

ME 491 Introduction to Thin Film Mechanics

Spring Semester, 2020

Dept. of Mechanical Engineering, KAIST

Course Description	Thin films play an important role in many technological applications including microelectronic devices, magnetic storage media and surface coatings. This course provides an introduction to mechanics-related topics involving stress, defect formation, and structural evolution in thin films. The processing, structure, and properties of thin films are discussed emphasizing current areas of scientific and technological interest.
Instructor	Gi-Dong Sim (심기동), Office: ME Bldg(N7) #6114 Email: gdsim@kaist.ac.kr , Tel: 7318
Teaching Assistant	김지영 (jyoung2k@kaist.ac.kr), 박유현 (yuhyun.park@kaist.ac.kr), 김호장 (khz5312@kaist.ac.kr)
Website	klms.kaist.ac.kr
References	<ol style="list-style-type: none">1. Mechanical Properties of Thin Films (Lecture notes of Prof. Nix) – will upload full pdf2. The New Science of Strong Materials (J.E. Gordon)3. Thin Film Materials: Stress, Defect Formation and Surface Evolution (L. B. Freund, S. Suresh)4. The Materials Science of Thin Films (M. Ohring)5. The Science and Engineering of Microelectronic Fabrication (S.A.Campbell)
Grading Policy	<ol style="list-style-type: none">1. Homework: 15%, Participation and Attitude: 5%, Quiz: 10%2. Exam grading (2 types of grading) Type 1 (diligent student): Mid term: 35%, Final Exam: 35% Type 2 (late bloomer): Mid term: 25%, Final Exam: 45%
Lab Tour (tentative)	Planning to schedule 2 lab tour: <ol style="list-style-type: none">1. Visit iCaRE Lab. to observe sputter deposition2. Visit iCaRE Lab. to observe micromechanical testing

Course Outline

Week	Topics
1	Introduction to Thin Films
2	Deposition of Thin Films
3	Processing of Microelectronic Structures
4	Mechanical Fundamentals/Tensors
5	Tensors/Elementary Elasticity
6	Elementary Elasticity
7	Mechanics of Thin Films on Substrates: Stoney formula, wafer curvature
8	<i>Mid-term Exam</i>
9	Technique for Measuring Stresses
10	Development of Microstructures and Stresses During Growth
11	Mechanical Behavior of Thin Films
12	Strengthening Mechanisms in Metal Thin Films
13	Measuring Mechanical Properties of Thin Films: Nanoindentation
14	Measuring Mechanical Properties of Thin Films: Bulge Testing & Micromechanical Testing
15	Introduction to Fracture of Thin Films
16	<i>Final Exam</i>