Subject Description Form

Subject Code	ABCT3402
Subject Title	Food Chemistry
Credit Value	3
Level	3
Pre-requisite	Organic Chemistry (ABCT2423) or Organic Chemistry I (ABCT2742) or equivalent
Exclusion	ABCT3774 Food Chemistry
Objectives	This subject aims to provide students with the understanding of the basic chemistry of the major food constituents (water, carbohydrates, lipids and proteins) and the minor food components (vitamins, pigments and food additives). The chemical reactions and changes in the constituents of major food products during harvesting, handling, processing, and storage will be emphasized.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) understand the chemistry underlying the properties and reactions of various food components; b) explain the behavior of food components on processing, cooking, and storage; c) recognize the impacts of chemical reactions occurring in foods on their safety, shelf life, sensory and nutritional qualities and control chemical reactions in food; d) integrate chemistry with the quality attributes of food and apply knowledge to solve real-life problems in food preparation, processing and storage; e) utilize laboratory techniques to study the chemical properties of food constituents and their reactions; f) demonstrate analytical power, critical thinking and communication skills.
Subject Synopsis/ Indicative Syllabus	<u>Introduction</u> Major and minor components in foods; examples of chemical reactions occurring in foods and the impacts on their safety, sensory and nutritional qualities. <u>Water</u> Structure and properties; interactions of water with food components and food materials; water binding; water determination. <u>Carbohydrates</u> Structure, properties and reactions; mono-, oligo- and polysaccharides and their roles in foods; gelatinization and retrogradation of starch; modified starches; fibres and gums; pectin and fruit pectin gels; caramelization and Maillard reactions; composition and properties of cereals, fruits and vegetables. <u>Lipids</u> Classification, structure and properties; deteriorative reactions of lipids – autoxidation and lipolysis; modification of fats – hydrogenation,

interesterification, acetylation and winterizing.

Proteins
Amino acids; protein structure and properties; reactions during processing – denaturation, non-enzymatic browning and cross-linking; functional properties; structure and composition of milk, eggs and meat; milk proteins – effect of heat, acid and rennin; meat proteins – chemistry of meat colour and effect of cooking on meat quality; wheat proteins – properties of wheat protein; chemical and physical changes during bread-making.

Vitamins
Water-soluble and fat-soluble vitamins; effect of processing and storage on vitamins; technical roles of vitamins.

Pigments
Chlorophylls, carotenoids and flavonoids; chemical structures; changes in plant pigments during processing; enzymatic browning reactions and their inhibition.

Food flavour
Chemical structure and taste; sulphur compounds in vegetables; process and reaction flavours; flavour enhancers.

Chemical additives
Chemistry and technical roles of food additives: preservatives, antioxidants, anti-browning agents, emulsifiers/stabilizers, sweetening agents and others.

Teaching/Learning Methodology

The principles and concepts of the chemistry of foods are introduced to the students through lectures. Real-life examples and industrial practices are cited in lectures and tutorials to integrate chemistry and its application in food. Tutorial questions are designed to reinforce learned materials and to facilitate discussions in tutorials. Laboratory work illustrates the chemical properties of food constituents and their reactions under processing conditions. It also helps the students develop their ability to experiment, observe and analyze.

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
1. Exam	50	√	√	√	√		
2. Test	30	√	√	√	√		
3. Lab	20	√				√	√
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

	Tests and examination are employed to gauge how much students have learned in the chemistry of various food components, the behavior of food components on processing, cooking, and storage and the impacts of chemical reactions occurring in food on their safety, shelf life, sensory and nutritional qualities. The performance of the students in laboratory and written reports will be used to assess the ability of the students to apply chemistry with the quality attributes of food and apply knowledge to solve real-life problems in food preparation, processing and storage, utilize laboratory techniques to study the chemical properties of food constituents and their reactions and demonstrate analytical power, critical thinking and communication skills.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	▪ Lab	9 Hrs.
	Other student study effort:	
	▪ Self study (reading on textbooks, reference books, reports etc)	80 Hrs.
	▪ Lab reports	20 Hrs.
	Total student study effort	148 Hrs.

Reading List and References

Essential

Coultate, T.P	Food: The Chemistry of Its Components (4th ed.)	RSC 2002

Supplementary

McWilliams, M.	Food – Experimental Perspectives (5th ed.)	Prentice Hall 2005
Clark, N.	Food Chemistry	Food Trade Press 1992
Bruice, P.Y.	Organic Chemistry (5th ed.)	Prentice Hall 2007