# Annex A

## Revised Course Content

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

- **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**

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**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)

Lectures, tutorials, assessments

**Any duplication of course**

School is advised to coordinate/check with the School offering the course to avoid duplication.

No

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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