1.- GENERAL INFORMATION

Learning Unit	Department	Format
Food Chemistry I	Chemistry	Lecture-workshop

Prerequisites (P)	Corequisites (CO)	Ascribed academy	Module
Macromolecular Chemistry	None	Industrial and Bromatological Analysis.	M4: Prevention and solution of problems in the Chemical field.

Type	Lecture hours	Practice hours	Total hours	Credits
Basic particular mandatory	41 hrs.	10 hrs.	51 hrs.	6

2.- GENERIC COMPETENCY

Students…
…identify the structure and the most important characteristics of food in terms of its reactivity, physical, and chemical properties of its inorganic and organic components in order to understand the implications of specific treatments used for its biotransformation, preservation, storage and transportation (based on its composition, nutritional value and sensorial aspect).

3.- SPECIFIC CHARACTERISTICS OF THE COMPETENCY

Knowledge	-Students… …know the role of a chemistry undergraduate in the food field. …identify the nutritional composition of food. … know the biochemistry of nutrition. … evaluate the sensory analysis of food. … know the chemistry of smells, flavors and colors in food. … identify the decomposition mechanisms of the different food nutriments.
Skills	Students …know how to classify the composition of food. … identify the decomposition mechanism of food and apply an inhibition method or adequate promoter. …implement a sensory quality control system. … design meal plans.
Aptitudes	Students… …communicate their ideas effectively. …are willing to review bibliographic information individually and as a team. …reflect argument, discover and connect knowledge and results with everyday life. …are responsible when doing research work. …apply the appropriate format for the research projects discussing the results and making conclusions based on the objective of the practices.
Values	Students …are aware of the team they belong to and its members, establish bonds, and promote communication, critical thinking, tolerance, respect and responsibility.

4.- TRANSVERSAL COMPETENCIES

☑	Foreign Language (English)
☑	Critical, analytical and synthetic thinking.
☑	Oral and written expression
☑	Professional ethics
☑	Administration of human and material resources
☑	Leadership and sustainability
☑	Creativity, innovation and entrepreneurship

5.- COURSE CONTENT OF THE LEARNING UNIT

Unit 1 Introduction to food chemistry
Unit 2 Water in food
Unit 3. Food components
Unit 4 Nutrition
Unit 5 Sensory evaluation of food.
Unit 6 Food color (colorants and pigments)
Unit 7 Flavor and smell of food

6.- ASSESSMENT

☑	Numeric grade
☐	

7.- GRADING CRITERIA OF THE LEARNING UNIT

Indicator of evaluation	Percentage
Departmental exams	30
Partial exam	40
Homework	5
Research activities	5
Practice reports	15
Class participation	5
Total	**100**

8.- REQUIRED MATERIAL (for students)	
☑	Calculator
☑	Periodic table
☑	Lab coat
☑	Textbook
☑	Workbook
☑	Safety glasses
☑	Other : Caloric value charts

9.-SPECIFIC CONTENT BY LEARNING UNITS

Content unit	Topics	Generic competency of the content unit	Class hours	Professor activities	Student activities	Bibliography
Unit 1 Introduction to Food Chemistry	**1.1.** Historical background	Students… ✓ Analyze the origins of food chemistry through the contribution of those people who sought to find impurities in food and thus helped develop an analytical methodology on the matter. ✓ Value the importance of those contributions in the development of analytical methodologies relevant to today's food chemistry.	**2h**	Professor… -Elicits through brainstorming how much students know about food chemistry and its relationship with other sciences. -Using audiovisual aids, teacher presents relevant aspects on the food chemistry field of action and asks students to write an essay on the importance of food chemistry. -Asks students to analyze the greatest moments in the historical development of food chemistry and asks students to create a timeline of the main	Students… -Participate in the brainstorming. -Create a timeline with the main historical events and characters that have made important contributions to the world of food. -Create as a group the concept of food chemistry and explain its applications using everyday life examples that involve social ecological, technical and ethical aspects. - Establish informed opinions about the importance of food chemistry in our daily lives by writing of an essay on the matter.	Fennema, O. (1993) *Química de los Alimentos.* Acribia. Chapter 1.
	1.2. Importance of food chemistry	✓ Establish informed opinions about the importance of food chemistry in our daily lives, considering the	**1h**			

		physical, legal, social, and ethical aspects of it.		contributions to the subject. - Using audiovisual aids, the teacher presents the classification criteria and characteristics of food.		
	1.3. Food classification.	✓ Know the criteria to classify food and identify them according to different characteristics.	**3h**			
COURSE EVIDENCE (Deliverables) ***Essay on the importance of food chemistry, timeline and infographic on the types of food.***						
Unit 2 Water in food	**2.1.** Physicochemical properties of water and types of water in food.	Students… ✓ Know the properties of water and understand its importance in basic and industrial processes ✓ Understand the importance of water content in food, distinguishing the differences between free and bound water as well as its relationship with the preservation/decay	**2h**	-Professor… -presents a case to exemplify the relationship of water with food decay. -Using audiovisual aids, teacher presents the types of water in food and their relationship with food preservation. -Presents the concept of hysteresis and the form	Students… -participate actively in building the knowledge concerning this topic -investigate the concept and recognize the importance of the term aw (water activity) as a food safety parameter as well as the difference between humidity and aw.	Badui, D.S. (2013). *Química de los Alimentos.* 5th. Edition. Pearson. Chapter 2. Gonzalez, M. (2011) Actividad acuosa. Available at: http://quimica.laguia2000.com/conceptos-basicos/actividad-acuosa Báez, M. (2011). *Actividad Acuosa, concepto e*

		and transformation of food.		and general use of the sorption isotherms. -Presents the map of food stability based on the water activity of a specific type of food. - Makes groups and asks students to make a conceptual map about the general concepts of	-Categorize food according to its Aw values and its decay reactions. - Create a comparative chart to distinguish the different methods to determine the water activity in food. (Individually)	*importancia.* Retrieved on July 16, 2015. Available at: http://www.catlab.com.ar/notas.php?idm=1120

	2.2. Concept of Water Activity (Aw). Intermediate moisture food.	✓ Understand the importance of water activity (aw) on the organoleptic properties of foods and as an indicator of their safety. ✓ Describe the use of sorption isotherms. ✓ Define what intermediate moisture food is and its relationship with the most important decay reactions. ✓ Categorize food according to their humidity and water activity content. (Aw) ✓ Know the basic methods to modify water activity in food.	**2**	water in food industry and water activity. -Provides students with exercises to determine water activity through mathematical models.	-Recognize the different uses and applications of water in the food industry and the effects of the different water contaminants in the processing of food. This is represented through a conceptual map that they present. -Work collaboratively to determine water activity through mathematic models and compares them to practical values.	

	1.4. Water activity and determination methods.	✓ Analyze scientific texts that present methodologies to determine water activity in food.	**1**			
	1.5. Water and food industry.	✓ Recognize the importance of water in all the sectors of the food industry. ✓ Identify the problems in the food industry caused by different contaminants in water.	**3**			
COURSE EVIDENCE (Deliverables) Map on the importance of water in the food industry and comparative chart of water activity determination methods.						
Unit 3 Food components	**3.1.** Food components: Macronutrients and Micronutrients (Proteins, lipids, carbohydrates and fibers, vitamins and minerals).	✓ Explain the importance and the characteristics of food components. ✓ Know the structure and classification of the main macronutrients and micronutrients and their functions in food.	**2**	**Professor…** -Makes groups and assigns the important topics related to food components to each team in order for them to present it to their classmates. - Reviews the topic through a practical activity.	-In teams, students analyze the properties and characteristics of the food components, explaining and providing examples of the important change aspects during the food processing and storing.	Badui, D.S. (2013). ***Química de los Alimentos.*** 5th edition. Pearson. Chapter 2. Relevant links on glycemic index: http://www.montignac.com/es/el-concepto/

	3.2. Glycemic index and load.	✓ Understand the concept and application of glycemic index as an indicator for the control of the glycemic load in the bloodstream according to its values.	**4**	-Makes groups in order to make a conceptual map on the classification of fiber. -Provides students with exercises on glycemic index and glycemic load.	-Investigate the concepts of glycemic index and glycemic load and their uses in food. - Answer some exercises about the topic. -Solve an experimental activity in order to identify the main food components and type up a written report of the results.	http://www.montignac.com/es/buscar-el-indice-glicemico-ig-de-un-alimento/

COURSE EVIDENCE (Deliverables) Presentation on nutrients, problems about glycemic indexes and loads, and practice report on nutrients.						
Unit 4 Nutrition	**4.1.** Basic concepts of nutrition.	Students… ✓ Know the difference between food, nutrient, feeding, and nutrition as well as the terms related to metabolism (anabolism and catabolism) and food digestion. ✓ Are able to list the main parts of the human digestive system – Distinguish the use of energy depending on the different food nutrients. (Rule 4/9/4).	**1**	**Professor…** -Fosters group discussion about the difference between nutrient and food, naming the characteristics of each. -Using visual aids, teacher presents the terms related to metabolism (anabolism and catabolism) as well as the main parts of the digestive system. -Fosters group discussion on eating disorders and their characteristics. -Teaches the *Escudero* Laws about eating and their current application. -Makes base groups to answer some exercises and problems about the caloric value of certain	Students… -Participate in a group discussion on the basic concepts of this topic and build definitions for these concepts in groups. -Do research on eating disorders and create a comparative chart about the different types. -Create a concept map in groups of 3 or 4 about digestion and absorption of proteins, lipids and carbohydrates, highlighting the enzymes that are involved in this process. This work is to be presented to their classmates -Answer exercises on the caloric value of food and	Fox, B., and Cameron, A. (2008). ***Ciencia de los alimentos. Nutrición y salud.*** Limusa. Chapter. I. pages. 9 -21 Chapter. II pages. 23-39, Chapter. III pages. 41-51. Potter, N. (1999) ***La Ciencia de los alimentos***. Acribia. Chapter. IV pages. 65 – 83. Food calorie tables and indicators. Available at: http://comedoresugr.tcomunica.org/docs/composicion_alimentos.pdf http://www.dietas.net/tablas-y-calculadoras/tabla-de-composicion-nutricional-de-los-alimentos/lacteos-y-
	4.2. Food related illnesses and eating laws.	✓ Give their opinion on the main reasons that provoke eating disorders in our current society. ✓ Recognize the main eating laws established by Pedro Escudero,	**1**			

		better known as "Escudero Laws" that set the bases for healthy nutrition.		foods and about indicators, basal metabolism and daily requirements. -Fosters classwork to design real diets according to the specific energy requirements. -Assigns the lab practice on enzymatic activity of some digestive enzymes.	draw conclusions on the matter in small teams. -Determine the basal metabolism rate of one of their classmates, his/her body mass index, and his/her daily energy expenditure. -Design a balanced diet according to the proposed parameters of the eatwell plate -Carry out the practice on enzymatic activity and write up a report according to the guidelines established by the teacher.	derivados/quesos/queso-azul.html http://www.dietasycalorias.com/calcular-indice-de-masa-corporal.html http://www.abcfarma.net/imb.shtml
	4.3 Energetic value of food	✓ Solves problems to obtain the caloric value of different foods.	**2**			
	4.4 Diets and BMR (Basal Metabolism Rate).	✓ Know the main types of diets according to the energetic requirements and health condition of an individual. ✓ Determine the indicators of the nutritional state of an individual and calculate the basal metabolism rate and the caloric expenditure according to their age, gender, height, physical activity and weight. ✓ Design a balanced diet based on the requirements of a specific person.	**2**			

	4.5 Digestion and nutrient absorption: the function of the digestive enzymes.	✓ Are able to explain the function of the main hormones and enzymes to break down the nutriments in food ✓ Know the main absorption mechanisms of the different food components: proteins, lipids, and carbohydrates. ✓ Use the safety regulations in the handling of substances, instruments and equipment when carrying out lab practices.	**3**			
COURSE EVIDENCE (Deliverables) Exercises on the caloric value of food and problems of basal metabolism; design of balanced diet and lab report of enzymatic activity						
Unit 5 Sensory evaluation of food	**5.1.** Sensory evaluation and food quality.	Students… ✓ Define the concept of sensory analysis	**1**	**Professor…** -Lectures. -Asks students to create concept maps on the different sensory tests and tasting panels.	**Students…** -Do research on tasting panels and tasting techniques. -Investigate the requirements to be a tasting judge.	Helen Charles. *Tecnología de alimentos* Limusa Chapter. I Pages. 11-42 Daniel L. Pedreros, Rose Marie Pangborh. *Evaluación sensorial de*
	5.2. The role of senses in sensory analysis and the quality	✓ Describe the perception of the five human senses and their role in sensory evaluation.	**2**			

	evaluation of a specific food.			-Teaches the recruiting requirements to be a taste judge. -Helps students understand the foundations of sensory tests and tasting panels and asks them to do the following practices: primary flavors Scaling, Preference ranking, taste thresholds. -Determination of quality in specific food.	-Do the practice and the research report of sensory tests and conclusions. -Read about analytical foundations.	*los alimentos. Métodos analíticos.* E. Alambra Mexicana Jean Chaude Cheftel .*Introducción a la bioquímica y tecnología de los alimentos* Vol. II .Acribia J. R. Salfield. *Manual de prácticas de ciencia de los alimentos.* Acribia
	5.3 Sight, smell, taste and touch. Primary flavors and quality rules.	✓ Define the function of flavor, smell, color and taste in the evaluation of food.	**2**			
	5.4 Sensory tests and tasting panels.	✓ Understand and execute the different sensory tests and sets up a tasting panel.	**2**			
	5.5 Selection and training of judges for sensory analysis and taste norms.	✓ Number and understand the different sensory tests there are to evaluate the quality of food.	**2**			
COURSE EVIDENCE (Deliverables) Practice report of sensory analysis						
Unit 6 Food color: dyes and pigments.	**6.1.** Natural colors in food.	✓ Are able to list the organic compounds that naturally provide color to food.	**1**	-Lectures -Presents individual topics.	-Research in the Codex about the approved food dyes.	Salvador Badui D. *Química de los Alimentos*Pearson Educativa

	6.2. Pigment classification: 1. Carotenoids 2. Chlorophyll 3. Anthocyanins 4. Flavonoids 5. Tannins 6. Betalains 7. Myoglobin 8 Hemoglobin	✓ Define the physical, chemical and structural properties of natural dyes.	**2**	-Asks students to create concept maps of the physical and chemical properties of natural dyes. -Asks students to identify meat pigments and natural food pigments.	-Research on the damages of banned food dyes.	Chapter. 7 Bearliz Grosch *Química de los Alimentos.*Acriba Helen Charley.*Química de los alimentos, procesos Químicos y Físicos en la preparación de Alimentos.* Limusa. Chapter. 27
	6.3 Natural pigments used as food dyes.	✓ Describe the decay mechanisms of pigmentation when food is subject to different manufacturing processes	**2**			
	6.4 Synthetic food dyes.	✓ Investigate the use of each of the natural dyes in the manufacture of food.	**1**			
COURSE EVIDENCE (Deliverables) Research the Codex about approved food dyes.						
Unit 7 Taste and aroma in food.	**7.1.** Concept of taste and aromas.	Students… ✓ Define the role of taste and aroma to evaluate specific food.	**1**	Professor… -Lectures	Students… -Carry out research on the mechanisms of aroma.	Salvador Badui D. *Química de los Alimentos*. Ed Pearson Educativa.

	7.2. Physicochemical aspects on taste and smell perception of food.	✓ Define physicochemical properties of natural and artificial flavors and aromas.	**1**	-Asks students to crate concept maps. -Teaches in order for students to determine the quality of specific food based on their flavor and aroma.		
	4.3 Mechanisms that generate aromas and flavors.	✓ Describe the decay mechanisms of flavor and aroma when food is subject to different manufacturing processes.	**1**			
	4.4 Precursors and development of aroma and flavor in food.	✓ Know the general precursors of aroma and flavor in fruit and vegetables.	**1**			
	4.5 Analysis of aroma and flavor compounds.	✓ Research the use of aromas and flavors in the manufacture of food.	**2**			
COURSE EVIDENCE (Deliverables) Research on the mechanisms of aroma.						

Digital support sources:

1. http://wdg.biblio.udg.mx/
2. http://www.angie-oquendo.blogspot.mx
3. http://www.cofepris.gob.mx/Paginas/Biblioteca%20Virtual/Bibliografias/Alimentos.aspx
4. http://www.gestiondelconocimientoels.org/?q=node/6
5. http://www.paho.org/panaftosa/index.php?option=com_content&view=article&id=736
6. http://www.revistavirtualpro.com/revista/algunas-operaciones-unitarias-aplicadas-a-laindustria-de-alimentos/1