Special Topics/ Elective Course

EEMF7V82.001.21F / MECH 6V95.001.21F

Offered for

ECE/ME

Advanced Electronic Packaging Technology

Instructor : Dr Mahadevan (Devan) Iyer

FALL 2021

Class Location : ML2 1.216 MW 8:30am-945am

COURSE TITLE: " **Advanced Electronic Packaging Technology -** Multi-disciplinary Course

TEACHING MODALITY for Fall 2020 : As of now, the classes are intended to run in a face to face mode. In the event of any changes necessitated, classes will go on line. Blackboard collaborate will be used for on line teaching.
Lectures will be held on Mondays and Wednesdays 830am -945am CDT.

PRIMARY FACULTY
Dr Mahadevan (Devan) IYER .
Attempts will be made to have Guest Lectures from Industry Experts / Faculty members

REFERENCE TEXT:
***Fundamentals of Microsystems Packaging, Rao R Tummala, McGraw Hill,* Tummala, 2001**
Additional Reference Text : Introduction to System on Package -miniaturization of the entire system, Rao R Tummala, Madhavan Swaminathan, Mc Graw Hill, 2008

FORMAT OF THE COURSE:
Lectures, Invited presentations/ Guest lectures from Industry Experts/Faculty members,
Exams & Project : Exam 1, Exam 2 and a Project Report/Seminar

ABOUT THE COURSE:
This is an electronics system level overview and a cross-disciplinary microsystems packaging course that reviews and discusses the systems packaging and integration technologies for consumer, computer, telecom, industrial, automotive and bio electronic systems. It integrates various disciplines including electrical, mechanical and materials and is an advanced introductory overview course for graduate students in ECE, ME and MSE. It provides both fundamental and applied aspects of electronic packaging technologies as applied to emerging products trends and applications, system miniaturization and multifunctional (computing, communication and sensing) integration needs.

COURSE SYLLABUS

Introduction to microsystems designs, materials, assembly/ packaging
- Fundamentals of microminiaturized systems, products , multifunctional integration challenges
- Role of packaging technologies at device and system level – Electrical, Mechanical, Materials
- Role of electronic packaging in next generation smart and connected systems – sensing, bio medical, automotive and industrial,

Fundamentals of Package Electrical Designs
- Package Electrical Design needs
- Signal and Power Distribution methods
- RF/ mmwave Packaging

Fundamentals & Principles of Thermal management
- Device, Package and system level thermal management fundamentals
- Cooling requirements and methods for electronic devices and systems
- Thermal Characterization – Numerical & Experimental methods – fundamentals

COURSE SYLLABUS (Contd.)

Electronic Packaging: Mechanical design and analysis

- Thermo mechanical stress and stress induced failures/ failure modes and analysis
- Stress mitigation, design optimization
- Fundamentals of design for reliability, reliability/ qualifications.

Electronic Packaging Technology – Materials, Assembly processes and Manufacturing

- Role of materials in device and systems packaging
- Electronic Packaging materials, properties and characterization (electrical and mechanical)
- Assembly Processes – Wire bond, Flip Chip and wafer scale packaging processes
- Manufacturing fundamentals – Quality, Cost, Reliability, Design for Manufacturing

Package reliability

- Reliability fundamentals
- Design for Reliability
- Failure modes and mechanisms

MEMS Packaging –

- Classification od MEMS, Fundamentals,
- Assembly Processes
- Packaging Challenges

COURSE OBJECTIVES:

At the end of the course, the students should be able to :

- explain the electronic packaging technologies in the context of single chip, multi chip modules/subsystems and systems.
- articulate packaging technologies pertinent to devices and systems and as applied to System on Chip, System in Package and other advanced system miniaturization technologies.
- understand and explain the fundamentals of package co designs from electrical, thermal and mechanical performance.
- explain the electronic device and system packaging materials needs, characterization techniques and design optimization methodologies with a clear understanding of material properties.
- understand and describe the electronic packaging assembly processes and manufacturing fundamentals
- understand and explain the fundamentals of design for performance, design for reliability and design for manufacturing needs, thermal management, thermo mechanical stress mitigation and reliability.

GRADING

Exam. 1	: 30%
Exam. 2	: 30%
Project/Presentations	: 40%

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go through these policies and procedures particularly the dos and don'ts in the context of COVID-19.

Please go to https://coursebook.utdallas.edu/syllabus-policies for these policies.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Instructor