

MS3081– Laboratory III

Course Code	MS3081					
Course Title	Laboratory III					
Pre-requisites	NIL					
Pre-requisite for	NIL					
No of AUs	1					
Contact Hours	LABORATORY CLASS	15 hrs				

Course Aims

This course aims to equip students with the skills and abilities to conduct hands-on scientific and engineering investigation. Through scientific and engineering experimentation and writing lab reports, this course will also provide you with a deeper understanding of the theoretical knowledge acquired in the various materials engineering classes.

Intended Learning Outcomes (ILO) for Part B

By the end of this course, you (as a student) would be able to:

1. perform hands-on scientific and engineering experimentation
2. correlate theoretical concepts to practical phenomena
3. apply relevant engineering calculations to predict the mechanisms taking place
4. explain theoretical phenomena in a descriptive text
5. draw logical conclusions from experimental data
6. produce lab reports in accordance with established practices of the engineering discipline

Course Content

This course consists of the following five laboratory sessions related to the various subjects covered in Materials Science & Engineering:

- EC1. Corrosion
- EC2. Synthesis of colloidal gold nanoparticles
- EC3. Sintering, microstructure and properties of ceramics
- EC4. Composite materials: processing and mechanical evaluation
- EC5. Electrical characterisation of a P-N junction diode and a bipolar transistor

Reading and References

- [1a] Laboratory Manual for EC1
- [1b] K. R Trethewey and J Chamberlain: Corrosion for students of science and engineering, Longman
- [1c] U. R. Evans: The Corrosion and Oxidation of Metals, Arnold, London, 1960

- [2a] Laboratory Manual for EC2
- [2b] A. D. McFarland, C. L. Haynes, C. A. Mirkin, R. Van Duyne, H. A. Godwin, "Color My Nanoworld", J. Chem. Educ. 2004, 81, 544.
- [2c] P. C. Hiemenz, R. Rajagopalan, "Principles of Colloid and Surface Chemistry", 3rd edition, CRC press, 1997.
- [2d] J. Z. Zhang, "Optical Properties and Spectroscopy of Nanomaterials", World Scientific, 2009.

- [3a] Laboratory Manual for EC3

[3b] W. D. Kingery, H. K. Bowen, and D. R. Uhlmann, Introduction to Ceramics, John Wiley & Sons, 2nd Edition, 1991.

[3c] R. B. Heimann, Classic and Advanced Ceramics: From Fundamentals to Applications, WILEY-VCH, 2010.

[3d] J. Moulson and J. M. Herbert, Electroceramics: Materials, Properties, and Applications, Chapman and Hall, 1990.

[4a] Laboratory Manual for EC4

[4b] Hull D & Clyne TW (1996) An Introduction to Composite Materials (Cambridge University Press, Cambridge, UK) 2nd Ed p 326.

[4c] Ashby MF (2005) Materials Selection and Process in Mechanical Design (Butterworth Heinemann, Oxford, UK) 3rd Ed p 624.

[4d] ASTM International (2008) D 3039/D 3039M – 08. D 3039/D 3039M – 08: Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials in ASTM Annual Book of Standards (American Society for Testing and Materials, Philadelphia, USA), pp 1-13.

[5a] Laboratory Manual for EC5

[5b] S. M. Sze, "Semiconductor Devices" 2nd edition, John Wiley & sons, 2002.

[5c] R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall International, 2002.

Course Policies and Student Responsibilities

(1) General

Students are expected to read all laboratory manuals, attend all laboratory classes punctually and submit all scheduled reports/log sheets by due dates.

(2) Absenteeism

MS3081 requires you to be in laboratory classes to perform hands-on experiments. Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. Students who miss a lab session without valid reasons will be given a penalty deduction of 10 marks.

If you miss a laboratory session (with or without valid reasons), make-up is compulsory. The students who did not attend the make-up will be considered as 'ABS', and no mark will be awarded to the missed laboratory session(s). For students who missed an experiment due to valid reasons and did not attend the make-up, they will still be considered as 'ABS' and no mark will be awarded to the missed laboratory session(s).

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.