MS3014 – Analysis of Materials

Course Code	MS3014					
Course Title	Analysis of Materials					
Pre-requisites	NIL					
Pre-requisite for	NIL					
No of AUs	3					
Contact Hours	LECTURES	26 hrs	LAMS/TEL (Online Videos and Resources)	13 hrs		

Course Aims

Designed for third year undergraduate students with little background in material characterization, this course aims to introduce various materials characterization techniques, involving both fundamental theoretical frameworks and operations in a virtual lab.

The fundamental theoretical frameworks provide detailed and comprehensive working principles of various equipment for imaging, spectroscopy and diffraction methods used in the compositional and structural characterization of engineering materials.

The virtual lab in this course offers vivid instruction in the most widely practiced equipment for materials evaluation such as x-ray diffraction (XRD). Due to the limited access of undergraduate students to the above popular equipment, the virtual lab allows students to operate such equipment and explore various functions anytime outside the classroom, arousing interest by hands-on operation and enhancing understanding of the theoretical knowledge.

The goal is to provide you with a foundation in the use of characterization techniques to diagnose and solve material problems that can be identified and potentially resolved in their forthcoming final year project and future research experience.

Intended Learning Outcomes (ILO)

By the end of this course, you should be able to:

1. Describe working principles of electron microscopy and the theory of image formation.
2. Explain basic principles of UV-Vis, fluorescence and vibration spectroscopy, and to derive material properties from the data acquired.
3. Describe the working principles of x-ray diffraction, x-ray fluorescence spectroscopy and x-ray photoelectron spectroscopy, and to derive material properties from the data acquired.
4. Identify suitable applications for each of the techniques covered, and provide justifications for the choice.

Course Content

1. Imaging Methods
2. Energy Dispersive X-ray Analysis
3. UV-Vis Spectroscopy
4. Vibrational Spectroscopy
5. Fluorescence Spectroscopy

6. X-Ray Diffraction
7. X-Ray Fluorescence Spectroscopy
8. X-ray Photoelectron Spectroscopy

Reading and References

1. A.R West, Solid State Chemistry and its Applications, John Wiley & Sons Ltd.
2. Cullity, B.D., Stock, S.R. Elements of x-ray diffraction (3rd ed), New Jersey : Prentice Hall, 2001.

Course Policies and Student Responsibilities

Students are required to be punctual for lectures and tutorials. They are to strictly observe NTU exam policy during continual assessments and final exam.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.