

**REVISED COURSE CONTENT**

<b>New Course Code and Title</b>	<b>MS7310: Chemical Analysis of Materials (2AU)</b>
<b>Details of Course</b>	<p data-bbox="574 369 1040 401"><b>Rationale for introducing this course</b></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="574 617 834 648"><b>Aims and objectives</b></p> <p data-bbox="574 680 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 831">At the end of this course the students will</p> <ul data-bbox="623 831 1451 1104" style="list-style-type: none"> <li>▪ <b>describe</b> the working principles of IR, UV-VIS, XRF and XPS,</li> <li>▪ <b>analyze</b> data acquired from each of the spectroscopic techniques</li> <li>▪ <b>recommend</b> suitable techniques for evaluating material properties with clear justifications, and</li> <li>▪ <b>integrate</b> information from multiple datasets to make deductions about material properties</li> </ul> <p data-bbox="574 1136 992 1167"><b>Course Syllabus (Refer to below)</b></p> <ul data-bbox="623 1199 1070 1325" style="list-style-type: none"> <li>• Infrared Spectroscopy</li> <li>• Ultra violet visible Spectroscopy</li> <li>• X-ray Fluorescence Spectroscopy</li> <li>• X-ray photoelectron Spectroscopy</li> </ul>

<b>Assessment</b> (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"> <li>• <b>LO1.</b> Describe the working principles of UV-VIS, IR, XRF and XPS</li> <li>• <b>LO2.</b> Analyse data acquired from each of the analytical techniques</li> <li>• <b>LO3.</b> Recommend suitable techniques for evaluating material properties with clear justifications.</li> <li>• <b>LO4.</b> Integrate information from multiple datasets to make deductions about material properties</li> </ul>	CA : LO1, LO2, LO3, LO4 Peer review: LO2, LO3 and LO4
<b>Hours of Contact/Academic Units</b>	26 hours / 2 AU	
<b>Proposed Date of Offer</b>	AY2020/21 Semester 1	
<b>Instructor and Co-instructor (if any)</b>	Dr. Fong Wen Mei Eileen	
<b>Class size</b>	30	
<b>Mode of Teaching &amp; Learning</b> (Lectures, regular tests, Q&A, problem-based learning)	<i>Lectures, tutorials, assessments</i>	
<b>Any duplication of course</b> 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