

COURSE CONTENT

New Course Code and Title	MS733M: Electron Microscopy of Materials
Details of Course	<p>Summary of course content</p> <p>The characterization of material using electron have greatly involved in the last decade due to unprecedented developments of new instruments and new modeling methods. Over the last years, Singapore universities and NTU in particular have invested in state-of-the art electron microscopes allowing to perform such characterization in house. Thus, there is a need to train the graduate students to get a deep understanding of these advanced techniques. This course is divided in two modules, the first module will be about the fundamentals of electron microscopy while a second module will be about the advanced characterization methods.</p>
	<p>Rationale for introducing this course:</p> <p>This course will educate on the use of complementary materials characterization techniques through understanding the advantages and limitations of commonly used analytical electron microscopy characterization tools. Students will be acquainted with the principles, instrumentation and operation of scanning/transmission electron microscopy (SEM/TEM) for the characterization of inorganic materials. Practical methods of designing experiments, sample preparation, data collection / interpretation will be highlighted. Laboratory demonstration sessions will reinforce and consolidate the themes of the lectures.</p>
	<p>Aims and objectives</p> <p>Students will gain an understanding of the importance of various analytical electron microscopy tools individually and complementary to each other in designing and solving real-world industrial problems. This course will prepare students for their continuous studies as PhD candidates that require electron microscopy for nanomaterials characterization.</p>

	<p>Syllabus</p> <p>Module 1:</p> <ol style="list-style-type: none"> 1. Structure – Property Relationships 2. History of Electron Microscopy 3. TEM - Instrumentation 4. TEM – Contrast Formation 5. TEM – Electron Diffraction <p>Module 2</p> <ol style="list-style-type: none"> 6. TEM - EDX 7. TEM - EELS 8. HRTEM 9. Scanning (Transmission) Electron Microscopy: introduction 10. Scanning Electron Microscopy 11. HR-STEM imaging 12. Acquisition and analysis softwares 13. Image simulations
Assessment	<p>Assignment module1: 20% (individual)</p> <p>Exam module1: 30% (individual)</p> <p>Online MCQ module2: 20% (individual)</p> <p>Exam module2: 30% (individual)</p> <p>Total: 100 % (4 AUs)</p>
Hours of Contact/Academic Units	52 hours / 4 AUs
Proposed Date of Offer	Semester 1, AY2020-21
Instructor and Co-instructor (if any)	<p>Assoc. Prof. Dong Zhili</p> <p>Asst. Prof. Martial Duchamp</p>
Class size	20
Any duplication of course	No