1	**Course title**	Food Flavours and Colours
2	**Course number**	0603926
3	**Credit hours (theory, practical)**	3 theoretical
	Contact hours (theory, practical)	3 theoretical
4	**Prerequisites/corequisites**	
5	**Program title**	PhD in Food Science and Technology
6	**Program code**	032
7	**Awarding institution**	The University of Jordan
8	**School**	Agriculture
9	**Department**	Nutrition and Food Technology
10	**Level of course**	Ph.D
11	**Year of study and semester (s)**	
12	**Final Qualification**	Ph.D
13	**Other department (s) involved in teaching the course**	
14	**Language of Instruction**	English
15	**Date of production/revision**	16/12/2020

16. Course Coordinator:

Name: Prof. Khalid Al-Ismail
Office number:
Phone number:
Email:kh.Ismail@ju.edu.jo

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

18. Course Description:

The course covers the physical and chemical characteristics of natural and synthetic food colors and flavors, as well as their isolation, concentration, and analysis. It also deals with their biosynthesis in the biological systems and the physiology of color and flavor perception, and the changes they undergo during processing and storage of foods.

19. Course aims and outcomes:

A- Aims: 1- To identify the chemical structure of food components including fats, proteins, carbohydrates and enzymes. 2. To understand the chemical changes that take place with food components during processing and storage such lipid oxidation 3. Recognize reactions and mechanisms important in food chemistry such as fat hydrogenation and carmalization of sugars B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to
A-Knowledge and Understanding A1- understand the chemical structure and properties of water, colloids, proteins, carbohydrates, lipids, enzymes and natural pigments. A2- understand the chemical reactions of the major food components during processing and storage. A3- Compare the similarities and differences in the structures of the natural pigments: anthocyanins, carotenoids, chlorophyll and heme.
B- Intellectual Analytical and Cognitive Skills B1- Explain the important chemical and physical reactions of flavor and colors that affect quality of food. B2- Distinguish between different food pigments B3- Distinguish between natural pigment and synthetic colors B4- sketch the basic structure of natural pigments and colors
C- Subject Specific Skills C1- Gain the basic principles to avoid flavor and color degradation in foods C2- Applicable for solve the problems that affect the quality of flavor and colors during processing and storage
D- Transferable Key Skills D1- Gain the basic knowledge to be applied in production of extraction, purification and identification of food flavor and colors from food D2- Suggest which specific analytical methods that are relevant for describing chemical changes of food quality

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Introduction to food flavor and color -Definition, importance and purpose of color in food -Classification of color according to source and chemical structure -Pigments in animal tissue:-Heme and myoglobin	1&2	Khalid Al-Ismail Or Malik Haddadine	A1-A3, B1	Assignment Or quiz	Fenema, O.

-Cured Meat/ Pigments Stability of Meat Packaging Considerations					
-Chlorophyll -Structure of Chlorophylls - Derivatives - Physical Characteristics . . . -Alterations of Chlorophyll. -Color Loss During Thermal Processing. - . -Technology of Color Preservation **Carotenoids.** -Structures of Carotenoids -Occurrence and Distribution -Physical Properties, Extraction, and analysis - Chemical Properties -Stability During Processing	3&4	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.
Anthocyanins and Other Phenols -Anthocyanins - Other Flavonoids - Quinoids and Xanthones - Physical Properties, Extraction, and analysis of anthocynins Chemical properties Betalains Structure -Physical Properties . - Chemical Properties	5&6	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.
Aroma Compounds -Introduction -Impact Compounds of Natural Aromas -Threshold Value - Aroma Value - Aroma Analysis Aroma Isolation Distillation Extraction Gas Extraction	7&8	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.

Volatile flavoring compounds -Nonenzymatic Reactions - Carbonyl Compounds -Alcohol -Acids -Ethers -lactones -Furans -Terenoids -Phenols - Thiols, Thioethers, Di- and Trisulfides -Thiazoles -Pyrazines	9&10& 11	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.
Nonvolatile flavoring compounds Sweet Taste Substances Bitter Taste Substances . Salty Taste Substances. Sour Taste Substances Kokumi Taste Substances and Other Flavor Modifiers Pungent Substances . Cooling Substances Astringent Substance	12&13	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.
Vegetable , fruits and spices flavors -Sulfur containing volatiles in *Allium Sp* Methoxyalkyl Pyrazine Citrus flavours Herbs and spices flavor .	14	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.

- Enzymyically derived volatiles From fatty acids -Lipoxygenase-Derived Flavors in Plants -Volatiles from β-Oxidation of Long-Chain Fatty Acids -Volatiles from branched chain amino acids -flavours from lactic acid-ethanol fermentation	15& 16	Khalid Al-Ismail Or Malik Haddadine	All A,B,C,D	Assignment Or quiz	Fenema, O.

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

- Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz…etc

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
-Mid exam	30	Colors- part of volatiles	8th	Lm-system
-Second exam	20	Volatile and nonvolatile flavor compounds		
-Assignment or quiz	10		14th	Lm-system
Final	40			At the faculty

23. Course Policies:

A- Attendance policies:

B- Absences from exams and handing in assignments on time:

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior:

E- Grading policy:

F- Available university services that support achievement in the course:
Students and instructors each have an important role in maintaining a classroom environment optimal for learning, and are expected to treat each other with respect during class, using thoughtful dialogue, and keeping disruptive behaviors to a minimum. Class discussions are interactive and diverse opinions will be shared; please be thoughtful in sharing your perspectives and responses with one another. Other behaviors that can be disruptive are chatting and whispering during class, the use of electronic equipment, preparing to leave before class is over, and consistently arriving late to class. Please keep these disruptions to a minimum. Inappropriate behavior in the classroom may result in a request to leave the class and/or subject to penalty.

24. Required equipment: (Facilities, Tools, Labs, Training….)

should have a computer, internet connection

25. References:

Required book (s), assigned reading and audio-visuals:

Text Book
1- Fenema, O. (editor) 2007. Food Chemistry 4rd ed. Marcel Dekker, New York, USA 1 Text book

Reference
1- Deman, J.M., 1999. Principle of Food Chemistry, 3rd edition, Aspen Publication Inc, Gaithersburg, Maryland, USA.

26. Additional information:

Name of Course Coordinator Prof. Khalid Al-Ismail Signature: ---------- Date: 27/12/2020

Head of curriculum committee/Department: ---------- Signature: ----------

Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- -Signature: ----------