AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Technology of Thin Films								
Course Code	FZK518		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	6	Workload	155 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To make an introduction to the preparation methods and characterization techniques of thin films.								
Course Content	The main topics to be discussed in this course; vacuum evaporation techniques, mean free path of vapour molecules, methods of thermal evaporation; resistive heating, laser evaporation, arc evaporation, radiofrequency heating, flash evaporation, electron beam evaporation, the emission characteristics of vapour sources and film thickness distribution, vacuum coating units; O-rings, valves, pumps and gauges of vacuum, vacuum evaporation sources; heating flaments and boats, substrates and their cleaning, the nucleation, growth ve structural properties in vacuum deposited films, sputtering techniques; magnetron, ion beam and AC sputtering, chemical deposition techniques, others deposition techniques, film thickness monitoring techniques and apparatus.								
Work Placement									
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Discussion, Individual Study								
Name of Lecturer(s)									

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	40
Final Examination	1	60

Recommended or Required Reading	
1	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, 1992
2	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961
3	Science and Technology of Thin Films, F. C. Matacotta and G. Ottaviani, World Scientific Publishing Co.Pte. Lte., London, 1995
4	Thin Film Phenomena, K. L. Chopra, McGraw-Hill, New York, 1969

Week	Weekly Detailed Course Contents	
1	Theoretical	Thin film definition and preparation methods
	Preparation Work	The Optical Constants of Bulk Materials and Films (2nd Ed.), L Ward, Institute of Physics Publishing, Bristol-1994, pp.140-148.
2	Theoretical	Vacuum evaporation techniques
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp.1-33
3	Theoretical	Mean free path of vapour molecules
	Preparation Work	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, USA, 1992, pp.1-5.
4	Theoretical	Methods of thermal evaporation; resistive heating, laser evaporation, arc evaporation, Radiofrequency heating, flash evaporation, electron beam evaporation
	Preparation Work	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, USA, 1992, pp.5-35.
5	Theoretical	The emission characteristics of vapour sources and film thickness distribution
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp.141-168.
6	Theoretical	Vacuum coating units; O-rings, valves, pumps and gauges of vacuum
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp..7-14
7	Theoretical	Vacuum evaporation sources; Heating flaments and boats
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp..104-1121.
8	Intermediate Exam	Midterm Exam
9	Theoretical	Substrates and their cleaning
	Preparation Work	The Optical Constants of Bulk Materials and Films (2nd Ed.), L Ward, Institute of Physics Publishing, Bristol-1994, pp.140-143.
10	Theoretical	The nucleation, growth ve structural properties in thin films
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp.199-205.
11	Theoretical	Sputtering techniques; magnetron, ion beam and AC sputtering

11	Preparation Work	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, USA, 1992, pp.41-93.
12	Theoretical	Chemical deposition techniques
	Preparation Work	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, USA, 1992, pp.223-287.
13	Theoretical	Others deposition techniques
	Preparation Work	Preparation of Thin Films, Joy George, Marcel Dekker, Inc., New York, USA, 1992, pp.335-350.
14	Theoretical	Film thickness monitoring techniques and apparatus
	Preparation Work	Vacuum Deposition of Thin films, L. Holland, Chapman&Hall Ltd., London, 1961, pp.298-308.
15	Theoretical	The study techniques for the surface of thin films: AFM and Elektron microscopy
	Preparation Work	Basics of Optics of Multilayer Systems, Sh A. Furman and A. V. Tikhonrsvov, ADAGP; Paris, France, pp.232-235.
16	Final Exam	Final Exam

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	4	2	84
Individual Work	7	5	1	42
Midterm Examination	1	10	2	12
Final Examination	1	15	2	17
			Total Workload (Hours)	155
			[Total Workload (Hours) / 25*] = **ECTS**	6

**25 hour workload is accepted as 1 ECTS*

Learning Outcomes

1	To be able to describe the basics of growth and material parameters of thin films.
2	To be able to recognize the various deposition methods and syntheses of various materials and be able to relate them to principles of fundamental physics
3	To be able to identify application areas according to difference between thick and thin films
4	To be able to give the examples of vacuum pumps and vacuum systems.
5	To be able to recognize the techniques used in structural, electrical and optical characterizations of thin films.

Programme Outcomes *(Physics Master)*

1	The student should conceive the concepts in physics and may apply them on her/his own
2	The student should be able to conceive the relationship between the different physics laws and integrity of them and apply them in solving different physics problems
3	The student should know the basic principles of classical, quantum and relativistic physics and use them in the solutions of problems
4	The student should be able to do research in a specific area of physics
5	The student should be able to prepare reports on papers on the subject of her/his research and present her/his research subject in scientific conferences
6	The student should be able to explain the relationship between complicated problems and basic physics laws.
7	The student should be able to use computers for solving complicated physics problems
8	The student should be able to interrelate between the theory and the experiment. If she/he is experimentalist he/she has to explain the theory behind her/his work. If she /he is a theorist she/he should has to know the experiments in her/his subject.

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	5	2	2	5	5
P2	5	4	3	4	5
P3	4	1	1	3	5
P4	5	4	4	5	
P5	5	4	5	4	5
P6	4	3	4	3	5
P7	3	3	5	1	5
P8	5	5	5	5	5