Laser and photo processes for microvia formation in polymer dielectrics	X	X	X								
6. Understand lithography process methods	X	X	X								
7. Understand microvia copper metallization by electroplating technologies	X	X	X								
8. Understand how to fabricate multi-layer wiring and build-up substrate technology	X	X	X								
9. Understand the role of passives in forming circuits capacitors, inductors and resistors	X	X	X								
10. Understand inspection, metrology and substrate testing	X	X	X								
11. Learn to operate tools and handle chemicals safely	X	X	X								
Entire Course	3	3	3	2	3	0	0	0	0	1	3
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