



**UNIVERSITI TEKNOLOGI MARA**

**EVT714: ENVIRONMENTAL SAMPLING AND ANALYSIS**

<b>Course Name (English)</b>	ENVIRONMENTAL SAMPLING AND ANALYSIS <b>APPROVED</b>
<b>Course Code</b>	EVT714
<b>MQF Credit</b>	4
<b>Course Description</b>	This course provides students with knowledge of planning strategies for environmental sampling and monitoring of 3 environmental matrixes: air, water and soil, with emphasize on the importance of representative sampling and compliance with regulatory requirements and standard protocols, using appropriate tools and methodology. Sampling design covers basic statistical concepts including data variability. Sampling methods surveys current methods for discrete sampling and automated data acquisition for each medium. Practical applications of sampling and monitoring techniques and analytical methods used in the quantitative determination of air/environmental pollutants are discussed. Procedure for stack sampling in source monitoring and its subsequent analysis will be reviewed in terms of practicality and inherent problems.
<b>Transferable Skills</b>	Analysis skill, Critical thinking skill, Information searching skill
<b>Teaching Methodologies</b>	Lectures, Lab Work, Field Trip
<b>CLO</b>	CLO1 Understand the concept of environmental sampling, analyzing and monitoring CLO2 Develop the sampling design for significant environmental parameters CLO3 Analyze the environmental data according to validated methods approve by the regulatory authority CLO4 Predict the pollution source via statistical approach
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. Overview of legislation/regulations/guidance on environmental sampling</b> 1.1) US EPA soil screening guidelines 1.2) US survey of Soil and Groundwater Clean-up Standards 1.3) Malaysian National Quality Standards (water) 1.4) Malaysian Guidelines (Air Quality standards)	
<b>2. Overview of Environmental sampling and monitoring design</b> 2.1) Planning and Sampling protocols 2.2) Sampling Environmental Population and Sampling approaches 2.3) Sampling Technique-General Guidelines common to all environmental sampling	
<b>3. Air Sampling: Equipment and devices</b> 3.1) Sample collection for particulates 3.2) Sample collection for vapours and gas 3.3) Sample handling, preservation and analysis	
<b>4. Emission monitoring and sampling</b> 4.1) Stack sampling and monitoring-parameters for consideration 4.2) Procedures of sampling 4.3) Problems and recent advances in measurement	
<b>5. Water Sampling, Equipment and devices</b> 5.1) Sampling strategies of water pollutants- practical approaches 5.2) Field Measurements – Field quality Control and Quality Assurance Samples	
<b>6. Water Monitoring Techniques and Methodology</b> 6.1) Methods of Assessment of Environmental Quality	

<b>7. Basic Principles of Soil Sampling</b> 7.1) Site selection 7.2) Selection of sampling approach 7.3) Selection of area and parameters for sampling 7.4) Selection of sampling point 7.5) Selection of sampling and monitoring equipment
<b>8. Analysis of Soil Samples</b> 8.1) Pretreatment and storage of samples 8.2) Analytical methods 8.3) Evaluation of reliability
<b>9. Introduction to multivariate data modeling</b> 9.1) Principal Component Analysis (PCA) Multivariate regression: 9.2) MLR- Multi Linear Regression 9.3) PCR - Principal Component Regression 9.4) PLS - Partial Least Squares
<b>10. Data Collection and sorting</b> 10.1) Relevant data collection 10.2) Data filter/sorting
<b>11. Model multivariate analysis</b> 11.1) Multivariate modeling step by step 11.2) Pretreatment and scaling 11.3) Detecting and dealing with outliers
<b>12. Calibration, validation</b> 12.1) Prediction 12.2) The different validation methods 12.3) Basic rules for successful data analysis
<b>13. Environmental Sampling Presentation</b> 13.1) Air ,water and soil sampling

Assessment Breakdown	%
Continuous Assessment	70.00%
Final Assessment	30.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	n/a	20%	CLO2
	Group Project	n/a	20%	CLO3
	Test	n/a	30%	CLO1

Reading List	Recommended Text	<ul style="list-style-type: none"> <li>• Maria Csuros 1997, <i>Environmental Sampling and Analysis</i>, C12C Press Inc</li> <li>• C. David Cooper, F. C. Alley, C. Otis 2002, <i>Air Pollution Control, a Design Approach</i>, (3rd ed.), Ed., Waveland Press, Prospect Heights</li> <li>• Gilbert, R.O. 1987, <i>Statistical Methods for Environmental Pollution Monitoring</i>, Van Nostrand Reinhold.</li> <li>• Wark, K., Warner, C.E., and Davis, W.T, <i>Air Pollution: Its Origin and Control</i>, 3rd Ed Ed., Chapman and Hall /CRC.</li> <li>• George Tchobanoglous 2003, <i>Wastewater engineering; treatment and reuse</i>, 4th ed. Ed., McGraw Hill</li> </ul>
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	