



UNIVERSITI TEKNOLOGI MARA

CHM561: QUALITY IN ANALYTICAL MEASUREMENT

Course Name (English)	QUALITY IN ANALYTICAL MEASUREMENT APPROVED
Course Code	CHM561
MQF Credit	3
Course Description	This course will interactively engage students cognitively and scientifically in areas of sampling, method selection, procedures in establishing new analytical process, validating an analytical method, making and reporting measurements, quality assurance issues in making analytical measurement and reporting for efficient management of analytical laboratories. Quality and reliability are the two very important parameters in analytical chemistry. High-quality analytical information alone is not enough, as the information must also be reliable. Reliability is defined as the maintenance of quality through time. To obtain reliable analytical data, it is important to examine the reliability of all the steps involved in analytical process: sampling, data processing and reported results. Topics such as quality systems in chemical laboratories will facilitate the mutual recognition of analytical data between laboratories and trading partners in relation to regulations. The outcomes shall be accessed through a variety of tools which include the final examination and tests.
Transferable Skills	Students can understand, apply and synthesize the knowledge in providing reliable and valid analytical data.
Teaching Methodologies	Lectures, Blended Learning, Presentation
CLO	<p>CLO1 Explain the concept of quality assurance, sampling, method validation, measurement uncertainties and Quality Systems in Chemical Laboratory.</p> <p>CLO2 Apply the procedures in sampling, selecting an analytical method, establishing new analytical process, validating an analytical method, the process of reporting analytical measurements and measurement</p> <p>CLO3 Present the implementation of audit and the process in obtaining traceability and quality systems and management in chemical laboratories</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction to Quality Assurance 1.1) n/a	
2. Sampling 2.1) 2.1 Types of samples (Representative, selective, Random, Composite) 2.2) 2.2 Sampling Plan, Sampling Strategies 2.3) 2.3 Sampling Stages 2.4) 2.4 Chain of Custody	
3. Selecting the Method 3.1) 3.1 Sources of Methods 3.2) 3.2 Factors to Consider in Choosing a Method	
4. Establishing a New Analytical Process 4.1) 4.1 Experimental Optimization 4.2) 4.1.1 Experimental Design 4.3) 4.1.2 Response Surface 4.4) 4.2 Validation of Analytical Methods 4.5) 4.2.1 Replications, Recovery Tests, Reference Material 4.6) 4.2.2 Inter Laboratory Comparison 4.7) 4.2.3 Validation parameters (Accuracy and Precision, Limit of Detection and 4.8) Limit of Quantitation, Specificity / Selectivity, Linearity and Range, 4.9) Ruggedness and Robustness, System suitability)	

5. Making Measurements and Reporting

- 5.1) 5.1 Traceability in Analytical Measurement
- 5.2) 5.2 Establishing Traceability
- 5.3) 5.3 Record management

6. Measurement Uncertainties

- 6.1) 6.1 Defining Uncertainties
- 6.2) 6.2 Evaluating Uncertainties
- 6.3) 6.3 Sources of Uncertainties

7. Quality Systems in Chemical Laboratories

- 7.1) 7.1 Background Quality Systems
- 7.2) 7.2 Quality Systems Documentation
- 7.3) 7.3 Good Laboratory Practice (GLP) and Good Manufacturing Practices (GMP)
- 7.4) (Principles of GLP Compliance, Requirements for GLP Compliance)
- 7.5) 7.4 Types of Quality Standards for Laboratories
- 7.6) 7.5 Standard operating procedures (SOP)
- 7.7) 7.6 Total Quality Management (TQM)
- 7.8) 7.7 Auditing and Assessing Quality Systems

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment	20%	CLO3
	Test	Test 2	20%	CLO2
	Test	Test 1	20%	CLO1

Reading List	Recommended Text	<ul style="list-style-type: none"> • Elizaberth Prichard, <i>Quality in Analytical Chemistry Laboratory. Analytical Chemistry by Open Learning</i>
	Reference Book Resources	<ul style="list-style-type: none"> • Harrison M. Wadsworth & Kenneth S. Stephens, A. Blanton Godfrey. 2002, <i>Mordern Methods for Quality Control and Improvement.</i>, 2nd Edition Ed., John Wiley & Sons. Inc. • B.W.Wenclawiak, M. Koch & E. Hadjicostas (Eds). 2004, <i>Quality Assurance in Analytical Chemistry Training and Teaching.</i>, Springer-Verlag Berlin Heidelberg • Helmut Günzler (Ed.) 1996, <i>Accreditation and Quality Assurance in Analytical Chemistry</i>, Springer-Verlag Berlin Heidelberg • V. Barwick, S.Burke, R. Lawn, P.Roper & R.Walker. 2004, <i>Applications of Reference Materials in Analytical Chemistry.</i>, Royal Society of Chemistry • James N Miller & Jane C Miller. 2005, <i>Statistics and Chemometrics for Analytical Chemistry</i>, 5th Edition Ed., Pearson Prentice Hall • Hassan Y. Aboul-Enein, Raluca-Ioana Stefan & George-Emil Baiulescu. 2001, <i>Quality and Reliability in Analytical Chemistry.</i>, CRC Press LLC
Article/Paper List	Recommended Article/Paper Resources	<ul style="list-style-type: none"> • E. Prichard and V. Barwick 2007, Chapter 1 The need for reliable results, <i>Quality Assurance in Analytical Chemistry</i> • R. Briggs United Nations Environment Programme and the World Health Organization 1996, Chapter 9 - ANALYTICAL QUALITY ASSURANCE, <i>Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes</i> [ISSN: 041922320] • National Institute of Standards & Technology New York/New Jersey Waterway Sediment Standard Reference Material® 1944
Other References		<ul style="list-style-type: none"> • Website Design-Expert 6 User's Guide <i>Section 6 Response Surface Method (RSM) Tutorials</i>, Stat Ease Design Expert 6.0