COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
DEPARTMENT	DEPARTMENT OF CHEMISTRY		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	YN801	**SEMESTER**	7th Semester
COURSE TITLE	Materials characterization		

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**
Lectures	2	
Laboratory practice	2	
	4.0	6.0
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Skill Development
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass2.emt.duth.gr/courses/CHEM_H125/

(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.

Upon successful completion of the course, students will be able to:

- Understand the basic concepts of advanced methods/techniques for characterizing materials
- Describe how these techniques work
- Perform basic use of experimental equipment
- Select and apply appropriate techniques for analyzing the physicochemical properties and nanostructure of various types of materials

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, Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment,

(3) COURSE CONTENT

Week 1: Transmission electron microscopy (TEM).

Week 2-3: Scanning electron microscopy – electron dispersing X-Ray spectroscopy.
Week 4-5: Crystallography and X-ray diffraction (XRD).
Week 6: Computed tomography (CT) (Micro CT).
Week 7: Fourier Transform Infrared Spectroscopy (FTIR).
Week 8: RAMAN Spectroscopy.
Week 9: Atomic Force Microscopy (AFM).
Week 10: Nanoindentation.
Week 11-12: Small Angle X-ray Scattering (SAXS).
Week 13: Thermal Analysis (TGA-DTA).

(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.*	**Activity** / **Workload/semester** Lectures: 26 Laboratory Excercise: 26 Project: 15 Study: 83 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*	Students are assessed by means of a final written exam which includes: 1. Problem solving 2. Multiple choice questions

(5) SUGGESTED BIBLIOGRAPHY

- Griffiths P. R. and de Haseth J. A., Fourier Transform Infrared Spectrometry. Second Edition, 2007.
- Π. ΒΕΡΙΛΛΗΣ, Οπτική και ηλεκτρονική μικροσκοπία, Πανεπιστημιακές εκδόσεις Θεσσαλίας, 2015.
- Μ. Κούη, Ν. Αβδελίδης, Π. Θεοδωρακέας, Ε. Χειλάκου, Μη καταστρεπτικές και φασματοσκοπικές μέθοδοι εξέτασης των υλικών, Εκδόσεις Κάλλιπος, 2015.
- J. R. Ferraro, K. Nakamoto and C. W. Brown, Introductory Raman Spectroscopy (Second edition), Elsevier, 2003.
- Sam Zhang, Lin Li, Ashok Kumar, Materials Characterization Techniques, CRC Press, 2008.
- Peter E.J. Flewitt, R.K. Wild, Physical Methods for Materials Characterisation, CRC Press, 2003.