CÓDE	NAME OF MODULE	TYPE
	ADVANCED NANO-SCALE CHARACTERIZATION TECHNIQUES: ELECTRON ENERGY LOSS SPECTROSCOPY	E

M = mandatory
E = elective

3.3.1. Learning goals of the module.

(List the specific learning goals that the current module should provide to the student; goals can focus on content, skills, or attitudes.)

THE GOAL OF THIS COURSE IS TO INTRODUCE THE STUDENT TO SELECTED EXPERIMENTAL TECHNIQUES OF RELEVANCE IN THE NANOSCALE CHARACTERIZATION. BOTH THE THEORETICAL AND EXPERIMENTAL FOUNDINGS ARE GOING TO BE CONSIDERED IN DETAILS. THIS YEAR THE ELECTRON ENERGY LOSS SPECTROSCOPY WILL BE CONSIDERED.
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3.3.2. Methodology: learning activities and credit value of the module (ECTS).

3.3.2.1. Learning activities.

(Time required to teach the module; links to other modules included in the MSc Program and suggested chronological sequence with the latter)

THIS MODULE IS PLANNED FOR A HALF ACADEMIC YEAR WITH 3 ECTS DIVIDED IN 10 THEORETICAL LECTURE HOURS, 20 PRACTICAL HOURS (EXERCICES ON LABORATORY RESULTS) AND 45 PERSONAL WORK HOURS. IN THESE LAST HOURS THE STUDENT WILL HAVE TO DO SOME BIBLIOGRAPHIC WORK WITH THE CORRESPONDING EXPOSITION ABOUT SOME PART OF THE COURSE.

3.3.2.2. ECTS credit value (and time)

1 ECTS credit = 25 hours UPV/EHU

TYPE OF LECTURE[1]	Theory		Practice							Evaluation	
	M[2]	S	PA	PL	PO	TA	TAI	PCL	PCC	Periodic Grading	Final Grading
Classroom lectures	10			20							3
Personal work [3]	20			25							
TOTAL	30			45							3

(1) M (standard lecture); S (seminar); PA (practical exercises in classroom); PL (practical exercises in laboratory); PO (practical exercises with computers); TA (non-industrial workshops); TAI (industrial workshops); PCL (clinical practice); PCC (field practice); the acronyms are taken from the Spanish wording.

(2) M = maximum allowed is 60% of the full classroom lectures .

(3) Personal work = time that the student would use to prepare and develop individual and group assignments.

3.3.2.3. Module Program.

(Lectures)

Lecture 1	AN INTRODUCTION TO EELS.
Lecture 2	INSTRUMENTATION FOR ENERGY LOSS SPECTROSCOPY.
Lecture 3	ELECTRON SCATTERING THEORY: INNER SHELL AND VALENCE ELECTRON EXCITATIONS.
Lecture 4	QUANTITATIVE ANALYSIS OF EELS.
Lecture 5	EELS IN NANOSYSTEMS: BULK AND SURFACE PLASMONS.

3.3.2.4. Bibliography.

(Basic and specialized bibliographies, journal references, internet addresses, etc.)

ELECTRON ENERGY LOSS SPECTROSCOPY IN THE ELECTRON MICROSCOPE, R.F. EGERTON PLENUM PRESS 1996
ELASTIC AND INELASTIC SCATTERING IN ELECTRON DIFFRACTION AND IMAGING, Z.L WANG, PLENUM 1995
TRANSMISSION ELECTRON ENERGY LOSS SPECTROSCOPY IN MATERIALS SCIENCE AND THE EELS ATLAS, ED.
CHANNING C. AHN, WILEY-VCH 2004
ELECTRON MICROSCOPY AND ANALYSIS, P.J. GOODNEW, J. HUMPHREYS AND R. BEANLAND.
ELECTRON ENERGY LOSS SPECTROSCOPY, RIK BRYDSON, BIOS SCI. PUBL. LIM. 2001
PHYSICAL PRINCIPLES OF ELECTRON MICROSCOPY, R.F. EGERTON. SPRINGER 2005

http://www.mscnano.eu/intranet/ANCT/

3.3.3. Criteria and methods for evaluation and grading

(Analysis of the methodology that will be used to evaluate the learning process of the student)

As it is a module of fundamental and basic character for the development of the master, it will be necessary to evaluate the acquired knowledge by means of an examination which will correspond to a 70% of the final qualification. The resting 30% will be marked by the work developed in the classroom and laboratories.

3.3.4. Learning resources

The student will have free access to the libraries of the Facultad de Química of the UPV/EHU, the Centro de Física de Materiales (Centro Mixto CSIC-UPV/EHU) and to the existing computer resources.
When existing in the neighbouring, we will visit the laboratories disposing of the described experimental techniques
ACCESS TO LECTURE VIEWGRAPH PDF'S AND SUPPLEMENTARY MATERIAL AT THE INTRANET AREA OF THE INTERNET WEB SITE: http://www.mscnano.eu/Intranet/ETI

3.3.5. Language and number of groups attending the module

1	NUMBER OF GROUPS
x	LANGUAGE: ENGLISH

3.3.6. Fields of science and technology to which the module is related

CODE	FIELD
	PHYSICS OF CONDENSED MATTER
	APPLIED PHYSICS

3.3.7. Department in charge of the Program

CODE	DEPARTMENT [1]
	DEPARTMENT OF MATERIALS PHYSICS

3.3.8. Teachers in charge of the module

DNI	Teacher UPV/EHU	Number of credits
	Alberto Rivacoba	1.5
	Nerea Zabala	1.5

DNI	Teacher other institutions	Number of credits