

REVISED COURSE CONTENT

New Course Code and Title	MS731M: Chemical Analysis of Materials (2AU)
Details of Course	<p data-bbox="574 373 1040 401">Rationale for introducing this course</p> <p data-bbox="574 432 1484 611">This course will cover the subject of chemical analysis of materials. Chemical analysis of materials is wherein the composition and chemical information of various materials and properties are probed and measured. This course will focus specifically on different spectroscopic analytical techniques of chemical analysis of materials. It will cover surface chemical analysis to bulk chemical analysis of materials.</p> <p data-bbox="574 619 834 646">Aims and objectives</p> <p data-bbox="574 678 1414 764">The aim of this course is to cover fundamental principles of some of the spectroscopic chemical analysis of materials techniques, their instrumentation and applications.</p> <p data-bbox="574 800 1065 827">At the end of this course the students will</p> <ul data-bbox="623 831 1451 1100" style="list-style-type: none"> <li data-bbox="623 831 1398 858">▪ describe the working principles of IR, UV-VIS, XRF and XPS, <li data-bbox="623 890 1442 917">▪ analyze data acquired from each of the spectroscopic techniques <li data-bbox="623 949 1451 1010">▪ recommend suitable techniques for evaluating material properties with clear justifications, and <li data-bbox="623 1041 1425 1100">▪ integrate information from multiple datasets to make deductions about material properties <p data-bbox="574 1136 992 1163">Course Syllabus (Refer to below)</p> <ul data-bbox="623 1199 1068 1325" style="list-style-type: none"> <li data-bbox="623 1199 932 1226">• Infrared Spectroscopy <li data-bbox="623 1230 1045 1257">• Ultra violet visible Spectroscopy <li data-bbox="623 1262 1068 1289">• X-ray Fluorescence Spectroscopy <li data-bbox="623 1293 1068 1325">• X-ray photoelectron Spectroscopy

Assessment (Individual and Group Assessment)	Mode of Assessments and weighting	4 Tutorials – 40% (Individual) CA: MCQs + short answer essays -30% (Individual) Research paper critique: peer review -30% (Individual) Total – 100%
	Instructions	CA: 10-20 questions, Open book, Randomised Questions and Options (MCQ) and short answer essays (All content) Research paper critique: All content
	Mapping of assessment to course objectives <ul style="list-style-type: none"> • LO1. Describe the working principles of UV-VIS, IR, XRF and XPS • LO2. Analyse data acquired from each of the analytical techniques • LO3. Recommend suitable techniques for evaluating material properties with clear justifications. • LO4. Integrate information from multiple datasets to make deductions about material properties 	CA : LO1, LO2, LO3, LO4 Peer review: LO2, LO3 and LO4
Hours of Contact/Academic Units	26 hours / 2 AU	
Proposed Date of Offer	AY2020/21 Semester 1	
Instructor and Co-instructor (if any)	Dr. Fong Wen Mei Eileen	
Class size	30	
Mode of Teaching & Learning (Lectures, regular tests, Q&A, problem-based learning)	<i>Lectures, tutorials, assessments</i>	
Any duplication of course School is advised to coordinate/check with the School offering the course to avoid duplication.	No	

Course Syllabus

The following topics will be covered:

1. Introduction to Spectroscopy

Spectroscopy definition, Types of spectroscopy, Data obtained/analysis, uses of spectroscopy in chemical analysis

2: Infra-red Spectroscopy

Molecular vibrations, concept of wavenumber, Group frequencies, finger print vibrations, sample preparation, applications

3: Ultra Violet visible Spectroscopy

Background, absorption spectra, ligand field theory, d-d transitions, Beer-Lambert's law, quantitative analysis, applications

4: X-ray Fluorescence Spectroscopy

Theory, wavelength and energy dispersive spectrometry (WDS and EDS), Qualitative and Quantitative analysis, Instrumentation, Applications

5: X-ray Photoelectron Spectroscopy

Introduction, Background principle, Photoelectron/Auger peaks, Chemical Shift, Spin orbit splitting, Depth profiling, Data analysis, applications