

MTSE 765-002
Thin Film Preparation and
Characterization

Course Outline

Spring 2023

Dr. Oktay H. Gokce
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Webex room: <https://njit.webex.com/join/gokce>

Course schedule:
Tuesday and Thursday 10:00 AM – 11:20 AM

Office Hours: Monday 2:30 – 4:00; Thursday 4:00 – 6:00; or by appointment

Delivery Mode: Face-to-Face (Delivery of instruction is structured around in-person classroom meeting times. Instruction is delivered in person and students are expected to attend class).

Course Content	Film structure, amorphous thin films, thin films and surface characterization, the structural and chemical characterization of thin films. The diffusion reaction and transformation in thin films. Electrical, optical measurements, the determination of physical properties of thin films.
Expected Learning Outcomes	At the completion of the course the students should be able to comprehend: Film structure, amorphous thin films, the characterization of thin films. The commonly used thin film deposition techniques. The diffusion reaction and transformations in thin films. Also the methods used in determination of deposited thin film properties.
Methods and Strategies	Teaching with Visual Presentations, Classical Lecture, Discussions and Question-answer sessions. Laboratory and demonstrations.

Recommended Reading/Literature	<ul style="list-style-type: none">• M.Ohring, Materials Science of Thin Films, Academic Press, Second Edition, 2002.• Gernot Friedbacher, Henning Bubert - Surface and Thin Film Analysis_ A Compendium of Principles, Instrumentation, and Applications-Wiley-VCH, 2011.• Krishna Seshan, Dominic Schepis - Handbook of Thin Film Deposition-William Andrew, 2018.• Inorganic and Organic Thin Films_ Fundamentals, Fabrication, and Applications- Yujun Song (editor) - Wiley-VCH (2021)• Non-Classical Crystallization of Thin Films and Nanostructures in CVD and PVD Processes-(Springer Series in Surface Sciences 60) Nong Moon Hwang (auth.) - Springer Netherlands (2016)• Thin Film Coatings_ Properties, Deposition, and Applications- (Emerging Materials and Technologies) Fredrick Madaraka Mwema, Tien-Chien Jen, Lin Zhu - CRC Press (2022)
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Grade items:

- Quizzes – There will be weekly quizzes on previous week's lecture and/or assigned homework.
- Projects – A selected research work from the literature that is relevant to the course will be presented in the class. An accompanied report is requested for the presentation. Each student also writes a critique on another student's presentation in the class.
- Laboratory – A comprehensive laboratory report is to be written for each of the laboratory and demonstration done during the semester: NJIT clean room, York Center thin film characterization techniques.

The contributions of these items to the overall grade change depending on the number of the arrangements made for the Laboratory component of the course: Quizzes (20-30%), Projects (20-30%), Laboratory (40-60 %)

Lecture No.	Subject
1	Introduction and Overview
2	Kinetics and Diffusion, Nucleation and Growth
3	Film Formation
4	Kinetic Theory of Gases, Vacuum Technology, Physical Vapor Deposition, Evaporation
5	Physical Vapor Deposition, Sputter Deposition
6	Sputter Deposition, Molecular Beam Epitaxy
7	Chemical Vapor Deposition
8	Atomic Layer Deposition, Thin Film characterization
9	Thin Film Characterization