

Subject Description Form

Subject Code	ABCT3631
Subject Title	Metrology and Calibration
Credit Value	3
Level	3
Pre-requisite	NIL
Objectives	This subject aims at providing an in-depth coverage of the fundamentals of metrology, the science of measurement, and its application to establish measurement traceability to the International System of Units; especially metrology in chemistry for establishing the comparability of chemical measurements and their traceability in ensuring reliability of test results.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. demonstrate an understanding of the fundamentals of metrology and its application to establish traceability of measurements, in particular physical metrology in calibration of laboratory apparatus and equipment; b. understand the concept of metrology in chemistry and its application to establish comparability of chemical measurements and their traceability; c. appreciate the teamwork and communication skills in laboratory operation and management; d. develop senses of professional and technical competence
Subject Synopsis/ Indicative Syllabus	<p><u>Metrology and Its Application</u></p> <ul style="list-style-type: none"> • Principles and roles of metrology • Physical metrology and establishment of traceability of physical measurements • Calibration of laboratory apparatus and equipment <p><u>Metrology in Chemistry</u></p> <ul style="list-style-type: none"> • Comparability and traceability of chemical measurements • International organization and traceability chain • Inter-comparisons and certified reference materials <p><u>Metrology and laboratory accreditation</u></p> <ul style="list-style-type: none"> • Traceability of test results • Calibration programme and operation of calibration system
Teaching/Learning Methodology	<p>Principles and concepts of metrology science and application for calibration of various equipment will be covered in lectures. Tutorials with designed guiding problems will be arranged, and students will learn how to consolidate ideas and improve their problem solving skills.</p> <p>Students are required to work in a small group for project and laboratory study, which can help students to consolidate their acquired knowledge of metrology and calibration principles.</p>

Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
			a	b	c	d	
	1. Project	30	✓	✓	✓	✓	
	2. Laboratory	20	✓	✓	✓	✓	
	3. Lab quiz	20	✓	✓		✓	
	4. Examination	30	✓	✓		✓	
	Total	100 %					
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Tests and examination are employed to assess students' learning of metrology science of measurement, principles of calibration for equipments, policy of traceability with reference materials and certified reference materials, calibration program, calibration requirements and specified tolerance.</p> <p>In addition to project, practical laboratory performance and written reports will be used to assess students' knowledge ability and skills to solve problems in metrology and calibration.</p>							
Student Study Effort Expected	Class contact:						
	▪ Lecture		26 Hrs.				
	▪ Tutorial		7 Hrs.				
	▪ Laboratory		9 Hrs.				
	Other student study effort:						
	▪ Self study (reading on textbooks, reference books, etc)		70 Hrs.				
	▪ Project		20 Hrs				
	▪ Lab reports		10 Hrs.				
	Total student study effort		142 Hrs.				
Reading List and References	<p>Valery, A.S.; Chunovkina, A.G.; Mironovsky, L.A. Metrology and theory of measurement. Berlin; Boston 2013.</p> <p>Nucher, J.L. The metrology handbook: the measurement quality division. ASQ Quality Press 2012.</p> <p>Kimothi, S.K. The uncertainty of measurements: physical and chemical metrology: impact and analysis. ASQ Quality Press 2002.</p> <p>Paul de Bievre and Helmut Gunzler</p>						

Measurement uncertainty in chemical analysis. Springer online 2003.

International Organization of Legal Metrology
<https://www.oiml.org/en>

International Congress of Metrology
<http://cfmetrologie.edpsciences.org/>