DIPARTIMENTO DI SCIENZE

COURSE: **ADVANCED ANALYTICAL CHEMISTRY MOD.A**			
ACADEMIC YEAR: **2019-2020**			
TYPE OF EDUCATIONAL ACTIVITY: **Characterizing Activity**			
TEACHER: **Anna Maria Salvi**			
e-mail: **anna.salvi@unibas.it**		website: http://docenti.unibas.it/site/home/docente.html?m=00056	
phone: **0971-206256**		mobile (optional):	
Language:			
ECTS: **5** (lessons e tutorials/practice) 3 for lessons and 2 for laboratory pratice	n. of hours: **48** (lessons e tutorials/practice) 24 lessons and 24 laboratory practice	Campus: **Potenza** Dept./School: **Science Department** Program: **Chemical Science LM-54**	Semester: 01 October 2019 to 20 December 2019/ 20 January 2020

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course deepens the study of the electronic structure of solids with reference to surface and interface properties. The aim is that of providing a complete picture of the various kinds of interaction between radiation/particles and matter at the basis of the examined instrumentations and of the various kinds of the output signals. The performances of many spectroscopic and microscopic surface-specific techniques are compared within the applicative field of analytical chemistry with particular regards to data processing, elaboration and the results significance.

PRE-REQUIREMENTS

SYLLABUS

Natural and synthetic materials: classification on the basis of chemical bonds. Composite materials. Electronic structure of surfaces and interfaces. Collective electronic and vibrational properties in solids: plasmons, phonons. Adsorption and surface reconstruction. Study of the properties of surfaces and interfaces for the understanding of phenomena such as conductivity, adhesion, adsorption, corrosion, catalysis, etc.

General classification of the main surface- and interface techniques on the basis of the type of radiation' interaction with matter, of the information (structural, morphological, composition) and resolution, sensitivity and detection limits achievable. Demonstrative experience of the available and operational instrumentation will be provided. Illustrations of the specificity of the various instrumental techniques: sources, vacuum systems and / or ultra-high vacuum (UHV) systems for the analysis and detection of the signal.

Electronic surface techniques available in the Department and their use for applications in Analytical Chemistry: Basic Principles of X-ray Photoelectron Spectroscopy (XPS or ESCA) for compositional analysis. Software for data acquisition and data processing. Curve-fitting procedure for the identification and quantification of the spectral peaks. Basic principles and operational modality of SEM (Scanning Electron Microscopy), AFM (Atomic Force Microscopy) and TEM (Transmission Electron Microscopy) techniques for morphological and structural comparison analysis.

Analysis of a real sample by XPS and combined techniques. Planning of an optimal analytical scheme. Comparison and rationalization of the data output and its analytical significance. Introduction to the chemometric analysis.

The final part of the course will be devoted to the elaboration of the experiments in form of a technical report comprehensive of bibliographic research, to be discussed at the exam.

TEACHING METHODS

Lectures / thematic seminars / laboratory experiments

EVALUATION METHODS

Tutorial sessions on data elaboration useful for the experimental report.

The **oral** examination will start with discussion of the experimental report that must be delivered at least one week before the examination date.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

1.-D.Briggs, M.P.Seah 'Practical Surface Analysis' Vol. I e II. J.Wiley & Sons (1990).
2.-P.A. Cox 'The Electronic Structure and Chemistry of Solids' Oxford Science Pubblications
3.-P.E.Flewitt and R.K.Wild 'Physical Methods for Materials Characterisation' Institute of Physics Publishing– Bristol & Philadelphia
4.-Lecture Notes
5. *http://www.nist.gov/ts/msd/srd/surface.cfm* (XPS database)

INTERACTION WITH STUDENTS

The theoretical lessons will be accompanied by practical exercises to be performed in the XPS laboratory and demonstrative experiences with advanced equipment available in the Department. The course intends to provide the basis for learning the use of these instruments and for the interpretation of data that can be obtained from them. Each student will be assigned an individual analytical application consisting in the characterization, through XPS and any combined techniques, of a real sample.
Students will be constantly followed during their experiments and, in addition to the lesson hours, they will be able to contact the teacher for further details and agree a reception time (Study 4°floor MR-Edificio 2DA) by email anna.salvi@unibas.it or by phone (**3204238516)**.

EXAMINATION SESSIONS (FORECAST)[1]

20 February; 12 March; 18 June; 09 July; 17 September; 22 October; 10 December 2020

SEMINARS BY EXTERNAL EXPERTS YES □ NO

FURTHER INFORMATION

EXAMINATION BOARD: **President**: Anna Maria Salvi **Component**: Rosanna Ciriello
Adjunctive Components: Giuliana Bianco; Antonio Guerrieri

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.