Electronic Materials Processing

1. GENERAL			
SCHOOL	Faculty of Sciences in collaboration with Faculty of Engineering, Aristotle University of Thessaloniki		
DEPARTMENT	Materials Science and Engineering		
LEVEL OF STUDIES	ISCED level 7 (5-year Integrated Master's programme) ISCED level 6 (4-year BSc programme)		
COURSE CODE	MSEN 823	**SEMESTER**	8th Semester
COURSE TITLE	**Electronic Materials Processing**		
TEACHING ACTIVITIES Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
		4	6
COURSE TYPE	The Electronic Materials Processing course in Materials Engineering focuses on the materials, methods, and technologies used in the fabrication of electronic devices and components A. Introduction to Electronic Materials B. Critical Material properties C. Crystal Growth and Material Synthesis D. Doping and Diffusion E. Lithography and Patterning F. Deposition and Thin Film Processing G. Annealing and Thermal Processing H. Packaging and Interconnects I. Characterization Techniques		
PREREQUISITES	Materials Science Fundamentals Solid-State Physics Thermodynamics and Kinetics		
TEACHING AND EXAMINATION METHODS	Lectures, Homework assignments, Quizzes, Midterm examination, Final exam		
COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE URL	https://elearning.auth.gr/course/view.php?id=xxxxx		

2. LEARNING OUTCOMES	
Learning Outcomes	By the end of the course, students will be able to: 1. Understand the properties of electronic materials and their role in device performance. 2. Apply processing techniques such as crystal growth, thin-film deposition, doping, lithography, and etching. 3. Analyze and correlate material microstructure with electrical, optical, and mechanical properties. 4. Perform material characterization and interpret experimental data. 5. Evaluate and propose suitable materials and processes for specific applications.

General Skills	Students will develop analytical and problem-solving skills, interpret surface and thin-film behavior, and apply theoretical and experimental methods to materials engineering challenges. They will also gain technical proficiency and the ability to communicate scientific results effectively.

3. COURSE CONTENT

This course introduces the principles and techniques used to process materials for electronic applications. It covers the properties of semiconductors, conductors, insulators, and other functional materials, linking their structure and composition to performance in devices. Students learn about crystal growth, thin-film deposition, doping, diffusion, lithography, etching, and packaging processes. The course also emphasizes characterization techniques to evaluate structural, electrical, optical, and surface properties. Practical laboratory sessions develop skills in material fabrication, testing, and analysis. By the end, students will be able to select appropriate materials and processing methods, analyze defects, and understand their impact on electronic device functionality.

4. LEARNING & TEACHING METHODS - EVALUATION

Teaching method	Face-to-face.
Use of ICT	ICT plays a significant role in enhancing teaching, learning, experimentation, visualization, and assessment in this course as follows: **Computational Tools for Problem Solving:** Spreadsheet calculations (Excel, Google Sheets), Coding solutions in Python, MATLAB, or Mathematica **Online Learning Platforms:** Learning management systems (LMS) like Moodle, Online lectures, video tutorials, and animations, **Communication and Collaboration:** Online discussion forums, Collaborative documents, Sharing of data and reports **Presentation and Reporting Tools:** Lab reports (word processors), Data plots and charts (graphing tools), Presentations (PowerPoint, Google Slides).
Teaching organization	The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).

Activity	Workload/semester (hours)
Lectures	52
self-study, quizzes, on-line tests	46
Independent study	50
examination	2
Total	**150**

Student evaluation	Assessment Language: English Assessment Methods: Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Written Exams

5. SUGGESTED BIBLIOGRAPHY

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Manufacturing Technology: Materials, Processes, and Equipment| ISBN 978-1032432489 | CRC Press 2023
Additional bibliography for study
Principles of Electronic Materials and Devices,| ISBN 9780078028182| McGraw Hill 2023