CÓDE	NAME OF MODULE	TYPE
	EXPERIMENTAL TECHNIQUES II	M

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 MAIN GOAL OF THE COURSE IS TO INTRODUCE THE SPECTROSCOPIC EXPERIMENTAL TECHNIQUES IN THE NANOSCIENCE AND NANOTECHNOLOGY CONTEXT.
TWO MAIN GROUPS ARE CONSIDERED, TECHNIQUES INVOLVING ELECTRON SPECTROSCOPY AND THOSE FOCUS ON MOLECULAR SPECTROSCOPY.

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 IS A 3 ECTS MODULE WITH A THE TEACHING TIME OF 30 HOURS, INCLUDING LABORATORY ACTIVITIES.
THE LINK WITH EXPERIMENTAL TECHNIQUES I IS OBVIOUS
THE MODULE MUST BE THOUGHT AFTER BASIC SCIENTIFIC SUBJECTS, SUCH AS QUANTUM PHYSICS AND MATHEMATICS

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											
Personal work [3]											
TOTAL											

(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	1. INTRODUCTION: MEASURING ELECTRONIC STATES IN NANOSTRUCTURES 2. THE SURFACE APPROACH ULTRA HIGH VACUUM ATOMICALLY CLEAN SURFACES
Lecture 2	EVAPORATION OF MATERIALS THIN FILM GROWTH QUANTUM DOTS, STRIPES AND WIRES
Lecture 3	3. SURFACE SENSITIVE TECHNIQUES 3.1 PARTICLE SOURCES 3.2 PARTICLE ANALYZERS
Lecture 4	3.3 LOW ENERGY ELECTRON DIFFRACTION
Lecture 5	3.4 SCANNING TUNNELING MICROSCOPY 3.5 ATOMIC FORCE MICROSCOPY
Lecture 6	3.6 PHOTOEMISSION
Lecture 7	4 SURFACE SCIENCE LABORATORY (PRACTICAL)
Lecture 8	5 SURFACE SCIENCE LABORATORY (PRACTICAL)
Lecture 9	6 SURFACE SCIENCE LABORATORY (PRACTICAL)
Lecture 10	7 SURFACE SCIENCE LABORATORY (PRACTICAL)
Lecture 11	8 MOLECULAR SPECTROSCOPIES. AN OVERVIEW
Lecture 12	9 DIELECTRIC RELAXATION SPECTROSCOPY AND RELATED TECHNIQUES
Lecture 13	10 DIELECTRIC RELAXATION LABORATORY (PRACTICAL)

Lecture 14	11 NUCLEAR MAGNETIC RESONANCE
Lecture 15	12 NUCLEAR MAGNETIC RESONANCE SPECTROMETERS (PRACTICAL)
Lecture 16	13 INELASTIC AND QUASIELASTIC NEUTRON SCATTERING
Lecture 17	14 INFRARED SPECTROSCOPY. FOURIER TRANSFORM SPECTROMETERS
Lecture 18	15 RAMAN SPECTROSCOPY

3.3.2.4. Bibliography.

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

1.- Introduction to nanoscale science and technology. Eds Di Ventra, Evoy and Heflin. Springer, 2004.
2.- Physics at surfaces, A. Zangwill, cambridge university press (1996)
3.- Very high resolution photoelectron spectroscopy, ed. S. Hüfner, lect. notes in physics 715, Springer, Berlin, Heidelberg 2007.
4.- Scanning Probe Microscopy and Spectroscopy: Methods and Applications. Roland Wiesendanger, Cambridge University Press (1994)
5.- Broadband dielectric spectroscopy. F. Kremer, A. Schönhals, Springer-Verlag, Berlin 2003.
4.- http://www.cis.rit.edu/htbooks/nmr
5. Exploring Nanotechnology, 3rd volume of the Nanopolis™ encyclopedia series. Multimedia distributed knowledge network in nanotechnology. www.nanopolis.net
5. Exploring matter with Neutrons - 2nd edition, 2nd volume of the NANOPOLIS™ encyclopedia series. Multimedia distributed knowledge network in nanotechnology . www.nanopolis.net
6.- Modern Raman Spectroscopy: A Practical Approach, Ewen Smith y Geoffrey Dent., Wiley (2005).

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)

THE EVALUATION IS GOING TO BE MADE ON THE BASIS OF A COMBINATION OF AN INDIVIDUAL SEMINAR ON A RELATED SUBJECT (ASSISTANCE TO LECTURES IS MANDATORY) AND A TEST QUESTIONER EXAM.

3.3.4. Learning resources

ACCESS TO LECTURE VIEWGRAPH PDF'S AND SUPPLEMENTARY MATERIAL AT THE INTRANET AREA OF THE INTERNET WEB SITE: www.mscnano.eu/Intranet/ETII

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
	Angel Alegria	1.5

DNI	Teacher other institutions	Number of credits
	Frederich Schiller	1.5