



University of Science and Technology of Hanoi

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COURSE SYLLABUS

Subject: Material Characterization Techniques (Spectroscopy Technics)
Lecturer: Nguyen Luong Lam

Academic field: Materials Science and Nanotechnology

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Academic year: 2017-2018

COURSE DESCRIPTION

Credit points	2	
Level	Undergraduate	
Teaching time	2017 ó 2018	
Location	University of Science and Technology of Hanoi	
Time Commitment	Lecture	14 hrs
	Tutorial	0 hrs
	Practice	6 hrs
	Lab-work	0 hrs
	Total	20 hrs
Prerequisites	Electromagnetism, Chemical Physics, Electronic structure of materials	
Recommended background knowledge	Basic knowledge in Physics, Chemistry, Materials science	
Subject description:	Materials Characterization Techniques deals with techniques that characterise structures of material based on their interactions with photons, electrons and atoms. It covers the physics, working principles, instrumentations and applications of the most popular methods including ultraviolet visible spectroscopy, X-ray diffraction, Infrared-Raman spectroscopy. Besides regular lectures, students will have oppoturnities to practice at actual laboratories at NanoLab that based on the availability of the tools.	
Objectives & Out-come	<ul style="list-style-type: none"> • To introduce students to various characterisation methods that are being used in materials science research. • To show students the relationship between materials properties and their corresponding characterisation means in order to select the suitable tools for their future research. • To show students current trends in surface science research. As for the out-come of the lecture, students are expected to: <ul style="list-style-type: none"> • Get the fundamental understanding about the working principals and applications of each method. 	



	<ul style="list-style-type: none"> For the practical emphasis, student are expected to be able to use the instruments; prepare samples and perform the experiments; analyse and interpret data. Achieve an additional knowledge in materials science, including new trends in materials research. Eventually, they are able to make their own decision on the use of the characterisation tools for their research. 	
Assessment/ Evaluation	Attendance/Attitude	10 %
	Class exercise(s)	0 %
	Assignment(s)	0 %
	Lab work	20 %
	Mid-term test	30 %
	Final exam	40 %
Prescribed Textbook(s)	<p>[1]. Yang Leng, "Materials Characterization: Introduction to Microscopic and Spectroscopic Methods", John Wiley & Sons (Asia) Pte Ltd, 2008.</p> <p>[2]. David Brandon, "Microstructural Characterization of Materials", 2nd Ed., John Wiley & Son, Ltd, 2008.</p>	

COURSE CONTENTS & SCHEDULE

Class	Contents	Hours			Ref./Resources	Assignment(s)
		Lect.	Exr.	Prc.		
1	Introduction to materials characterization fundamentals <ul style="list-style-type: none"> Microscopies technics Spectroscopies technics 	2			[1]	
2	FT-Infrared and Raman Spectroscopy <ul style="list-style-type: none"> Vibrational Spectroscopy for Molecular Analysis Fourier Transform Infrared Spectroscopy Raman Microscopy Interpretation of Vibrational Spectra 	3			[1]	
3	X-ray Techniques <ul style="list-style-type: none"> X-Ray Radiation Theoretical Background of Diffraction X-Ray Diffractometry Wide-Angle X-Ray Diffraction and Scattering 	3			[1]	



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4	Elemental Analysis <ul style="list-style-type: none"> • X-Ray Spectroscopy for Elemental Analysis • Secondary Ion Mass Spectrometry for Surface Analysis 	3			[1]	
5	Thermal Analysis <ul style="list-style-type: none"> • Common Characteristics • Differential Thermal Analysis and Differential Scanning Calorimetry • Thermogravimetry 	3			[1]	
6	Lab work FT-Infared			3	[1]	
7	Lab work XRD			3	[1]	

Notes:

- *Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).*
- *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*

Reference Literature:

[1] Yang Leng, "**Materials Characterization: Introduction to Microscopic and Spectroscopic Methods**" , John Wiley & Sons (Asia) Pte Ltd,2008.

[2] David Brandon, "**Microstructural Characterization of Materials**", 2nd Ed., John Wiley & Son, Ltd, 2008.