



Course Specification

(Bachelor)

Course Title: Principles of Food Chemistry

Course Code: APFQ1102

Program: Intermediate Diploma in Food Quality and Safety

Department: Clinical Nutrition

College: Applied Medical Sciences

Institution: Umm Al-Qura University

Version: V3

Last Revision Date: 21 March 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

- A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
- B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 1/Year1)

4. Course General Description:

This course introduces food chemistry mainly deals with chemical structure and properties of food constituents, and with chemical changes food undergoes. The course covers a broad range of subjects related to foods including basic scientific principles to food systems and practical applications. The course is divided into different modules which are arranged systematically and gives the learner the basic information about chemical composition of main types of foods, bio molecules such as carbohydrates, proteins and enzymes, lipids, vitamins, pigments, flavours, minerals and other micro components, additives and contaminants.

5. Pre-requirements for this course (if any):

N/A

6. Co-requisites for this course (if any):

N/A

7. Course Main Objective(s):

1. Develop and understanding of how individual food components contributes to the overall quality of foods.
2. Achieve an understanding of the chemical changes that take place with food components during processing and storage.
3. Recognize reactions and mechanisms important in food chemistry.
4. Be capable of designing and conducting experiments and interpreting data to understand important food chemistry principles

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	45	100
4	Distance learning		





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Discuss the relationship between chemical composition and structure of macro-and micro-constituents and their functions in foods	K1	<ul style="list-style-type: none">• Lectures• Assignments	<ul style="list-style-type: none">• Midterm exam• Rubrics for assignments• Final exam
1.2	Describe the major chemical reactions that occur in foods during processing and storage	K1		
2.0	Skills			
2.1	Assess chemical composition, structure and function of macro-and micro-constituents	S1	<ul style="list-style-type: none">• Lectures• Class discussion• Assignments	<ul style="list-style-type: none">• Short essay questions in the midterm and final exam• Rubrics for assignments
2.2	Analyze the major chemical reactions occurring in foods during processing and storage	S1		
3.0	Values, autonomy, and responsibility			
3.1	Use scholarly activities, innovative thinking and performing good performance.	V1	<ul style="list-style-type: none">• Term paper• Class presentation	<ul style="list-style-type: none">• Rubrics for group work





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
				•Oral presentation assessment

C. Course Content

No	List of Topics	Contact Hours
1.	Course overview, assessment, and resources Overview of food chemistry and its importance Key concepts in organic chemistry Basic Organic Structures Functional Groups: e.g., alcohols, aldehydes, ketones, carboxylic acids, amines, esters, and amides). How functional groups influence the properties and reactivity of compounds.	3
2.	Organic chemistry basics Basic reaction types (substitution, addition, elimination, and redox reactions). Specific reactions relevant to food chemistry, such as esterification, hydrolysis, and the Maillard reaction. Isomerism Understanding of acids and bases, including pH and pKa concepts.	3
3.	Water Lecture Terminology Structure of Water Water binding and chemical reactions mediated by water Water activity and its significance; Determination of moisture in food	3
4.	Food proteins Lecture Terminology Classification and physicochemical properties Reaction involved in processing and reactions with alkali Enzyme catalyzed reaction involving hydrolysis and proteolysis Theories of formation of texturized proteins	3
5.	Food lipids Lecture Terminology Edible fats and oils- Classification and chemical composition Reactions involved during deep frying of food Lipoprotein – definition, classification and involvement in the formation of biological membranes	3



6.	Food carbohydrates Lecture Terminology Polysaccharide - linear, branched and modified Properties and utilization of common polysaccharides – cellulose, glycogen, hemicellulose, pectin, agar, alginate, carrageenan, gums and starch Enzymatic degradation of polysaccharides – starch Production of dextrins and maltodextrins	3
7.	Midterm Exam + Minerals in food Lecture Terminology Main elements and trace elements in eggs, cereals & cereal products, vegetables and fruits	3
8.	Food enzymes Lecture Terminology Hydrolases, lipases and other important enzymes in food Utilization in food industry and effect of inhibitors, pH and temperature	3
9.	Vitamins, amino acids , minerals Lecture Terminology <ul style="list-style-type: none"> Impact of processing and cooking on nutrient levels Bioavailability and health effects 	3
10.	Food Additives Lecture Terminology Types of food additives (preservatives, colorants, emulsifiers) Sugar substitutes – sorbitol, saccharin, cyclamate Food Colours Aroma Compounds in food and flavor enhancers – monosodium glutamate, nucleotides	
11.	Antinutritional factors and food contaminant Lecture Terminology Toxic trace elements, radionuclides	3
12.	Cereals and cereal products Lecture Terminology Individual constituents – proteins, lipids, carbohydrates and vitamins in cereals flour and their relationship in dough making Type of flours for bread making and confectioneries and influence of additives	3
13.	Cereals and cereal products Lecture Terminology Physical, chemical changes during baking and determination of gluten and starch content in flour	3
14.	Food Fermentation <ul style="list-style-type: none"> Basics of fermentation chemistry Microbial processes in food (e.g., yeast, bacteria) Fermented products: yogurt, cheese, sauerkraut 	3



15.	Preservation of foods Lecture Terminology General principles of food preservation-Physical methods Chemical preservation of food	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam	6 th week	25%
2.	Assignments and oral presentation	All weeks	15%
3.	Practical assessment	All weeks	20 %
4.	Final theoretical exam	16-18 th week	40%
	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<p>Aurand, L. W. and Wood, A. E. (1973). Food Chemistry. The AVI Publishing Co., Connecticut.</p> <p>Belitz, H. D., Grosch, W. and Schieberler, P. (2004). Food Chemistry. Springer, Berlin.</p> <p>DeMan, J. M. (1999). Principles of Food Chemistry. A Chapman and Hall Food Science Book, Aspen Publ., Inc., Gaithersburg, Maryland.</p>
Supportive References	<p>Fennema, O. R. (1996). Food chemistry (3rd ed.). CRC Press. https://ipa-pasca.unpak.ac.id/pdf/Food%20Chemistry%20by%20Fennema%203rd%20Ed.pdf</p> <p>Damodaran, S., Parkin, K. L. (2017). <i>Fennema's food chemistry</i> (5th ed.). CRC Press.</p> <p>Gopalan, C., Rama Sastri, B.V., and Balasubramaniam, S.C. (1991). Nutritive value of Indian Foods. National Institute of Nutrition (NIN), Indian Council of Medical Research (ICMR), Hyderabad.</p> <p>Potter, N. M. (1995). Food Science. The AVI Publishing Co., Connecticut.</p>
Electronic Materials	<p>Graham, H. (n.d.). <i>Fermentation in food chemistry</i>. LibreTexts. From https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Fermentation_in_Food_Chemistry_(Graham)</p>





Rodriguez-Velazquez, E. (n.d.). *Chemistry of cooking*. LibreTexts. From [https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Chemistry_of_Cooking_\(Rodriguez-Velazquez\)](https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Chemistry_of_Cooking_(Rodriguez-Velazquez))

Other Learning Materials

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, laboratories
Technology equipment (projector, smart board, software)	Blackboard collaborating, data show, Smart Board, internet access
Other equipment (depending on the nature of the specialty)	laboratory equipment, kits

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, faculty, program leaders and peer reviewer	<ul style="list-style-type: none"> Continuous monitoring by directors of program and quality assurance unit (Direct)
Effectiveness of Students assessment	Students, faculty, program leaders and peer reviewer	<ul style="list-style-type: none"> Applying questionnaires received from the Deanship of Academic Development for student evaluation (Indirect) Evaluation of course report (Indirect)
Quality of learning resources	Program leaders and peer reviewer	<ul style="list-style-type: none"> Continuous monitoring by directors of program and quality assurance unit (Direct) <p>Applying questionnaires for student evaluation (Indirect)</p>
The extent to which CLOs have been achieved	Students, faculty, program leaders and peer reviewer	<ul style="list-style-type: none"> Applying questionnaires for student evaluation (Indirect) <p>Evaluation of course report (Indirect)</p>





Assessment Areas/Issues	Assessor	Assessment Methods
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190392
DATE	22/11/1446

