

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE709-2023	SEMESTER	7th Semester
COURSE TITLE	Physics and Technology of Thin Films		
TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.		TEACHING HOURS PER WEEK	ECTS CREDITS
		3	6.0
COURSE TYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area		
PREREQUISITES	none		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	YES		
COURSE URL:	https://exams.emt.i.hu.gr/modules/auth/courses.php		

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The purpose of the course is to acquaint the students with the Physics and technology of surfaces and especially thin films, providing knowledge about the physical mechanisms and processes that govern surface structures and the mechanisms and processes of composition and microstructural development of thin films. In this context, the methods used for the synthesis and characterization of the films are reviewed, their physical and mechanical properties are studied and applications of thin films in microelectronics, biomedicine, the development of optical devices, etc. are presented. Upon completion of the course, students should: • To understand the fundamental mechanisms and processes that govern the formation and microstructural development of thin films. • Know the advantages and disadvantages of different deposition methods. • Have knowledge of the capabilities and importance of thin films for a variety of applications.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use, Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas

Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Autonomous work
Working in an interdisciplinary environment
Production of new research ideas
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

Introduction to Surface Physics and definition of thin films, atomic structure, surface thermodynamics, chemical reactivity, crystal structure, crystalline and amorphous materials, Bravais lattices, crystallographic directions and planes, nanocrystalline, polycrystalline and epitaxial thin films, crystalline film defects and disassembly. Convection and diffusion phenomena and surface diffusion. Mechanical stresses and elastic deformation in thin films. Film formation, nucleation and growth, homoepitaxial and heteroepitaxial growth. Development of thin films by deposition techniques, chemical deposition, physical vapor deposition, sputtering, molecular beam epitaxy, laser deposition. Physical and mechanical stability and properties of films. Methods of characterization of films with electron and X-ray diffraction techniques, microscopy and spectroscopic study of surfaces. Modern applications of thin films in microelectronics, optical devices, biomedical technology, solar panel technology, etc.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face										
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students										
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	<table> <tr> <th>Activity</th><th>Workload/semester</th></tr> <tr> <td>Lectures</td><td>75</td></tr> <tr> <td>Writing project</td><td>25</td></tr> <tr> <td>Bibliographic research & analysis</td><td>50</td></tr> <tr> <td>Total</td><td>150</td></tr> </table>	Activity	Workload/semester	Lectures	75	Writing project	25	Bibliographic research & analysis	50	Total	150
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Lectures	75										
Writing project	25										
Bibliographic research & analysis	50										
Total	150										

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	Student evaluation languages Greek English Method (Formative or Concluding) Formative Student evaluation methods <table> <tr> <td>Written Exam with Problem Solving</td><td>Rate</td></tr> <tr> <td>Written exam with multiple choice test</td><td>70</td></tr> <tr> <td></td><td>30</td></tr> </table>	Written Exam with Problem Solving	Rate	Written exam with multiple choice test	70		30
Written Exam with Problem Solving	Rate						
Written exam with multiple choice test	70						
	30						

5. Suggested Bibliography

Βιβλίο [94692386]: Διατάξεις Ημιαγωγών, Φυσική και Τεχνολογία, 3η Έκδοση, Sze Simon, Lee Ming-Kwei
 Βιβλίο [41956294]: ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΔΙΑΤΑΞΕΙΣ ΗΜΙΑΓΩΓΩΝ, Neamen
 Βιβλίο [50659222]: Φυσική Ημιαγωγών, Τριμπέρης Γιώργος

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