Annex A

REVISED COURSE CONTENT

New Course Code and Title	**MS7310: Chemical Analysis of Materials (2AU)**
Details of Course	**Rationale for introducing this course** 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.
	Aims and objectives The aim of this course is to cover fundamental principles of some of the spectroscopic chemical analysis of materials techniques, their instrumentation and applications. At the end of this course the students will ▪ **describe** the working principles of IR, UV-VIS, XRF and XPS, ▪ **analyze** data acquired from each of the spectroscopic techniques ▪ **recommend** suitable techniques for evaluating material properties with clear justifications, and ▪ **integrate** information from multiple datasets to make deductions about material properties
	Course Syllabus (Refer to below) • Infrared Spectroscopy • Ultra-violet visible Spectroscopy • X-ray Fluorescence Spectroscopy • X-ray photoelectron Spectroscopy

<table>
<tr><td rowspan="3">Assessment
(Individual and Group Assessment)</td><td>Mode of Assessments and weighting</td><td>CA: MCQs + short answer essays – 30%
(held in person; 1h)

Research paper (peer review) – 20%
(online assignment)

Final exam – 50%
(held in-person; 1h)
Total – 100%</td></tr>
<tr><td>Instructions</td><td>CA: 10-15questions, Closed-book, in-person; MCQ and short answer questions (selected topics)

Research paper critique: All content

Finals: 10-15 questions, Closed-book, In-person; MCQ and short answer questions (all content)</td></tr>
<tr><td>Mapping of assessment to course objectives
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</td><td>CA : LO1, LO2, LO3, LO4
Peer review: LO2, LO3 and LO4
Final Exam: LO1, LO2, LO3, LO4</td></tr>
<tr><td>Hours of Contact/Academic Units</td><td colspan="2">26 hours / 2 AU</td></tr>
<tr><td>Proposed Date of Offer</td><td colspan="2">AY2020/21 Semester 1</td></tr>
<tr><td>Instructor and Co-instructor (if any)</td><td colspan="2">Dr. Fong Wen Mei Eileen</td></tr>
<tr><td>Class size</td><td colspan="2">>130</td></tr>
<tr><td>Mode of Teaching & Learning
(Lectures, regular tests, Q&A, problem-based learning)</td><td colspan="2">Lectures, tutorials, assessments</td></tr>
<tr><td>Any duplication of course
School is advised to coordinate/check with the School offering the course to avoid duplication.</td><td colspan="2">No</td></tr>
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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