

## Subject Description Form

<b>Subject Code</b>	ABCT4402
<b>Subject Title</b>	Advanced Analytical Techniques for Food Hazards
<b>Credit Value</b>	3.0
<b>Level</b>	4
<b>Pre-requisite / Co-requisite/ Exclusion</b>	ABCT3415 Food Analysis
<b>Objectives</b>	The subject provides students with a comprehensive understanding of the modern analytical techniques and skills for identifying and quantifying food hazards and related materials as well as testing and certification. It is also the objective of this subject to develop students' abilities to apply the knowledge and skills acquired to solve analytical problems associated with food contaminants in real life.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. identify food contaminants and the associated hazards that are commonly found in the community;</li> <li>b. understand the basic principles of modern chemical and biological methods for the analysis of food hazards;</li> <li>c. apply the knowledge and skills acquired to analyze and interpret experimental data obtained from different instrumental measurements;</li> <li>d. select and carry out appropriate techniques to solve analytical problems associated with food hazards;</li> <li>e. appreciate new developments of techniques in rapid and on-line detection/analysis of food contaminants;</li> <li>f. develop competence in testing laboratory,</li> <li>g. demonstrate analytical and critical thinking as well as life-long learning and communication skills.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><u>Food Contaminants and Residues of Major Concerns</u> Metallic contaminants, harmful substances, mineral oil, pesticide and veterinary drug residues, microbiological contaminants, etc., typical examples in each type of contaminants.</p> <p><u>Mass spectrometry and its hyphenated techniques</u> Applications of GC, GPC and HPLC with various detectors for qualitative and quantitative analyses of food hazards; fundamental principles and instrumentation of GC-MS, LC-MS, and other hyphenated techniques; interface systems; data acquisition; fragmentation patterns and mass spectra; compound identification by reference spectra; quantitative analysis by</p>

	<p>selected ion monitoring; applications of hyphenated chromatographic techniques in food hazards' analysis. Basic principles and instrumentation of ICP-MS; data acquisition and interpretation; applications of ICP-MS for analysis of metallic contaminants in food.</p> <p><u>Biological Methods</u> Real-time Polymerase Chain Reaction (PCR) technique; Enzyme Linked Immunosorbent Assay (ELISA); Radioimmunoassay (RIA); fundamental principles and instrumentation of the systems; measurement techniques and result interpretations; use of PCR for detection of genetically-modified organisms (GMO); other applications in analysis of food hazards and principles of systematic trouble-shooting based on microbiological identification, spoilage pattern as well as other evidence for locating the source of contamination.</p> <p><u>Recent Development of Rapid Techniques</u> Concepts in recent development of rapid detection/analysis of food contaminants: detection of foreign bodies, immunochemical assay kits, enzyme-based sensors, immunosensors and other biomimetic devices.</p> <p><u>Advanced Testing and Certification</u> Laboratory management; test sample and resources management; test method development; estimation of measurement uncertainty; chemical metrology and reliability of test results; product certification.</p>
<p><b>Teaching/Learning Methodology</b></p>	<p><u>Lectures:</u> The basic knowledge of different food hazards as well as the working principles of various chemical, biological and instrumental techniques for will be introduced in lectures.</p> <p><u>Tutorials:</u> Tutorial questions will be used to help students gain a better understanding on the lecture materials. For example, questions involving the use of advanced instruments (e.g. mass spectrometry) in food contaminant analyses will be designed for students for learning purposes.</p> <p><u>Practical classes:</u> Students will develop their practical skills and learn to apply different advanced instrumental techniques in laboratories. Students will also develop teamwork and communication skills and learn how to analyze experimental results/data in their practical work.</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	e	f	g	
	1. Exam	50	√	√	√	√	√			
2. Test	25	√	√	√	√	√				
3. Lab	25						√	√		
Total	100 %									
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Exam and tests will be used to assess students' understanding in various topics (e.g. advanced instrumental, chemical and biological techniques) in this course. These tools will also be used to assess the ability of students to analyze problems in chemical/biological analyses and select appropriate techniques/methods to solve the problems.</p> <p>Students will need to work in groups to complete their lab work. Such practical training provides a good platform for students to develop their teamwork and communication skills and apply different instrumental techniques for analytical purposes. Lab reports preparation will enable students to realize the importance of life-long learning through, for example, the search for up-to-date food safety information from the official websites of governments (e.g. HK, EU countries, US and China) and authoritative organizations (e.g. WHO).</p>										
Student Study Effort Required	Class contact:									
	▪ Lecture								24 Hrs.	
	▪ Tutorial								9 Hrs.	
	▪ Lab								9 Hrs.	
	Other student study effort:									
	▪ Self study  (Reading on textbooks, reference books, reports, literature etc.)								78 Hrs.	
	▪ Lab reports								15 Hrs.	
	Total student study effort							135 Hrs.		
Reading List and References	<u>Essential:</u>									

Principles of Instrumental Analysis (6<sup>th</sup> ed.)

Skoog, D.A., Holler, F.J. and Crouch, S.R.  
Publisher: Brooks Cole

Supplementary:

Analytical Chemistry  
Kelner, R. *et al* (Eds.)  
Publisher: Wiley-VCH

Contemporary Instrumental Analysis  
Rubinson, K.A. and Rubinson, J.F.  
Publisher: Prentice-Hall

Bioanalytical Chemistry  
Susan R. Mikkelsen, Eduardo Cortón  
Publisher: Wiley-Interscience

Useful websites:

<http://www.cfs.gov.hk>  
<http://www.fehd.gov.hk>  
<http://www.afcd.gov.hk>