University of Puerto Rico
Mayagüez Campus
College of Agricultural Sciences
Food Science and Technology Program

A. COURSE SYLLABUS

1. General Information:

Course Number:	CITA 6601
Course Title:	Food Processing I
Credit hours:	Three Credit Hours

2. Course Description:

Fundamentals and commercial practice of food preservation by heat treatment, drying, freezing, canning, irradiation, and microwaves. Topics included are selection of raw material, preparation, unit operations, packaging and storage. Processes covered will include aseptic packaging of juice and milk as well as canning of fruits and vegetables.

3. Prerequisites:

CITA6603

4. Textbook, Supplies and Other Resources:

Principles of Food Processing (1998) ISBN: 0-8342-1269-2
Dennis R. Heldman
Richard W. Hartel
Aspen Publication

Food Science. Fifth Edition. 1995
Norman N. Potter and Joseph H. Hotchkiss.

5. Purpose:

To relate students with the fundamentals of unit-step operations in food processing and their effect on the nutritional value of food

6. Course Goals:

6.1. To introduce students to the concepts of plant sanitation including contaminant sources, cleansers and sanitizing solutions.

Students should be able to:

- Differentiate between cleaning and sanitizing,
- Propose appropriate cleaning or sanitation method,
- Identify the sources of contamination, and
- Analyze the type of dirt and select the type of cleanser and sanitizing solution to use in a particular situation.

6.2. To study the most important causes and control methods of food spoilage (Post-harvest handling).

Students should be able to:

- Numerate the goals of food processing related to microbial control

Identify important nutritional components of foodstuffs
Identify potential causes of deterioration
Propose potential deterioration control methods

6.3. To understand the functionality and effect of the various unit step operations.
Students should be able to:
Describe the various ways to perform a particular unit operation
Describe the nutritional implications of food processing
Select the processing sequence of a particular good.

6.4. To identify the unit step operations required for the preparation of a given product
Students should be able to:
Design and diagram the processing sequence
Describe physical, sensory and nutritional changes at each step
Identify potential problem areas or sources.

6.5. To study new approaches of food processing (Novel or non-traditional technologies)

7. Requirements:

7.1. Class attendance.

7.2. Due to the nature of the course, exams will be cumulative. Formats and other specifics of the exams will be reviewed as needed.

7.3. A 30 minutes presentation is a requirement of the course. A written report not exceeding five pages is also required for each presentation. Specifics on the format of the presentation and written report will be given at a later time.

7.4. There will be no make-up work for unexcused absences.

8. Laboratory/Field Work:

Laboratory attendance is compulsory.

9. Department/Campus Policies:

9a. Class attendance and Behavior: Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits.

Arranging to make up work missed because of legitimate class absence is the responsibility of the student.

Proper clothing is expected. Students are expected to follow University regulations. Please turn off beepers/pagers and/or cell phones during class.

9b. Absence from examinations: If required by the supervising professor, students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed.

9c. Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays (December 7-16, 2011).

9d. Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar (November 10, 2011).

9e. Complete withdrawals: A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes (December 5, 2011).

9f. Disabilities: All the reasonable accommodations according to the Americans with Disability Act (ADA) Law will be coordinated with the Dean of Students and in accordance with the particular needs of the student.

9g. Ethics and Instructor Responsibilities: Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

It is expected for the instructor to follow all applicable regulations set forth by the University; including presenting a syllabus and returning graded work on a timely fashion. The instructor shall foster and environment of mutual respect inside and outside the classroom or laboratory**.**

10. Campus Resources:

General Library, University Computer Center and Departmental Computer Center are available to obtain professor's reference materials. The University's Counseling Office has a tutorial program for students who need extra help.

11. General Topics:

Food plant sanitation
Food Spoilage: Definitions; Causes of Food Deterioration; Deterioration Control
Ambient-Temperature Processing: Raw Material Preparation; Size Reduction; Mixing and Forming; Mechanical Separation; Fermentation and Enzyme Technology; Irradiation
Low-Temperature Processing: Chilling; Controlled Atmosphere Storage; Freezing; Freeze Drying; Freeze concentration
High-Temperature Processing: Blanching; Pasteurization; Heat Sterilization; Evaporation; Extrusion; Dehydration; Baking and Roasting; Frying; Microwave Heating; Infrared Heating
Novel technologies for food processing: High Hydrostatic Pressure; Pulse electric Field; Radiofrequency
Post-Processing Operations: Coating or Enrobing; Packaging; Filling and Sealing of Containers

B. Instructor Information Sheet

1. General Information:

Instructor:	Lynette E. Orellana, Ph.D.
Title:	Associate Professor
Office:	RA-109
Phone:	(787) 265-5410
	(787)832-4040 X-2938
Office Hours:	M 9:00-10:30 am
	J 9:00-10:30 am/ 2:00-3:30 pm
e-mail:	lynette.orellana@upr.edu

2. Instructional Strategy:

The course has a lecture format (three hours per week), but it's designed to provide a practical approach to the topic. Questions are encouraged and welcomed at any time. This includes before, during and after lectures or labs.

3. Evaluation/Grade Reporting:

Exam 1	100
Exam 2	100
Exam 3	100
Presentation	100
TOTAL	**400**

Standard curve

100-90	A
89-80	B
79-70	C
69-55	D
<55	F

12. Course Outline and Schedule:

I. Food Spoilage
- A. Introduction
  - 1. Definitions
    - a. Spoilage
    - b. Food Decay
    - c. Food Intoxication
    - d. Food Infection
  - 2. Food Processing Rationale
- B. Causes of Food Deterioration
- C. Food Microorganisms
  - 1. Bacteria
  - 2. Yeast
  - 3. Molds

- D. Insects, Parasites and Rodents
- E. Enzymes
- F. Environment
    1. Temperature
    2. Moisture
    3. Oxygen
    4. Light
    5. Time
- G. Deterioration Control
    1. Temperature
        a. Heat
        b. Cold
    2. Moisture
        a. Drying
        b. Sugar and salt
    3. Chemicals
        a. Acidity
        b. Oxygen
        c. Food additives
        d. Smoking
    4. Radiation

II. Food Plant Sanitation

- A. Introduction
    1. Definition
    2. Importance
    3. Problem Recognition
    4. Types of Clean
    5. Cleaning Considerations
        a. Contaminant to be removed
        b. Type of water available
        c. Nature of surface
        d. Cleaning and sanitizing method
    6. General Cleaning Sequence
- B. Food Contaminant Sources
    1. Soil and Dirt
    2. Water
    3. Air
    4. Personnel
    5. Rodents
    6. Insects
    7. Birds
- C. Cleansers
    1. Desirable Characteristics
    2. Properties of Cleansers
    3. Types of Cleansers
- D. Sanitizing Solutions
    1. Properties of Ideal Sanitizing Solutions
    2. Factors Affecting Efficiency
    3. Types of Sanitizing Solutions

III. Ambient-Temperature Processing

- A. Raw Material Preparation
- B. Size Reduction
- C. Mixing and Forming
- D. Mechanical Separation
- E. Fermentation and Enzyme Technology

IV. Low-Temperature Processing
- A. Chilling
- B. Controlled Atmosphere Storage
- C. Freezing
- D. Freeze Drying
- E. Freeze concentration

V. High-Temperature Processing
- A. Using Steam or water
  1. Blanching
  2. Pasteurization
  3. Heat Sterilization
  4. Evaporation
  5. Extrusion
- B. Using Hot Air
  1. Dehydration
  2. Baking and Roasting
- C. Thermal Inactivation Kinetics
  1. Thermal Death Rate, D
  2. Thermal Death Time, z
  3. F value
  4. Arhenius Equation
- D. Other
  1. Frying
  2. Microwave Heating
  3. Infrared Heating

VI. Novel technologies for food processing
- A. High Hydrostatic Pressure
- B. Pulse Electric Field
- C. Radio-frequency
- D. Irradiation

VII. Post-Processing Operations
- A. Coating or Enrobing
- B. Packaging
- C. Filling and Sealing of Containers

13. Additional References:

Principles of Food Processing. 1997
Dennis R. Heldman and Richard W. Hartel
Chapman & Hall
- The approach I like to food processing

Principles of Food Sanitation. Fourth Edition. 1999
Norman G. Marriot
Sapen Publications
- Cleaning and sanitation

Food Processing Technology: Principles and Practice. 1996
P. J. Fellows
Woodhead Publishing Limited
- Good reference on unit operations for food processing

Nutritional Evaluation of Food Processing. Second Edition. 1975
Robert S. Harris and Endel Karmas
The AVI Publishing Company, Inc.
- Nutritional effects of food processing

Physico-Chemical Aspects of Food Processing. 1995
S. T. Beckett
Blackie Academic and Professional
- Physical and chemical changes in food during processing

Minimal Processing of Foods and Process Optimization: An Interface. 1994
R. Paul Singh and Fernanda A. R. Oliveira
CRC Press
- Survey of on-the-edge research in food processing

Unit Operations for the Food Industries. 1996
Wilbur A. Gould
CTI Publications, Inc.
- Practical book on unit operations and equipment.

References are available at the University General Library on various topics related to agriculture. Students are urged to utilize them as needed. Internet services are available through the various Computer Centers in the University.

Horario clase: MJ 7:30-8:45 am

Tópico	Fecha
Introducción	Martes, 16 de agosto de 2011
Tópico I	Jueves, 18 de agosto de 2011
Tópico I	Martes, 23 de agosto de 2011
Tópico I	Jueves, 25 de agosto de 2011
Tópico II	Martes, 30 de agosto de 2011
Tópico II	Jueves, 1 de septiembre de 2011
Tópico II	Martes, 6 de septiembre de 2011
Tópico II	Jueves 8 de septiembre de 2011
Examen 1	**Martes 13 de septiembre de 2011**
NO CLASE Se reúnen clases de lunes	Jueves 15 de septiembre de 2011
NO CLASE	Martes 20 de septiembre de 2011
NO CLASE	Jueves 22 de septiembre de 2011
Tópico III	Martes 27 de septiembre de 2011
Tópico III	Jueves 29 de septiembre de 2011
Tópico III	Martes 4 de octubre de 2011
Tópico IV	Jueves 6 de octubre de 2011
NO CLASE Se reúnen clases de miércoles	Martes 11 de octubre de 2011
Tópico IV	Jueves 13 de octubre de 2011
Tópico V	Martes 18 de octubre de 2011
Tópico V	Jueves 20 de octubre de 2011
Tópico V	Martes 25 de octubre de 2011
Examen 2	**Jueves 27 de octubre de 2011**
Tópico VI	Martes 1 de noviembre de 2011
Tópico VI	Jueves 3 de noviembre de 2011
Tópico VI	Martes 8 de noviembre de 2011
Tópico VI	Jueves 10 de noviembre de 2011
Tópico VII	Martes 15 de noviembre de 2011
Tópico VII	Jueves 17 de noviembre de 2011
Tópico VII	Martes 22 de noviembre de 2011 Se reúnen clases de jueves
No clases	Jueves 24 de noviembre de 2011 Feriado Acción de Gracias
Tópico VII	Martes 29 de noviembre de 2011
Tópico VII	Jueves 1 de diciembre de 2011
Examen 3	**Martes 6 de diciembre de 2011**

- Sujeto a cambio de ser necesario

Universidad de Puerto Rico
Recinto Universitario de Mayagüez
Colegio de Ciencias Agrícolas
Programa de Ciencia y Tecnología de Alimentos

Nombre: _____
de identificación: _____

Prueba avalúo
Procesamiento de alimentos

I. ¿Qué entiendes por procesamiento de alimentos?

II. ¿Qué aspectos del alimento hay que tomar en consideración al procesar alimentos?

III. Mencione cinco operaciones unitarias

a.
b.
c.
d.
e.

IV. Pareo:

_____1. Valor D	a. º F requeridos para cambiar el valor D 90%
_____2. Valor z	b. Proceso térmico diseñado para reducir la posibilidad de de *C. botulinum* a 10^{-12}
_____3. Valor F	c. Tiempo para destruir 90% células viables a temperatura constante
_____4. 12D	d. Tiempo de proceso dado para un producto y envase particular

V. ¿Qué nuevos retos enfrentan algunos países, especialmente países en desarrollo para suplir sus abastos de alimentos y como pueden atenderse esos restos?