Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION

CHED MEMORANDUM ORDER (CMO)
No. 45
Series 2006

SUBJECT: POLICIES AND STANDARDS FOR BACHELOR OF SCIENCE IN FOOD TECHNOLOGY (BS FOOD TECHNOLOGY)

In accordance with pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the " Higher Education Act of 1994," and by virtue of Resolution No. 601 of the Commission en banc dated September 11, 2006 and for the purpose of rationalizing the undergraduate food technology education in the country with the end view of keeping at pace with the demands of global competitiveness, the following Policies and Standards (PS) are hereby adopted and promulgated by the Commission.

ARTICLE I

INTRODUCTION

Section 1. Rationale and Background

Food Technology is a discipline based on the application of science and related fields of study in the conversion of raw materials into safe, stable, palatable and nutritious foods. It includes the post-harvest handling, preparation, processing, packaging, storage and distribution of food to ensure food security and the well-being of individuals, families and communities. It includes the social, cultural, economic, managerial and environmental aspects of food systems.

The Policies and Standards (PS) for Bachelor of Science in Food Technology (BSFT) incorporate the advances in biotechnology, increasing demand of consumers for quality and safe foods and policy environments. These aim to develop and nurture competent, virtuous, productive, and well-rounded professional food technologist whose standards of practice and service shall be excellent, world-class and globally competitive.

ARTICLE II

AUTHORITY TO OPERATE

Section 2. Authority

All Private Higher Education Institutions (PHEIs) intending to offer the Bachelor of Science in Food Technology program must first secure proper authority from the Commission in accordance with existing rules and regulations. State Universities and Colleges (SUCs), Local Colleges and Universities (LCUs) should likewise strictly adhere to the provisions in these PS.

ARTICLE III

PROGRAM SPECIFICATIONS

Section 3. Degree

The degree program herein shall be called Bachelor of Science in Food Technology (BSFT).

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Section 4. Program Description

4.1 Objectives

The primary objective of the BS Food Technology program is to develop professionals in food technology. This program aims to produce professionals who have the capacity to apply the sciences and related fields of study in post-harvest handling, preparation, processing, packaging, storage, and distribution of food to ensure food security and the well-being of individuals, families and communities.

The program also aims to promote continued excellence in food science education.

4.2 Job Opportunities

Students who completed the BSFT program will be prepared for careers in different areas such as:

4.2.1 Food manufacturing and engineering, quality control/ assurance, product development, food analysis, food microbiology, marketing, distribution and sales.
4.2.2 Research, extension, instruction and training in the food industry, academic institutions, and government research institutions.
4.2.3 Agencies and Bureaus of Government, Food and Drugs (BFAD), Department of Agriculture (DA), Department of Science and Technology (DOST), Department of Trade and Industry (DTI), Department of Health (DOH), State and local health departments and other agencies.
4.2.4 Food Service Establishment
4.2.5 Academic institutions
4.2.6 Entrepreneurs/ Food Business

Section 5. Allied Programs

Food Technology is closely related to the fields of Nutrition, Agriculture, Biochemistry, Chemistry, Fisheries, Chemical Engineering, Veterinary Medicine, Pharmacy, and other allied fields.

ARTICLE IV

COMPETENCY STANDARDS

Section 6. Profile

6.1 Definition

Food Technology is the application of science and related fields of study in post-harvest handling preparation, processing, packaging, storage and

distribution of food to ensure food security and the well-being of individuals, families and communities. It includes the social, cultural, economic, managerial and environmental aspects of the food system.

6.2 Profile of Duties and Competencies of Food Technologist (See Attachment A)

ARTICLE V

CURRICULUM

Section 7. Curriculum Descriptions

The BSFT curriculum is primarily designed to provide an in-depth understanding of the sciences and the related fields of study to enable the graduates to apply such knowledge in their respective careers. This curriculum is based on the competency standards for food technology. It emphasizes the processes and techniques of identifying, analyzing problems and application of relevant technologies in the development of the food industry.

Section 8. Curriculum Outline

8.1 General Education Courses 51 Units

General education and legislated courses shall follow existing requirements. The CHED Memorandum No. 04 Series 1996 (GEC-B; 51 units) is the recommended track for the BS Food Technology program.

1. Language and Humanities 21 Units

	No. of Hours/Wk		Units
English	Lec	Lab	
a. Communications Skills I	3	0	3
b. Communications Skills II	3	0	3
Filipino			
a. Filipino I	3	0	3
b. Filipino II	3	0	3
Humanities			
a. Introduction to Humanities	3	0	3
b. Philosophy and Ethics	3	0	3
c. The Philippine Literature	3	0	3

2. Mathematics 6 Units

	No. of Hours/Wk		
Mathematics	Lec	Lab	Unit
a. College Algebra	3	0	3
b. Plane Trigonometry	3	0	3

3. Natural Sciences 9 Units

	No. of Hours/Wk		
Natural Sciences	Lec	Lab	
a. Chemistry I	2	3	3

b. Physics I	3	0	3
c. Biology	3	0	3

4. Social Sciences 12 Units

	No. of Hours/Wk		
	Lec	Lab	Units
a. Social Sciences 1*	3	0	3
b. Social Sciences 2*	3	0	3
c. Social Sciences 3*	3	0	3
d. Social Sciences 4*	3	0	3

***** May consist of subjects such as Political Science, Psychology, Anthropology, Economics, History and the like provided that the following topics are taken up in appropriate subjects: Taxation and Agrarian Reform, Philippine Constitution and Population Education.

5. Mandated Courses 3 Units

	No. of Hours/Wk		
	Lec	Lab	Units
a. Life and Works of Rizal	3	0	3

6. Other Required Courses (14 Units)

	No. of Hours/Wk		
	Lec	Lab	Units
a. NSTP	0	0	(6)
b. PE	0	0	(8)

8.2 Tool Courses 31 Units

These courses are highly related to food technology and are important in the deeper understanding of fundamental concepts of the discipline.

1. Chemistry 15 units

	No. of Hours/wk		Units
	Lec.	Lab.	
a. Quantitative Chemistry	2	3	3
b. Qualitative Chemistry	2	3	3
c. Organic Chemistry	2	3	3
d. General Biochemistry	2	3	3
e. Physical Chemistry	2	3	3

2. Mathematics 13 units

	No. of Hours/Wk		Units
	Lec	Lab.	
a. Differential Calculus	5	0	5
b. Integral Calculus	5	0	5
c. Statistics	3	0	3

3. Physics 3 units

	No. of Hours/wk	Units

	Lec	Lab.	
a. Physics II	2	3	3

8.3 Professional Courses **63 Units**

Professional courses lay down the fundamental concepts that every food technologist has to know. These are the following:

	No. of Hours/ wk		Units
	Lec.	Lab.	
a. Food Processing - 6 units			
a.1 Food Processing I	2	3	3
a.2 Food Processing II	2	3	3
a.3 Food Processing III** (Commodity Based)	2	3	3
b. Food Chemistry - 10 units			
b.1 Food Chemistry I	3	6	5
b.2 Food Chemistry II	3	6	5
c. Food Analysis	3	6	5
d. Food Microbiology			
d.1 General Microbiology I	3	6	5
d.2 Food Microbiology II	3	6	5
e. Food Packaging and Labeling	3	0	3
f. Food Laws	2	0	2
g. Food Engineering	2	3	3
h. Food Quality Assurance	2	3	3
i. Food Safety	3	0	3
j Sensory Evaluation	2	3	3
k. Environmental Management for Food Industries	3	0	3
l. Basic Business Management	3	0	3
m. Methods of Research in Food Science and Technology	3	0	3
n. Post-harvest Handling Technology	3	0	3

****** HEIs may choose any of the following:

1. Fish and Fishery Product
2. Meat and Poultry
3. Cereal and root crops
4. Fruits and Vegetables

8.4 Practicum and/or Thesis **9 units**

	No. of Hours		Units
	Lec	Lab	
a. Thesis	-	-	3
b. Practicum	-	-	6***

*** One (1) unit is equivalent to 50 practicum hours.

8.5 Electives **6 units**

8.5.1 Post-harvest Technology
8.5.2 Nutrition
8.5.3 Biotechnology
8.5.4 Business Economics
8.5.5 Chemical Engineering
8.5.6 Marine Sciences
8.5.7 Agriculture
8.5.8 Marketing / Entrepreneurship/Economics

8.6 Other Required Courses **(14 units)**

8.6.1 National Service Training Program (NSTP) (6)
8.6.2 Physical Education (PE) (8)

8.7 Summary **174 units**

General Education Courses	51
Tool Courses	31
Professional Courses	63
Thesis and Practicum	9
Electives	6
National Service Training Program (NSTP)	(6)
Physical Education (PE)	(8)
Total Units	**= 174 Units**

Section 9. Sample Program of Study (Minimum Units) –See Attachment B

ARTICLE VI

COURSE SPECIFICATIONS (See Attachment C)

ARTICLE VII

OTHER REQUIREMENTS

Section 10 Program Administration

10.1 Qualification of a Dean

- Preferably Master's degree holder in Food Technology/ Food Science or any of the disciplines for which the college offers.
- Holder of a valid certificate of registration and PRC license, where applicable.
- With at least three (3) years teaching experience and two (2) years on research and/or extension work in any of the disciplines for which the college offers.
- Full-time Dean.

10.2 Qualification of a Department Chair

- Master's degree holder in Food Technology/Food Science.
- At least three (3) years teaching experience: two (2) years on research and/or extension work, and two (2) years work experience in Food Industry
- Full-time Department Chair.

10.3 Load of Dean and Department Chair

- The Dean shall be allowed to handle a maximum teaching load equivalent to 12 hours a week.
- The Department Chair shall be allowed to handle a maximum teaching load equivalent to 18 hours a week.

Section 11. Faculty

11.1 Qualification of Faculty

At least 50% of the faculty teaching professional courses in BS Food Technology program must have a Master's degree in Food Technology/Food Science, or in any of the allied fields and a work experience of at least 2 years in academe, research or industry.

At least 50% of the faculty members teaching professional courses in the BS Food Technology program must be on a full time status.

11.2 Load

11.2.1 A faculty should not be assigned more than four (4) different courses per term.

11.2.2 In no instance should the aggregate work load of the faculty exceed 25 units including teaching equivalent for research and administrative work.

11.2.3 A faculty may be assigned an overload in accordance with the policy of the institution.

11.2.4 Teaching hours per day should not exceed 5 lecture hours.

11.3 Employment Status

At least 50% of the full-time faculty to teach the professional courses should have a permanent or regular status.

Section 12. Library

Libraries service the instructional and research needs of the staff and students making them one of the most important service units within an HEI. It is for this reason that libraries should be given special attention by HEI administrators by maintaining a wide and up-to-date collection, with qualified staff and providing communication and connectivity portals.

12. 1 Library Staff

12.1.1 Qualification of Head librarian:

1. Registered or licensed librarian;
2. Appropriate or relevant professional training;
3. At least a Master's degree in Library Science.

12.1.2 Number of Library Staff

1. One full time professional librarian for every 1,000 students
2. A ratio of 1 librarian to 2 staff/ clerks

12.2 Library Holdings

12.2.1 Five (5) book titles per professional course at a ratio of 1 volume per 15 students enrolled in the program. These titles must have been published within the last 5 years.

12.2.2 Current subscription of minimum of 2 refereed journals in food technology/food science should be available.

12.2.3 The HEI shall maintain periodicals and other non-print materials in food technology to aid the faculty and students in their academic work.

12.3 Space Requirements

The library seating capacity should be at least 10 percent of the combined total number of students and faculty.

The use of Internet and other education technologies is encouraged.

Section 13. Facilities and Equipment

13.1 Classroom requirements

The lecture room for a class of 25 students should be at least 30 square meters and 56 square meters for a class of 50 students. Classrooms must be well lighted and well ventilated. These should contain the necessary equipment and furniture such as chairs, instructor's podium, and black/white boards.

13.2 Laboratory requirements

13.2.1 Laboratory Rooms – The food technology college/department should have the following laboratory units for instruction and research activities:

- Physico-chemical Laboratory

- Microbiology Laboratory
- Sensory Evaluation Room/Laboratory
- Food Pilot Plant/Food Processing Laboratory
- Chemicals/Supplies Storage Room (optional)
- Instrument Room (optional)

13.3 Laboratory equipment

The specific equipment/instrument and glassware needed are listed in the course specifications (SEE ATTACHMENT C)

13.4 Audio-visual requirement

The school/college of food technology shall have at least one (1) of each of the following type of audio-visual equipment: 1) Overhead projectors 2) Audio-Video Player 3) Sound System 4) Television and 5) LCD Multi-Media Player

Section 14. Admission and Retention

The basic requirement for eligibility for admission of a student to food technology program shall be graduation from the secondary level recognized by the Department of Education. Higher education institutions offering food technology must specify admission, retention and residency requirements. They should ensure that all students are aware of these policies.

ARTICLE VIII

TRANSITORY, REPEALING CLAUSE AND EFFECTIVITY CLAUSE

Section 15. Transitory Clause

HEIs that have been granted permit or recognition for BS Food Technology program are hereby given three (3) years from the date of effectivity hereof to fully comply with all the requirements as stipulated in this CMO. Compliance to these requirements shall also be required to State Universities and Colleges (SUCs) and Local Colleges and Universities (LCUs). In the event that the HEI fails to comply, it is given a non-extendable period of two (2) years to comply.

Currently enrolled students in the BS Food Technology program shall be allowed to graduate under the old curriculum. However, students enrolling for the above-mentioned program beginning school year 2007-2008 shall be covered by this CMO.

Section 16. Repealing Clause

All pertinent rules and regulations or parts thereof that are inconsistent with the provisions of these policies and standards are hereby repealed or modified accordingly.

Section 17. Effectively Clause

This CMO shall be effective beginning SY 2007-2008 after publication in the Official Gazette or in a newspaper of general circulation.

All pertinent rules and regulations or parts thereof that are inconsistent with the provisions of these policies and standards are hereby repealed or modified accordingly.

Section 17. Effectively Clause

This CMO shall be effective beginning SY 2007-2008 after publication in the Official Gazette or in a newspaper of general circulation.

Pasig City, Philippines October 16, 2006.

CARLITO S. PUNO, DPA
Chairman

Attachment A

Commission on Higher Education
TECHNICAL PANEL FOR AGRICULTURE EDUCATION

DACUM Workshop
December 4-5, 2003, San Miguel Training Center, Alfonso, Cavite

PROFILE OF DUTIES AND COMPETENCIES OF FOOD TECHNOLOGIST

Definition:

Food Technology is the application of science and related fields of study in post-harvest handling, preparation, processing, packaging, storage and distribution of food to ensure food security and the well-being of individuals, families and communities. It includes the social, cultural, economic, managerial and environmental aspects of food systems.

DUTIES	COMPETENCIES					
1. Prepare communications, technical and other reports	1.1 Express ideas clearly	1.2 Apply the different forms of communication (Oral, written, non-verbal, electronic)	1.3 Prepare, analyze and evaluate reports, proposals and position papers.	1.4 Develop the ability to assess, retrieve and timely disseminate information (networking with Government Academe Industry and NGO)		
2. Practice professional work ethics	2.1 Practice the values of integrity, commitment and respect for others	2.2 Aim for excellent performance	2.3 Be a team player	2.4 Be proactive-strive for continuous professional and self improvement		

DUTIES	COMPETENCIES					
3. Comply with food laws and regulations in manufacturing and distribution of foods in the local and international markets.	3.1 Be aware of existing food laws, policies and regulations	3.2 Understand the implications of non-compliance to food laws/ legislations	3.3 Assist in the review of proposed regulations and preparation of position papers.			
4. Perform/ conduct food analysis	4.1 Understand physico-chemical properties and reactions of food components	4.2 Discuss the principles behind the analytical method	4.3 Use laboratory techniques common to basic and applied food chemistry	4.4 Utilize laboratory techniques to identify microorganisms in foods	4.5 Demonstrate proficiency in a food analysis laboratory	
5. Develop new products and improve existing ones in conformity with existing laws and regulations	5.1 Understand the chemical properties and reactions of various food components	5.2 Apply knowledge of food chemistry to control reactions in foods	5.3 Select appropriate techniques when presented with practical problems	5.4 Identify pathogens and spoilage microorganisms in foods.	5.5 Identify conditions for growth of pathogens and spoilage microorganism and their corresponding control	5.6 Understand principles in food preservation
	5.7 Apply food preservation methods and techniques to make a quality and safe food products.	5.8 Identify the source and variability of raw food material and their impact on food processing operations.	5.9 Know the mechanisms of spoilage and/ or deterioration's of foods and their control	5.10 Understand the properties and uses of various packaging materials	5.11 Apply the principles of food science in real world situation and problems	5.12 Apply statistical principles to food product development

DUTIES	COMPETENCIES					
	5.13 Apply the basic principles of sensory evaluation	5.14 Estimate product cost				
6. Implement and conduct research, development and extension	6.1 Identify the problem and the appropriate analytical technique.	6.2 Design an experimental methodology for research and development	6.3 Data collection and evaluation	6.4 Apply statistical principles to food science applications	6.5 Analysis and interpretation	6.6 Reporting and disseminatio n to end user
7. Implement quality management systems (Food Safety, Laboratory management, quality requirements, quality audit)	7.1 Explain the chemistry underlying the properties and reactions of various food component	7.2 Explain and demonstrate the principles behind analytical techniques (microbiological and physico-chemical) associated with food	7.3 Design and conduct sensory evaluation	7.4 Apply the principles of food science to assure safety and quality of food products (GMP, SSOP,GLP HACCP, ISO)	7.5 Apply statistical principles to QMS	7.6 Design and manage food analysis laboratory
	7.7 Recommend appropriate post-harvest handling techniques in relation to quality of processed foods					

DUTIES	COMPETENCIES					
8. Assist in waste management for environmental safety	8.1 Explain the principle involved in waste minimization (clean production), recycling, treatment and disposal	8.2 Recognize rules and regulations to maintain a wholesome environment	8.3 Be aware of the environmental impact and hazards of the operations			
9. Recommend specification for equipment and instruments	9.1 Understand the basic engineering principles in food processing (mass and energy balance, thermodynamics, fluid flow, heat and mass transfer)	9.2 Explain the principles of food processing technologies	9.3 Discuss the properties and uses of various packaging systems			
10. Supervise food processing operations	10.1 Apply principles of food processing	10.2 Know process flow	10.3 Supervise the implementation GMP, HACCP, SSOP	10.4 Assess human resource requirement	10.5 Prepare and implement production and preventive maintenance plan	10.6 Calculate material balance to have inventory control 10.7

DUTIES	COMPETENCIES					
	10.7 Understand basic operating principles of production equipment					
11. Assist/establish/ manage food business	11.1 Comprehend basic food processing principles	11.2 Prepares SWOT analysis and implement business plans	11.3 Understand feasibility study report	11.4 Supervise personnel effectively	11.5 Keep abreast with emerging market trends	

Attachment B

Sample Program of Study

The program study herein is only an example. HEIs may use this sample and modify it according to its needs. They may also add other preferred courses.

First Year

First Semester	Lecture Hrs.	Lab. Hrs.	Units
Communication Skills I	3	0	3
Sining pakipagtalastasan	3	0	3
College Algebra	3	0	3
Social Sciences*	3	0	3
Chemistry 1	2	3	3
Philosophy and Ethics	3	0	3
Biology	3	0	3
P.E 1	(2)		(2)
ROTC	(3)		(1.5)
Total			24.5

Second Semester	Lecture Hrs.	Lab. Hrs.	Units
Physics I	2	3	3
Organic Chemistry	2	3	3
Statistics	3	0	3
Communication Skills II	3	0	3
Filipino II (Poklorokong Pilipino)	3	0	3
Plane Trigonometry	3	0	3
Social Sciences*	3	0	3
P.E 2	(2)		(2)
ROTC	(3)		(1.5)
Total			24.5

Second Year

First Semester	Lecture Hrs.	Lab. Hrs.	Units
Qualitative Chemistry	2	3	3
Differential Calculus	5	0	5
Physics II	2	3	3
General Microbiology I	3	6	5
Social Sciences*	3	0	3
Introduction to Humanities	3	0	3
P.E 3	(2)		(2)
ROTC	(3)		(1.5)
Total			25.5

Second Semester	Lecture Hrs.	Lab. Hrs.	Units
Integral Calculus	5	0	5
Quantitative Chemistry	2	3	3
General Biochemistry	2	3	3
Food Microbiology II	3	6	5
Social Sciences*	3	0	3
The Philippine Literature	3	0	3
P.E 4	(2)		(2)
ROTC	(3)		(1.5)
Total			25.5

Third Year

First Semester	Lecture Hrs.	Lab. Hrs.	Units
Physical Chemistry	2	3	3
Food Chemistry I	3	6	5
Food Processing I	2	3	3
Post Harvest Handling Technology	3	0	3
Sensory Evaluation	2	3	3
Life and Works of Rizal	3	0	3
Total			20

Second Semester	Lecture Hrs.	Lab. Hrs.	Units
Food Engineering	2	3	3
Food Analysis	3	6	5
Food Chemistry II	3	6	5
Food Processing II	2	3	3
Elective 1**	3	0	3
Food Packaging and Labeling	3	0	3
Total			22

Fourth Year

First Semester	Lecture Hrs.	Lab. Hrs.	Units
Methods of Research in Food Science and Technology	3	0	3
Environmental Management for Food Industries	3	0	3
Food Safety	3	0	3
Basic Business Management	3	0	3
Elective 2**	3	0	3
Food Quality Assurance	2	3	3
Food Processing III**	2	3	3
Total			21

Second Semester	Lecture Hrs.	Lab. Hrs.	Units
Food Laws	2	0	2
Thesis	-	-	3
Practicum****	-	-	6
Total			11

* May Consist of subjects such as Political Science, Psychology, Anthropology, Economics, History and the like provided that the following topics are taken up in appropriate subjects: Taxation and Agrarian Reform, Philippine Constitution and Population Education.

** HEIs may choose any of the following:

1. Post-harvest Technology
2. Nutrition
3. Biotechnology
4. Business Economics
5. Chemical Engineering
6. Marine Sciences
7. Agriculture
8. Marketing / Entrepreneurship/Economics

*** HEIs may choose any of the following:

1. Fish and Fishery Product
2. Meat and Poultry
3. Cereal and root crops
4. Fruits and Vegetables

******** One (1) unit is equivalent to 50 practicum hours.

ATTACHEMENT C

ARTICLE VI

COURSE SPECIFICATIONS

COURSE NAME	FOOD PROCESSING 1
COURSE DESCRIPTION	Principles of food preservation, sterilization of food by heat treatment and packaging of heat sterilized food, [irradiation, use of food additives and] other non-thermal methods of processing such as irradiation and use of food additives
OBJECTIVES	Lecture 1. To study the general principles of food preservation and their application 2. To establish adequate thermal process requirements for different types of food products by: A. Determination of heat resistance characteristics of a reference organism or a biological entity; and B. Characterization of the heat transfer properties of the food and its container. 3. To evaluate the adequacy of the heat process applied through Microbiological, physico-chemical, sensory and nutritional analyses of the finished product. 4. To study the principles involved in the processing of food by non thermal processes such as food irradiation, use of food additives, and other non-thermal processing methods. Laboratory 1. To gain hands-on experience in the bench scale production of thermally processed foods using metal and glass containers and restorable pouches. 2. To evaluate the adequacy, safety as well as sensory qualities of the thermally processed food products by process calculations of (F value determination) and cut-out tests.
UNITS FOR LECTURE AND LABORATORY	3 units (2 units lecture, 1 unit laboratory)
CONTACT HOURS PER WEEK	5 hours (2 hrs. lecture, 3 hrs. laboratory)
PREREQUSITE	Food Microbiology
LECTURE TOPICS	I. Introduction Some historical background, review of basic Principles in food microbiology II General Principles of Food Preservation 1. Prevention or delay of microbial decomposition. 2. Prevention or delay of self-decomposition 3. Prevention of damage due to insects, pest Animals and other external forces. III. Different Methods of Food Preservation 1. Asepsis, removal of microorganisms, anaerobiosis, packaging. 2. Use of low temperature: refrigeration and Freezing. 3. Use of heat 4. Drying and dehydration 5. Concentration process 6. Use of high sugar and high acids 7. Modification of environmental conditions-controlled atmosphere storage, etc. 8. Fermentation 9. Use of food additives 10. Ionizing radiation 11. Non-thermal processes irradiation and use food additives 12. [Minimal processing] IV. Packaging of Heat Processed Foods 1. Rigid containers –metal, glass jars and bottles. 2. Flexible packages

	3. Other packaging materials – retort pouches, aseptic package. V. Sterilization by heat treatment 1. Thermal processing as a food preservation method. 2. Establishment of thermal process a. Effects of heat on microorganisms ▪ Thermal resistance characteristics of spoilage / significant microorganisms or other pathogens. ▪ Measurement of heat resistance in terms of D and Z values. ▪ Factors affecting heat resistance of microorganism. b. Heat transfer characteristics of the food being heated and its container. c. Other factors/considerations in the establishment of the thermal process. 3. Evaluation of the thermal process VI. Microbiology of thermally processed foods 1. Principal spoilage organisms – effect of pH 2. Organisms of public health significance VII. Nutritional Aspects of Processed Foods 1. Nutrients affected by processing in general 2. Nutrients affected by thermal processing and storage a. effect of poor exhaust, i.e. oxygen or low vacuum b. defective tin coating and other metallic elements c. heat and light VIII. Recent advances/new developments in thermal processing. IX. Non Thermal Processes 1. ionizing radiation 2. food additives
LABORATORY TOPICS	A. Activities 1. Laboratory Exercise No. 1: Vacuum in Canned Foods 2. Laboratory Exercise No. 2: Measurement of Can Seams 3. Laboratory Exercise No.3: Heat Penetration Studies of Starch Solutions 4. Bench Scale Production: Product I 5. Bench Scale Production: Product 2 6. BencH Scale Production: Product 3 7. lot Scale Production: Product 4 8. Submission of production reports 1 to 4
EQUIPMENT	Can Line Equipment 1. Pressure Caner Report 2. Mechanical Can Sealer 3. Water Bath For Pasteurization 4. Weighing Scale 5. Heat Penetration Set Up Cut Out Testing 1. Vacuum Gauge 2. Seam Micro Meter 3. Ph Meter 4. Incubators 5. Auto Clave 6. Set Of Glass Wares 7. Analytical Balance 8. Water Activity Meter 9. Blender
TEXTBOOKS AND REFERENCES	Foreign Baumgartner, J.G., and A.C. Herson. 1963. Canned Foods, An Introduction to their Microbiology. D. Van Nostrand Princeton, N.Y Desrosier, H., 1963 & 1970. The Technology of Food Preservation. AVI Pub. Co. Atlas, Ronald. 1984. Microbiology Fundamentals and Applications. MacMillan Pub. Co. N.Y. Davies, R. G.G. Birch and K.J. Parker (eds) Intermediate Moisture Foods, Applied Science Fennema, O.R. W.D Pourie and E.A. Marth 1973, Low temperature of Foods and Living Matter. Marcel-Deklker. N.Y. Heldman, Dennis R. and R.W. Hartel. 1997, Principles of Food Processing. Chapman and

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COURSE NAME	FOOD PROCESSING II
COURSE DESCRIPTION	Fermentation, drying and dehydration, refrigeration and freezing and other new and emerging food processing methods.
OBJECTIVES	General Objective: At the end of the semester the student must be able to understand the [fundamental] principles [in post-harvest physiology and handling], fermentation, drying and dehydration, refrigeration and freezing and other new and emerging food processing methods. Lecture: 1. State the principles and methods used in post harvest technology. 2. Explain the chemical and physiological changes in plant and animal tissues used as raw materials in relation to finished product quality. 3. Discuss the principles of fermentation, drying and dehydration, refrigeration and freezing and other new and emerging food processing methods. 4. Discuss recent advances in food processing with the local setting. Laboratory: 1. Discuss the different pre treatment required by each processing method 2. Describe the maturity indices and maturation process of fruits and vegetables; 3. Evaluate methods of pre-treatments used in processing foods and; 4. Apply the fundamental principles of processing food production utilizing indigenous raw materials and ingredients.
UNITS FOR LECTURE AND LABORATORY	3 units (2 units lecture, 1 unit laboratory)
CONTACT HOURS PER WEEK	5 hours per week (2 hours lecture, 3 hours laboratory)
PREREQUSITE	Food Processing I
LECTURE TOPICS	1. Basic concepts and principles of food processing a. Fermentation • Ethanoic, acetic and lactic acid fermentation 2. Drying and dehydration a. General methods b. Types of dryers c. Factors affecting drying rate d. Use of Psychrometric charts e. Sugar concentration f. Salting, curing, smoking 3. Refrigeration and Freezing a. General principles b. Changes in food during freezing c. Methods of freezing 4. New and emerging methods of food processing a. Microwave b. Hydrostatic pressure c. Electrical resistance d. High voltage e. Pulse technology f. Ultrasound g. Ozonation h. Minimal processing i. Hurdle technology
LABORATORY TOPICS	1. Course Orientation Survey of local post harvest, handling and storage of fruits and vegetables (preparation of survey tool and conduct of actual survey) 2. Handling of fruits and vegetables Maturity indices of fruits 3. Pre-treatment methods 4. Fermentation 5. Oral presentation of outputs 6. Drying and dehydration 7. High sugar preservation 8. Salting, curing and smoking
EQUIPMENT	1. Fermentation a. Fermentation Tank b. Thermometer c. Ph Meter d. Glass Wares

	e. Refractometer 2. Smoking a. Drum For Smoking 3. Drying a. Oven Dryer/Solar Dryer b. Glass Wares Moisture Meter c. Refractometer d. Salinometer e. Thermometer
TEXTBOOKS AND REFERENCES	Bautista OK. 1990. Postharvest technology for southeast asian perishable crops. Technology and livelihood Resource Center, UP Los Baños. Carpio EV. 2000. Engineering for food technologists. UPLB Publishing Center, UP Los Banos college, Laguna Fellows P. 1988. Food processing technology, priciples and practices. Ellis Horwood Limited. West Sussex, England. Fennema OR. 1975. Principles of food science part II: physical principles of food preservation Marcel Dekker. Inc., New York and Bassel Heldman DR and HArtel RW. 1997. Principle of food . processing. Chapman and Hall N.Y. Kader KA. 1992. Post harvest technology of horticultural crops. University of California, Division of Agriculture and Natural Resources, Oakland, California Oliveira FAR and Hotchkiss JH. 1995. Food Science. 5th ed. Chapman and Hall N.Y. Qiason SN and Ang JO. 1994 Indigenous fermentations theory and practice. Phoenix Publishing House, Inc. Quezon City Vieira ER. 1996. Elementary food science. Chapman and Hall USA Wiley RC. 1994 Minimally processed refrigerated fruits and vegetables. Chapman and Hall Inc. USA

COURSE NAME	Food Chemistry I
COURSE DESCRIPTION	Basic chemical composition, structure and properties of foods and the chemistry of changes occurring during food preparation, processing, storage and utilization.
OBJECTIVES	At the end of the semester, the student should have developed a deeper understanding of the properties and behavior of food macromolecules during post-harvest handling, preparation, processing, storage and distribution. Specific: Upon completion of the course, the student should be able to: 1. relate food chemistry with the other areas of food science and technology; 2. describe the role played by food chemistry in food science and technology, and discuss its role in the promotion of the welfare of the individual, the family and the society; 3. discuss the properties and behavior of the macromolecules in food under varied conditions; 4. describe the major chemical reactions occurring in food during processing and storage; 5. discuss the effects of various methods and conditions of processing on major food components, and on the quality and storage properties of foods; 6. explain the role of each macromolecule in the manufacture and storage of foods; 7. relate properties and behavior of the macromolecules with sensory and nutritional attributes of foods; and 8. assess the impact of recent advances in food chemistry on the family, the society and the local food industry.
UNITS FOR LECTURE AND LABORATORY	5 units (3 units lecture, 2 units laboratory)
CONTACT HOURS PER WEEK	9 hours (3 hours lecture, 6 hours laboratory)
PREREQUSITE	Biochemistry
LECTURE TOPICS	1. Introduction a. Course Objectives b. Course Requirements c. Overview of the course d. Grading system e. Relation of food chemistry with other areas in food science and technology f. Review of basic biochemical concepts 2. Water in Foods a. The water molecule: physical and chemical properties b. Forms of water in foods c. Functions of water in food processing d. Effects of hardness of water in food processing e. Water activity f. Water sorption phenomenon • Significance of water sorption properties • Construction of the water sorption isotherm • Zones of the water sorption isotherm • Sorption isotherm and food stability • Factors affecting the water sorption isotherm • Hysteresis and its implication 3. Carbohydrates a. Structure and classification of carbohydrates b. Occurrence and functions of carbohydrates in foods c. Properties of selected carbohydrates • Sugars • Starches • Pentosans and Hemicelluloses • Celluloses • Pectic substances • Gums • Algal polysaccharides • Chitin d. Modification of carbohydrates e. Changes in carbohydrates on processing and storage

	• Hydrolysis • Acyclic reactions • Dehydration • Thermal degradation • Caramelization 4. First Lecture Examination 5. Lipids in foods a. Fatty acids and glycerides b. Structure and classification of lipids c. Occurrence and functions of lipids in foods d. Physical and chemical properties of lipids 6. Lipid processing and technology a. Extraction and refinement b. Hydrogenation c. Interesterification d. Lipid tailoring 7. Lipolysis/Degradation reactions of lipids a. Hydrolysis b. Autooxidation c. Thermal decomposition d. Radiolysis 8. Lipid decomposition and functional and nutritive properties of food 9. Emulsions, emulsifiers and stabilizers 10. Proteins in Foods a. Composition, structure and classification of amino acids and • Proteins b. Structure-function relationship c. Occurrence and functions of proteins on foods d. Denaturation • Physical and chemical agents • Effects of protein denaturation e. Functional Properties of proteins • Hydration / Solubility • Emulsifying properties • Foaming properties • Flavor binding • Viscosity • Gelation / Texturization • Dough formation f. Protein Modification g. Enzymes in Foods • Nomenclature and classification of enzymes • Specificity, Catalysis and Regulation • Enzyme kinetics and reactions • Factors affecting enzyme activity ❖ Temperature ❖ PH ❖ Water activity ❖ Electrolytes/Ionic strength h. Control of enzyme action i. Applications of enzymes in food processing
LABORATORY TOPICS	Expt. No. Activity/Experiment Topic 1. Water 2. Carbohydrates 3. Lipids 4. Proteins and Enzymes
EQUIPMENT	1. analytical balance 2. beam/top-loading balance 3. blender 4. burner 5. centrifuge 6. colorimeter

	7. desiccators 8. differential scanning calorimeter 9. dryer, convection 10. extruder 11. flavor library 12. freezer 13. frequency generator 14. gas stove 15. gel meter 16. glassware 17. hot plate 18. incubators 19. metal trays 20. microscope 21. Munsell book of color 22. nephelometer 23. pH meter 24. proximity equilibrium cells 25. refrigerator 26. spectrophotometer 27. titration apparatus 28. thermometer 29. vacuum oven 30. viscosimeter 31. water activity meter 32. water bath 33. water distilling unit 34. water containers, 10-gal capacity
TEXTBOOKS AND REFERENCES	Alais C and G Linden. 1991. Food Biochemistry. New York: Ellis Horwood Allen JC and RJ Hamilton (ed.) 1983. Rancidity in Foods. London: Applied Science Publishers Ltd. Arroyo-Staub PT. 1982. The Science of Philippine Foods. 2nd rev.ed. Quezon City, Phil.: Abaniko Press Aurand LW. 1973. Food Chemistry. Westport, Connecticut: AVI Pub. Co., Inc. Baianu IC. (ed.) 1992. Physical Chemistry of Food Processes (Vol.1): Fundamental Aspects. New York: Van Nostrand Reinhold Banks W and CT Greenwood. 1975. Starch and Its Components. New York: John Wiley and Sons Belitz HD and W Grosch. 1999. Food Chemistry. 2nd ed. New York: Springer Bender DA. 1992. Nutritional Biochemistry of the Vitamins. Cambridge: Cambridge University Press Bennion M. 1990. The Science of Food. New York: John Wiley and Sons Birch GG and MG Lindley. 1986. Interaction of Food Components. Essex, England: Elsevier Applied Science Publishers, Ltd. Bowers J. 1992. Food Theory and Application. New York. MacMillan Publishing Company. Brauerman JB. 1963. Introduction to Biochemistry of Foods. Amsterdam: Elsevier Applied Science Publishers Charley H. 1982. Food Science. New York: John Wiley and Sons Chow CK (ed.) 1992. Fatty Acids in Foods and their Health Implications. New York: Marcel Dekker, Inc. Coultate TP. 1989. Food: The Chemistry of its Components. 2nd ed. London: Royal Society of Chemistry. Davidek J, J Velisek and J Pokorny (eds). 1990. Chemical Changes During Food Processing. Aricenlim: Czechoslovak Medical Press. deMan JM. 1990. Principles of Food Biochemistry. 2nd ed. Westport, Conn.: AVI Publishing Co., Inc.

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COURSE NAME	Food Chemistry II
COURSE DESCRIPTION	Secondary components of food, their structure and properties, and the chemistry of changes occurring during preparation, processing, storage and utilization.
OBJECTIVES	General: At the end of the semester, the student should have developed a deeper understanding of the properties and behavior of the minor food components during post-harvest handling, preparation, processing, storage and distribution. Specific: Upon completion of the course, the student should be able to: 1. discuss the properties and behavior of the secondary components of food under varied conditions; 2. describe the chemical reactions involving secondary food components during processing and storage; 3. discuss the effects of various methods and conditions of processing on secondary food components, and on the quality and storage properties of foods; 4. explain the role of various additives in the manufacture and storage of foods; 5. relate the properties and behavior of secondary components with the sensory and nutritional attributes of foods; 6. identify and characterize the various toxicants in food; and 7. assess the impact of recent advances in food chemistry on the family, the society and the local food industry.
UNITS FOR LECTURE AND LABORATORY	5 units (3 units lecture, 2 units lab)
CONTACT HOURS PER WEEK	9 hours (3 hours lecture, 6 hours lab.)
PREREQUSITE	Food Chemistry I
LECTURE TOPICS	1. Introduction a. Course Objectives b. Course Requirements c. Overview of the course d. Grading system 2. Water in Foods 3. Browning reactions in Foods a. Enzymatic browning b. Non- enzymatic browning ▪ Maillard reaction ▪ Caramelization or active aldehyde theory ▪ Ascorbic acid theory c. Control of browning reactions 4. Pigments in Foods a. Structure, classification and properties b. Changes during processing and storage c. Control of pigment changes 5. Flavor and aromatic compounds in Foods a. Structure and properties of compounds responsible for tastes and aroma b. Theories on taste perception c. Theories on odor perception d. Control of flavor and aroma in processed foods e. Flavor enhancers f. Non-sugar sweeteners 6. Vitamins in Foods a. Classification, structure and properties b. Changes on processing and storage c. Fortification, enrichment, restoration d. Optimization of vitamin retention 7. Minerals in Foods a. Classification, structure and properties b. Changes on processing and storage c. Fortification, enrichment, restoration d. Optimization of mineral retention

	8. Natural Antioxidants a. Antioxidant compounds b. Modes of action c. Preservation of functionality 9. Additives and Toxicants a. Additives: classification and functions/effects ▪ For sensory property improvement ▪ For shelf-life extension ▪ For processing enhancement ▪ For nutritive quality improvement ▪ For special dietary requirements b. Toxicants ▪ Inherent ▪ Unintentional/ contaminants ▪ Developed during processing
LABORATORY TOPICS	1. Pigments 2. Non-enzymic Browning Reactions 3. Flavors 4. Vitamins and Minerals 5. Natural Antioxidants 6. Food Additives
EQUIPMENT	1. analytical balance 2. beam/top-loading balance 3. blender 4. burner 5. centrifuge 6. colorimeter 7. desiccators 8. differential scanning calorimeter 9. dryer, convection 10. extruder 11. flavor library 12. freezer 13. frequency generator 14. gas stove 15. gel meter 16. glassware 17. hot plate 18. incubators 19. metal trays 20. microscope 21. Munsell book of color 22. nephelometer 23. pH meter 24. proximity equilibrium cells 25. refrigerator 26. spectrophotometer 27. titration apparatus 28. thermometer 29. vacuum oven 30. viscosimeter 31. water activity meter 32. water bath 33. water distilling unit 34. water containers, 10-gal capacity
TEXTBOOKS AND REFERENCES	References: Alais C and G Linden. 1991. Food Biochemistry. New York: Ellis Horwood Aurand LW. 1973. Food Chemistry. Westport, Connecticut: AVI Pub. Co., Inc. Baianu IC. (ed.) 1992. Physical Chemistry of Food Processes (Vol.1): Fundamental

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COURSE NAME	Food Analysis
COURSE DESCRIPTION	Principles, methods and techniques necessary for qualitative and quantitative physical and chemical analysis of food and food products
OBJECTIVES	To develop a deep understanding of the principles, methods and techniques necessary for physical and chemical analysis of food products, ingredients, and other food constituents At the end of the course, the student should be able to: 1. State and explain the theories and principles involved in the various methods of food analysis; 2. Select sampling methods and analytical techniques suitable for different food matrices and components; 3. Exhibit practical proficiency in food analysis; 4. Process and analyze data; and 5. Become aware of the recent advances in food analysis
NO OF UNITS	5 units (3units lecture and 2 units laboratory)
NO. OF CONTACT HOURS PER WEEK	9 hours (3 hours lecture, 6 hours laboratory)
PREREQUSITE	Food Chemistry and Quantitative Chemistry
LECTURE TOPICS	1. Introduction a. Course objectives and requirements ▪ Definition of food analysis ▪ The role of food analysis in food ▪ science and technology 2. Sampling a. Definition and importance b. Types of sample c. Sampling methods and techniques for different food types 3. Errors in Food Analysis a. Types of errors b. Sources of errors c. Error control 4. Assessment of Analytical Methods and Data a. Requirements and choice of analytical methods b. Processing and presentation of data c. Statistical analysis and interpretation of results 5. Theories and Principles of Techniques Used in Food Analysis a. Gravimetry b. Titrimetry c. Solvent Extraction d. Refractometry e. Spectrophotometry f. Polarimetry 6. Proximate Analysis – Principles, applications and limitations of the different methods used in: a. Moisture b. Crude Fat c. Carbohydrate ▪ Available Carbohydrate ▪ Total Dietary Fiber ❖ Soluble Fiber ❖ Insoluble Fiber d. Crude Protein e. Ash 7. Instrumental Methods – Principles, applications and limitations a. Spectroscopic methods ▪ Infrared ▪ Fluorimetry ▪ Flame/Atomic absorption ▪ Nuclear magnetic resonance b. Chromatography ▪ Thin layer ▪ Liquid ▪ Gas c. Mass spectroscopy d. Electrophoresis e. X-ray diffraction

	f. Immunochemical methods
LABORATORY TOPICS	1. Proximate Analysis Exercise 1: Moisture Exercise 2: Crude Fat Exercise 3: Crude Fiber Exercise 4: Proteins Exercise 5: Total Available Carbohydrate Exercise 6: Ash 2. Physical Properties Exercise 7: Water Activity Exercise 8: Colors and Pigments Exercise 9: Titratable Acidity 3. Specific Components Exercise 10: Sugars Exercise 11: Alcohol Exercise 12: Sulfite Exercise 13: Caffein Exercise 14: Ascorbic Acid Exercise 15: Iron Exercise 16: Calcium Exercise 17: NaCl Exercise 18: Nitrite 4. Indicators of Deteriorative Changes Exercise 19: Free Fatty Acids Exercise 20: Peroxide Value Exercise 21: Trimethylamine Exercise 22: Total Volatile Nitrogen
EQUIPMENT	for a class of 20 composed of 5 groups analytical balance 1 babcock fat extraction set up 6 sets beam/top-loading balance 2 blender 5 burner 5 centrifuge 1 circulating water pump 2 colorimeter 1 consistometer 1 desiccators 10 digestion apparatus for protein analysis 1 (8-placer) distillation apparatus (Dean and Stark) 2 distillation apparatus (ordinary) 5 fat extraction apparatus 1 (6-placer) freezer 1 fume hood 2 furnace 1 gas stove 5 hot plate with stirrer 5 hydrometers (different types) 5 per type hygrometer 2 infrared moisture balance 2 nitrogen distillation apparatus 1 Munsell book of color 1 oven, air/convection 2 oven, microwave 1 oven, vacuum 1 pH meter 2 pycnometer 5 refrigerated centrifuge 1 refrigerator (10 cu ft) 1 shaking water bath 1 spectrophotometer 1 titration apparatus 5 sets thermometer 5 vacuum pump 2

	viscosimeter (Brookefield)	1
	water activity meter	2 sets
	water bath with thermostat	1
	water distilling unit	1
	Glassware and other laboratory materials (for a class of 20 composed of 5 groups)	
	aspirator	10
	beaker, 50-ml	15
	beaker, 100-ml	10
	beaker, 250-ml	10
	beaker, 500-ml	10
	beaker, 1-liter	10
	beaker (tall-type) 800-ml 15	
	burette, acid	5
	burette, base	5
	burette, amber, 50-ml	5
	clamps	25
	clay triangle	5
	conical flask, 250-ml	10
	conical flask, 500-ml	10
	conical flask, 1-liter	5
	conical flask, 2-liter	2
	centrifuge tub	10
	crucible, glass	15
	crucible, porcelain	30
	cuvettes (matched)	8
	digestion tube (for protein determination)	8
	filter paper, ordinary	10 sheets
	filter paper, (Whatman No. 41)	1 box
	filtering stand	5
	funnel (ordinary)	5
	funnel (Buchner)	5
	graduated cylinder, 10-ml	5
	graduated cylinder, 50-ml	5
	graduated cylinder, 100-ml	10
	graduated cylinder, 250-ml	10
	graduated cylinder, 500-ml	5
	graduated cylinder, 1-liter	5
	ignition tube	5
	iron stand	5
	mortar and pestle	5
	pipettes, measuring, 1-ml	25
	pipettes, measuring, 2-ml	15
	pipettes, measuring, 5-ml	15
	pipettes, measuring, 10-ml	10
	pipettes, measuring, 25-ml	10
	pipettes, Pasteur	1 box of 100
	reagent bottle, clear, 250-ml	20
	reagent bottle, clear, 500-ml	20
	reagent bottle, clear, 1-liter	10
	reagent bottle, amber, 250-ml	20
	reagent bottles, amber, 500-ml	20
	reagent bottles, amber, 1-liter	10
	separatory funnel	5
	Soxhlet flask	15
	spatula	10
	stirring rod	25
	test tube, 18x 150 mm	50
	test tube holder	5 racks
	tongs, 12-inch	10
	tongs, 30-inch	1
	tripod	5
	volumetric flask, clear, 50-ml	10
	volumetric flask, clear, 100-ml	25
	volumetric flask, amber, 100-ml	10
	volumetric flask, clear, 250-ml	10
	volumetric flask, amber, 250-ml	10

	volumetric flask, clear, 500-ml	10
	volumetric flask, amber, 500-ml	5
	volumetric flask, clear,1-liter	5
	volumetric flask, amber, 1-liter	2
	volumetric flask, clear, 2-liter	2
	volumetric flask, amber, 2-liter	2
	wash bottle	10
	wire gauze	10
	water containers, 10-gal capacity	2
Textbooks And References	AOAC Aurand, Woods and Wells De Levie Egan, Kirk and Sawyer Ewing James Joslyn Kirk Linden Macleod Multon Nielsen Nollet	

COURSE NAME	General Microbiology
COURSE DESCRIPTION	Fundamental principles in microbiology, classification, characterization, properties and identification of microorganisms, cultural and staining techniques; parasites
OBJECTIVES	At the end of the course, the student should be able to: a. Describe the morphological, cultural and biochemical characteristics of microorganisms leading to their classification; b. Describe and perform methods of isolating and quantifying microorganisms; c. Describe the microbial metabolic processes; d. Identify methods in controlling harmful microorganisms; e. Characterize the distinguishing features of parasites and their life cycles; and f. Discuss recent issues and developments in food microbiology
UNITS FOR LECTURE AND LABORATORY	5 units (3 hours lecture, 2 hours lab)
CONTACT HOURS PER WEEK	9 hours per week (3 hours lecture, 6 hours laboratory)
PREREQUSITE	
LECTURE TOPICS	1. Introduction 2. Classification of microorganisms 3. Microscopy and staining techniques 4. Morphology and fine structures- bacteria, fungi, viruses, multicellular parasites 5. Microbial growth and reproduction 6. Isolation and enumeration methods 7. Microbial metabolism – enzymes, catabolism, anabolism 8. Food borne diseases 9. Control methods – physical, chemical, chemotherapeutic, food preservatives 10. Recent developments in food microbiology
LABORATORY TOPICS	1. Microscopy – parts and function, cell measurement 2. Staining procedures – simple, differential, structural 3. Cultural characteristics 4. Biochemical tests 5. Preparation of culture media – general, selective/differential, enrichment 6. Factors affecting microbial growth – intrinsic and extrinsic 7. Enumeration of microorganisms – pour plate, spread plate, swab method, direct microscopic count, membrane filter, MPN, recent developments 8. Water microbiology 9. Control of microorganisms – physical, chemical, chemotherapeutic, food preservative 10. Isolation techniques for specific food microorganisms
EQUIPMENT	1. Microscope (10-100x magnification) 2. Incubators (37C, 45C, 55C) 3. Refrigerator 4. Blender/Stomacher 5. Pressure canner/autoclave 6. Prepared slides 7. Glasswares (petri dishes, tubes, flasks, pipettes) 8. Triple beam balance/top loading balance 9. Inoculating loops/needles, bent glass rods 10. Gas stove/oven 11. Water bath 12. Colony counters 13. Membrane filtration set-up 14. Anaerobic jars 15. Thermometers 16. Hemocytometer 17. Bunsen burner 18. Ocular/Stage Micrometer
TEXTBOOKS AND REFERENCES	AOAC, Official Methods of Analysis. 2003. AOAC International, Washington DC. ASIAN FOOD and INFORMATION CENTER, 2003. Preventing food- borne illness from farm to plate in Food Facts Asia. July issue. P.O BOX 140 Phrankanong, Bangkok, Thailand. BEUCHAT, L.R. 1987. Food and beverage mycology, 2nd Ed. An AVIL Book. Van Nostrand

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FAO AND WHO OF THE UNITED NATIONS. 2001. Risk assessment of microbiological hazards in foods (Compylobacter spp) in broiler chickens and Vibrio spp in seafood. Report of a joint FAO/WHO expert consultation. WHO Headquarters, Geneva, Switzerland. July 23-27, 2001. 45 p.
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FRAZIER, W. AND WESTHOFF, 1988. Food Microbiology 4th ed. McGraw-Hill Co. New York, USA. 539 p.
FREIFELDER, D. 1987. Molecular Biology. Jones and Barlett Publishers, Inc. Boston, MA.
GUTHIE, R.K. 1972. Food Sanitation. AVI Publishing Co., Inc. Westpoint, CN. 247 p.
HARRIGAN, W.F. 1998. Laboratory Methods in Food and Dairy Microbiology. 3rd ed. Academic Press. London, UK. 531 p.
JOUVE, J.L., STRINGER, M.F and BAIRD-PARKER, A. C. 1998. Food Safety Management Tools. International Life Sciences Institute (ILSI) Europe. Avenue E. Mournier 83, Box 6, B-1200 Brussel, Belgium. 19 p.
KISS, I (ed.) 1984. Testing methods in food microbiology. Elsevier, Amsterdam. 447 p.
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ROBERTS, T.A. PITT, J.I., FARKAS, J. and GRAU (eds) 1998. Microorganism in foods. 6. Microbial ecology of food commodities. ICMSF. Blackie Academic and Professional. London, UK. 615 p.
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VANDERZANT. C. and D.F SPLITTSTOESSER (eds). 1992. Compendium of methods for the microbiological examination of foods. 3rd ed. American Public Health Association (APHA) Washington, D.C. 1219 p.

COURSE NAME	Food Microbiology
COURSE DESCRIPTION	Microbial flora of food as affected by processing/ preservation techniques with special attention to beneficial groups of microorganisms, pathogenic, and spoilage microorganisms.
OBJECTIVES	At the end of the course, the student should be able to: 1. Identify and utilize beneficial microorganisms in food processing; Identify key pathogenic and spoilage microorganisms in food; • Interpret the role of intrinsic and extrinsic parameters of food that influence the growth and survival of microorganisms; • Predict the impact of food processing/preservation on microbial control ; and • Use appropriate laboratory techniques in the microbial examination of foods
UNITS FOR LECTURE AND LABORATORY	5 units (3 units lecture, 2 units laboratory)
CONTACT HOURS PER WEEK	9 hours per week (3 hours lecture, 6 hours laboratory)
PREREQUSITE	General Microbiology
LECTURE TOPICS	Course Outline (Lecture) 1. Introduction 2. Microorganisms important in food microbiology (bacteria, fungi, viruses) 3. Intrinsic and extrinsic factors affecting microbial growth and survival in food 4. Microbial control through food processing/preservation procedures (kinetics of microbial inactivation, physical preservation, chemical preservation) 5. Beneficial food microorganisms (spontaneous and controlled fermentation systems, physiology and biochemistry, products of food fermentation) 6. Food spoilage causing microorganisms 7. Food borne disease causing microorganisms (traditional and emerging, microbial toxins, other agents) 8. Foods from microorganisms
LABORATORY TOPICS	Course Outline (Laboratory) 1. Microbial examination of meat and meat products 2. Microbial examination of poultry and egg products 3. Microbial examination of marine products 4. Microbial examination of fruits and vegetables 5. Microbial examination of cereals and grains 6. Microbial examination of spices and condiments 7. Microbial examination of milk and dairy products 8. Microbial examination of oils and seeds 9. Microbial examination of fermented products 10. Microbial examination of thermally processed products 11. Fermentation experiment (alcoholic, acetic, lactic)
EQUIPMENT	1. Microscope (10-100x magnification) 2. Incubators (37C, 45C, 55C) 3. Refrigerator 4. Blender/Stomacher 5. Pressure canner/autoclave 6. Glasswares (petri dishes, tubes, flasks, pipettes) 7. Triple beam balance/top loading balance 8. Inoculating loops/needles 9. Gas stove/oven 10. Water bath 11. Colony counters 12. Anaerobic jars 13. Thermometers 14. Vacuum gauge 15. Bacteriological can opener 16. Bunsen burner 17. Isolation room

TEXTBOOKS AND REFERENCES	AOAC, Official Methods of Analysis. 2003. AOAC International, Washington DC. ASIAN FOOD and INFORMATION CENTER, 2003. Preventing food- borne illness from farm to plate in Food Facts Asia. July issue. P.O BOX 140 Phrankanong, Bangkok, Thailand. BEUCHAT, L.R. 1987. Food and beverage mycology, 2nd Ed. An AVIL Book. Van Nostrand Reinhold, New York, USA. 661 p. FAO AND WHO OF THE UNITED NATIONS. 1999. Risk assessment of microbiological hazards in foods. Report of a joint FAO/WHO Expert Consultation, Geneva, Switzerland. March 15-19, 1999. 24 p. FAO AND WHO OF THE UNITED NATIONS. 2001. Risk assessment of microbiological hazards in foods (Compylobacter spp) in broiler chickens and Vibrio spp in seafood. Report of a joint FAO/WHO expert consultation. WHO Headquarters, Geneva, Switzerland. July 23-27, 2001. 45 p. FAO AND WHO OF THE UNITED NATIONS. 2003. Risk management strategies for Vibrio spp in seafood. Discussion on paper of the joint FAO/WHO Food Standards Porgram, Codex Committee on Food Hygiene. 35th session. Orlando, FL, USA. Jan. 27-Feb. 1, 2003. 29 p. FRAZIER, W. AND WESTHOFF, 1988. Food Microbiology 4th ed. McGraw-Hill Co. New York, USA. 539 p. FREIFELDER, D. 1987. Molecular Biology. Jones and Barlett Publishers, Inc. Boston, MA. GUTHIE, R.K. 1972. Food Sanitation. AVI Publishing Co., Inc. Westpoint, CN. 247 p. HARRIGAN, W.F. 1998. Laboratory Methods in Food and Dairy Microbiology. 3rd ed. Academic Press. London, UK. 531 p. JOUVE, J.L., STRINGER, M.F and BAIRD-PARKER, A. C. 1998. Food Safety Management Tools. International Life Sciences Institute (ILSI) Europe. Avenue E. Mournier 83, Box 6, B-1200 Brussel, Belgium. 19 p. KISS, I (ed.) 1984. Testing methods in food microbiology. Elsevier, Amsterdam. 447 p. MACFADDIN, J.F. 1980. Biochemical tests for identification of medical bacteria. Williams and Wilkins, Baltimore, ME. 527 p OLDI, R.W. and S.B. PRIMROSE. 1989. Principles of gene manipulation. 4th ed. Blackwell Scientific Publications. Oxford, London. 438 p. ROBERTS, T.A BAIRD PARKER. A.C., and R.B. TOMPKIN (eds.) 1996. Microorganisms in foods. Microbiological specifications of food pathogens ICMSF. Blackie Academic and Professional. London, UK. 513 p. ROBERTS, T.A. PITT, J.I., FARKAS, J. and GRAU (eds) 1998. Microorganism in foods. 6. Microbial ecology of food commodities. ICMSF. Blackie Academic and Professional. London, UK. 615 p. ROSS, T. and SUMMER J. 2002. A simple, spread- sheet based, food safety management tools. International Life Sciences Institute (ILSI) Europe. Avenue E. Mournier 83, Box 6, B-1200 Brussels, Belgium. 19 p. TOMPKIN, R.B. ROBERTS, T.A., VAN SCHOTHORST, M. COLE, M.B., GRAUL, L., BUCHANAN, R.L. and S. DAHMS. 2002. Microorganism in foods. 7. Microbiological testing in food safety management. ICMSF. Kluwer Academic Plenum Publishers. New York, USA. 362 p. USFDA 2003. Bacteriological analytical manual. AOAC, Int'l. Washington, DC. VANDERZANT. C. and D.F SPLITTSTOESSER (eds). 1992. Compendium of methods for the microbiological examination of foods. 3rd ed. American Public Health Association (APHA) Washington, D.C. 1219 p.

COURSE NAME	Food Packaging And Labeling
COURSE DESCRIPTION	Principles and methods of food packaging and labeling; evaluation of properties of packaging and labeling materials.
OBJECTIVES	Lecture 1. To relate the importance of food packaging in the preservation marketing and distribution of foods; 2. To identify various types of packaging materials suitable to specific type of food product 3. To study methods used in evaluating of packaging materials; 4. Safety in food packaging and labeling materials 5. To discuss current issues in food packaging and labeling. Laboratory 1. To assess the suitability of materials existing food packaging and label; 2. To evaluate the physico-chemical properties of food packaging materials; 3. To calculate the information required for labeling
UNITS FOR LECTURE AND LABORATORY	3 units (3 units lecture)
CONTACT HOURS PER WEEK	3 hours per week (3 hours lecture)
PREREQUSITE	Food Processing II
LECTURE TOPICS	1. Introduction to Food Packaging a. History b. Definitions, Classification c. Importance, Functions and Requirements 2. Packaging as a Marketing Tool 3. Food Packaging Materials 4. Product-Package Interaction a. Modes of Food Deterioration b. Product-Package Performance c. Shelf-life Testing 5. Packaging consideration for Specific Food Products 6. Environmental and safety concerns of packaging materials a. Disposal b. Migration of toxic components 7. Labeling Requirements a. Philippines and Asia b. USA c. Japan d. Europe 8. Recent issues and Trends in Food Packaging and labeling a. Modified Atmosphere b. Packaging c. Controlled Atmosphere d. Packaging e. Aseptic Packaging f. Edible Packaging g. Intelligent Packaging h. Others
SPECIAL PROJECTS	1. Exercise 1: Characteristics And Functions Of Food Packaging 2. Exercise 2: Food Packaging As A Marketing Tool 3. Exercise 3: Evaluation Of Properties Of Various Packaging Materials: a. Bottles – Visual, Capacity, Thermal Shock b. Paper – Moisture Content, Grammage c. Plastic – Physical: Film Thickness, Density, Ignition, Melt ability 4. Copper Wire Tests - Transmission/Permeation: Water Vapor, Odor, Flavor And Oil Permeability, Others 5. Exercise 4: Nutrition Labeling 6. Exercise 5: Food Product Label Evaluation

EQUIPMENT	1. Caliper 2. Humidity Chamber 3. Water Bath 4. Desiccators 5. Oven For Moisture Determination 6. Top Loading Balance 7. Fume Hood
TEXTBOOKS AND REFERENCES	Athalye AS. 1992. Plastics in Packaging. Tata McGraw-Hill Pub. Co. Ltd., New Delhi Blanchfield RJ (ed) 2000. Food Labelling. Woodhead Pub. Ltd. Cambridge, England Farber JM and Doods KL (eds) 1995. Principles of Modified-Atmosphere and Sous Vide Product Packaging. Technomic Pub. Co. Inc., Pennsylvania, USA Fellows P. 1988. Food Processing Technology Principles and Practices. Ellis Horwood Limited. West Sussex, England Gray JI, Harte BR and Miltz J. 1987. Food Product-Package Compatibility. Technomic Publishing Co. Inc. Pennsylvania, USA Hirsch A. 1991. Flexible Food Packaging, Questions and Answers. Van Nostrand Reinhold NY Jenkins WA and Harrington JP. 1991. Packaging Foods with Plastics. Technomic Pub. Co. Inc., Pennylvania USA Labuza TP 1982. Shelf-life Dating of Foods. Food and Nutrition press, Inc, Connecticut, USA Larousse J and Brown BE. 1997. Food canning technology. Wiley-VCH, Inc. Man CMD and Jones AA (eds) 1999. Shelf-life Evaluation of foods. Aspen Pub., Inc. Maryland, USA Osborn KR and Jenkins WA. 1992. Plastic Films. Technomic Pub. Co. Inc. Pennsylvania, USA Potter NN and Hotchkiss JH. 1995. Food Science 5th ed. Chapman and Hall NY Rooney ML. 1995. Active Food Packaging. Blackie Academic and professional, NZ Sullivan DM and Carpenter DE 1993. Methods of Analysis for Nutrition Labeling. AOAC International, Virginia USA

COURSE NAME	Food Laws
COURSE DESCRIPTION	Awareness of and compliance to food laws and regulations in manufacturing and distribution of foods in the local and international markets
OBJECTIVES	At the end of the course the students must be able to: 1. Acquire knowledge on the different local and international food laws on manufacturing and distribution 2. Comply with local and international food laws on manufacturing and distribution 3. Interpret provisions of the local and international food laws
UNITS FOR LECTURE AND LABORATORY	2 units lecture
CONTACT HOURS PER WEEK	2 hrs per week (2 hours lecture)
PREREQUISITE	Food Processing, Quality Assurance and Food Safety
LECTURE TOPICS	1. Introduction a. History b. Rationale 2. National Regulations a. Consumer Act b. Food Labeling c. Nutrition Labeling d. Food Fortification Act e. ASIN Law f. Food Sanitation Law g. And others 3. International Regulations a. CODEX b. HALAL /Kosher Mark c. Technical Barrier Trade (TBT), WTO, GATT 4. Major Trading Partners' Regulations a. Import/Export 5. Licensing Requirements a. LTO b. Product Registration 6. Incentives and Benefits to the Food Industry a. SULONG program (micro financing) b. Investment Priority Plan (IPP) of BOI 7. Formulation of Policies and Guidelines
TEXTBOOKS AND REFERENCES	Literature on: 1. BFAD Regulations (R.A., A.O., M.C. and D.O.) 2. CODEX 3. HALAL / KOSHER MARK 4. Import/Export Requirements 5. Other Regulation Publications

COURSE NAME	Food Engineering
COURSE DESCRIPTION	Engineering concepts and principles as applied to food processing.
OBJECTIVES	1. To study basic principles of engineering as applied unit operations/process 2. To analyze and solve material and energy balances for each unit operations/processes. 3. Apply the mechanical energy balance to different types of fluid systems. 4. To understand the mechanisms and be able to solve problems related to heat transfer
UNITS FOR LECTURE AND LABORATORY	3 units (2 unit lecture, 1 unit laboratory)
CONTACT HOURS PER WEEK	5 hours per week (2 hrs. lecture, 3 hrs. laboratory)
PREREQUSITE	Calculus, Physics, Food Processing I And II
LECTURE TOPICS	1. Introduction a. Definition of a unit operation and a unit process; b. Dimensions and units of measurement 2. Material Balance a. Law of conservation of Mass b. Material balance for batch system c. Material balance for continuous systems. d. Application to food processing operation 3. Energy Balance a. Concept of work, heat and energy b. Law of conservation of energy c. Total energy balance d. Application to food processing operations 4. Flow of Fluids a. Fluid at rest: measurement of static pressure b. Flow behavior of Newtonian and non-newtonian fluids, apparent viscosity, measurement of viscosity. c. Measurement of viscosity d. Laminar and turbulent flow e. Mechanical energy balance ▪ Definition of terms: potential energy, kinetic energy, pressure energy. ▪ Determination of friction loss ▪ Application of the mechanical energy balance e.g. calculation of required pump horsepower. f. Measurement of fluid pressure and velocity g. Pumps and fans 5. Heat Transfer a. Steady heat transfer ▪ conduction ▪ convection ▪ radiation b. Applications
LABORATORY TOPICS	1. Demonstrate the application of energy balance such as drying or dehydration 2. Energy balance 3. Fluid flow 4. Heat transfer in canning
EQUIPMENT	1. Fermentation a. Fermentation Tank b. Thermometer c. Ph Meter d. Glass Wares e. Refractometer f. Smoking 2. Drum for smoking 3. Drying a. Oven Dryer/Solar Dryer b. Glass Wares Moisture Meter c. Refractometer d. Salinometer e. Thermometer
TEXTBOOKS AND REFERENCES	Singh P. and Heldman D. 1993. Introduction to Food Engineering. 2nd ed. Acad. Press 499p. Batty C and Folkman S. 1983. Food Engr. Fundamentals John Wiley and Sons

	Toledo Romeo 1991. Fund of Food Process Eng. 2nd ed. Van Nostrand Reinhold. New York Brennan JG et al. 1990. Food Engr. Operation Elsevier Applied Sci. London. 700pp. Heldman D.R. 1975. Food Process Eng. AVI Westport Connecticut. 401p Carpio E.V. 2000 Engineering for Food Technologists. UPLB 316p

COURSE NAME	Sensory Evaluation of Foods
COURSE DESCRIPTION	Principles and techniques in sensory evaluation; statistical analysis and interpretation of sensory evaluation data; and their relations to physico-chemical tests
OBJECTIVES	At the end of the course the students must be able: 1. Appreciate the history, importance and uses of sensory evaluation 2. Apply appropriate sensory evaluation techniques in market research, product development, and quality control 3. Utilize proper statistical techniques in the design of sensory tests, analysis and interpretation of the results 4. Correlate sensory data with results of physico-chemical tests 5. Become familiar with recent trends in sensory evaluation
UNITS FOR LECTURE AND LABORATORY	3 units (2 units lecture, 1 unit laboratory)
CONTACT HOURS PER WEEK	5 hours per week (2 hours lecture, 3 hours laboratory)
PREREQUISITE	Basic Statistics
LECTURE TOPICS	1. Introduction a. Definition b. History c. Importance and Applications 2. Senses and Sensory Attributes a. Appearance b. Kinesthetics c. Flavor and Odor 3. Requirements and Factors Affecting Sensory Evaluation a. Physiological b. Psychological c. Physical and Environmental 4. Scaling/Scoring Techniques a. Line b. Category c. Magnitude estimation 5. Discriminative/Difference Tests a. Paired Comparison b. Triangle c. Duo-Trio d. Statistical Analysis and Interpretation 6. Descriptive e. Flavor Profile f. Texture Profile g. QDA h. Sensory Spectrum i. Generic Descriptive Analysis j. Free Choice Profiling k. Statistical Analysis and Interpretation 7. Consumer Tests 8. Correlation of Sensory and Physico-chemical Data 9. Sensory Evaluation in Research and Development and Quality Control 10. Recent Trends in Sensory Evaluation
LABORATORY TOPICS	1. Recognition tests 2. Planning and designing sensory evaluation tests 3. Scaling methods 4. Discrimination tests 5. Descriptive tests 6. Consumer tests 7. Correlating sensory and physico-chemical data
EQUIPMENT	1. Sensory booths (stationary or movable) 2. Sensory utensils (disposable or non-disposable) 3. Kitchen equipment (refrigerator, freezer, microwave, oven, etc) 4. Taste/flavor and odor references 5. Statistical software (e.g. Excel, SAS) 6. Titrable acidity set-up, pH meter, refractometer, viscometer, colorimeter/Munsell book of colors, NaCl set-up/salinometer

TEXTBOOKS AND REFERENCES	▪ Carpenter, RP, Lyon, DH and Hasdell, TA. 2000. Guidelines for Sensory Analysis in Food Product Development and Quality Control 2nd ed. Aspen Publishers, Inc. Gaithersburg, Maryland. ▪ Gathchalian, MM. 1989. Sensory Evaluation Methods. College of Home Economics UP Diliman ▪ Jellinek, G. 1985. Sensory Evaluation of Food. Ellis Hortwood. England ▪ Lawless, HT and Heymann, H. 1999. Sensory Evaluation of Food. Aspen Publishers, Gaithersburg, Maryland. ▪ Meilgaard, MD, Civille, GV, Carr, BT. 1987. Sensory Evaluation Techniques. CRC Press, Florida ▪ Moskowitz, H. 1988. Applied Sensory Analysis of Foods. Vols. I and II. CRC Press, Florida. ▪ Resurreccion, AVA. 1998. Consumer Sensory Testing for Product Development. Aspen Publishers, Inc. Gaithersburg, Maryland ▪ Any books on statistics ▪ Food science journals such as Journal of Food Science

COURSE NAME	Methods of Research in Food Science and Technology
COURSE DESCRIPTION	Application of research principles & methodologies in the field of food science & technologies ▪ Expected output is an undergraduate proposal
OBJECTIVES:	On completion of the course the student will be able to: ▪ Apply the various application of research principles & methodologies in the field of FST.
SPECIFIC OBJECTIVES	On completion of the course the student will be able to: 1. Explain the concept of research as applied to food science & technology. 2. Describe the steps in research problem identification 3. Conceptualize a problem 4. Select an appropriate research methodology for the identified problem 5. Prepare & present a research proposal
UNITS FOR LECTURE & LABORATORY	3 units (3 units lecture)
CONTACT HOURS PER WEEK	3 hours per week (3 hours lecture)
PRE-REQUISITE	Elementary Statistics and food processing
COURSE OUTLINE	1. Concept of Research a. Objectives and requirements b. Definition c. Types 2. Selecting research problems 3. Tools of research a. Gathering of information and use of library and other resources 4. Planning the research project (design, data collection and analysis) 5. Research methodology a. Writing the proposal 6. Preparation of research report 7. Presentation of completed research proposal 8. Laboratory work of selected phase of the research proposal 9. Write up of special problem reports
TEXTBOOKS AND REFERENCES:	Patton, Michael Quinn. Qualitative Research and Evaluation Methods, 3rd ed. Thousand Oaks, CA : Sage Pub.,2002 Finkelstein, Ellen. How to Do Everything with Powerpoint New McGraw-Hill/Osborne, 2003 Lawrence Helen, ed. Academic Research on the Internet: Options for Scholars and Libraries. New York: The Haworth Information Press, 2000. Lester, James D. Writing Research Papers: A Complete Guide, 6th ed. USA: Scott Foresman & Comp., 1990 Meriwether, Nell W. 12 Easy Steps to Successful Research Papers. Illinois, USA: National Textbook Comp.,1997 Spencer, Carolyn M. and B. Arbon. Foundations of Writing: Developing Research and Academic Writing Skills. Illinois, USA: National Textbook Comp., 1996 Turabian, Kate L. a Manual for Writers of Term papers, Thesis and Dissertations, 6th ed. Chicago & London: The University of Chicago Press, 1996.

COURSE NAME	**Food Safety**
COURSE DESCRIPTION	Essentials of food safety.
OBJECTIVES	At the end of the course, the students should be able to: 1. Identify food safety issues as related to preparation, handling, processing, and distribution of food; and 2. Explain and discuss the concepts and methods used to control and maintain the quality and safety of foods.
UNITS FOR LECTURE AND LABORATORY	3 units (3 units lecture)
CONTACT HOURS PER WEEK	3 hours lecture per week
PREREQUSITE	Food Microbiology, Food Processing
LECTURE TOPICS	1. Introduction to Food Safety a. Rational – Importance of food safety in the supply chain b. Definitions – food safety management, hazards and risks c. Review of general issues and concerns on food safety d. Information resources in food safety 2. Food contaminants a. Types of contaminants-biological, microbiological, physical, chemical, radiological contaminants b. Prevention of contamination 3. Food borne illness a. Factors affecting food borne-illness outbreaks b. Types of food poisoning ▪ food infection ▪ food intoxication c. Sources of food borne poisoning microorganisms d. High risk foods e. Detection of food borne pathogens 4. Chemical contaminants a. Pesticides b. Heavy Metals (lead and mercury) c. Natural toxins d. Other chemical contaminants (e.g acrylamide, PCB) 5. Key Food Safety Programs a. Good Manufacturing Practices (GMP) – Key areas of GMP b. Hazard Analysis and Critical Control Point (HACCP) on rationale, principles, conduct of HACCP studies, implementation, validation and verification 6. Food Safety Management a. Key food safety concerns b. Steps in safety management 7. Food Safety Laws Rules and Regulations a. R.A 3720 – Food Drug and Cosmetics Code b. Administrative Order 206 – GMP c. BFAD AO 153 – Series 2004 – Revised Guideline on Current GMP d. International Regulations on Food Safety ▪ Non-tariff trade barriers ▪ Codex Alimentarius 8. Current Issues in Food Safety
TEXTBOOKS AND REFERENCES	AOAC, Official Methods of Analysis. 2003. AOAC International, Washington DC. ASIAN FOOD and INFORMATION CENTER, 2003. Preventing food- borne illness from farm to plate in Food Facts Asia. July issue. P.O BOX 140 Phrankanong, Bangkok, Thailand. BEUCHAT, L.R. 1987. Food and beverage mycology, 2nd Ed. An AVIL Book. Van Nostrand Reinhold, New York, USA. 661 p. FAO AND WHO OF THE UNITED NATIONS. 1999. Risk assessment of microbiological hazards in foods. Report of a joint FAO/WHO Expert Consultation, Geneva, Switzerland. March 15-19, 1999. 24 p. FAO AND WHO OF THE UNITED NATIONS. 2001. Risk assessment of microbiological hazards in foods (Compylobacter spp) in broiler chickens and Vibrio spp in

seafood. Report of a joint FAO/WHO expert consultation. WHO Headquarters, Geneva, Switzerland. July 23-27, 2001. 45 p.
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COURSE NAME	Food Quality Assurance
COURSE DESCRIPTION	Concepts, principles and methods of quality assurance in relation to food standards and regulations
OBJECTIVES	At the end of the course the students must be able to: 1. Explain the concepts and principles of quality assurance in relation to food standards and regulations 2. Implement quality assurance methods in food processing operations 3. Develop/improve quality assurance systems in the food industry 4. Enhance quality assurance practices through application of statistical quality control (SQC) 5. Formulate and review TQM and ISO programs
UNITS FOR LECTURE AND LABORATORY	3 units (2 units lecture, 1 unit laboratory)
CONTACT HOURS PER WEEK	5 hrs per week (2 hours lecture, 3 hours laboratory)
PREREQUISITE	Food Processing, Basic Statistics
LECTURE TOPICS	1. Introduction a. Definition b. Concepts c. Importance and Applications 2. Quality Control Cycle 3. Stages in Quality Awareness a. Quality Awareness b. Quality Control 4. Statistical Quality Control a. 7 Basic Tools (e.g. Ishikawa and Pareto Analysis) b. Control Charts c. Acceptance sampling (raw material, in-process and finished product) 5. Standards and Specifications 6. Defects and Defective Units 7. Production Control and Evolutionary Operations 8. Inventory Control 9. Logistics (transportation management and problems)
LABORATORY TOPICS	Laboratory exercises covering: ▪ Sampling plans ▪ Case studies on problems related to quality assurance ▪ Raw material, in-process and finished product inspection and evaluation ▪ Development of quality specifications ▪ Development of quality manual
EQUIPMENT	Statistical software (e.g. Excel, SAS, Statistical) Food analysis equipment
TEXTBOOKS AND REFERENCES	▪ ITC, UNCTAD/GATT.1991. Quality Control for the Food Industry: An Introductory Handbook, Geneva, Switzerland ▪ Multon, J. 1996. Quality Control for Foods and Agricultural Products. New York: Wiley-VCH ▪ Any book on Statistics ▪ Food Science Journals

COURSE NAME	Environmental Management for Food Industries
COURSE DESCRIPTION	An introduction of an integrated strategy for the prevention, treatment and disposal of food processing of wastes.
OBJECTIVES	On completion of the course, the student will be able to: 1. Develop an expanded view of environmental protection and sustainable development concept 2. Identify applicable environmental laws and regulations applicable for food industry (EIS System, RA 8749, RA 9003, RA 9275, RA 6969) and determine how their business will be affected by specific environmental regulations 3. Recognize current global environmental issues for food industries (Environmental Management System, Green Consumerism, Eco labeling) 4. Determine types of waste and design possible waste minimization or cleaner production options
UNITS (LECTURE)	3 units (3 units lecture)
CONTACT HOURS/WEEK	3 hours per week (3 hours lecture)
PREREQUISITE	Food Processing, Food Chemistry, Food Engineering, GMP & Sanitation, QC/QA
COURSE OUTLINE	1. Introduction to the course a. The state of the Philippine environment b. The sustainable development concept c. Environmental laws and regulations d. Current and emerging environmental issues e. Waste minimization techniques 2. The state of the water quality a. Effluent standards (BOD, FOG, COD, Fecal Coliform) b. RA 9275 (Clean water act) c. National Environmental Users' Fee 3. Solid waste problem in urban areas a. RA 9003 (Ecological solid waste management act) b. The state of air quality c. RA 8749 (Clean air act) d. RA 6969 (Hazardous Waste and Toxic Substances Act **4.** Concept of sustainable development **a.** Definition of aspects and impacts 5. Examples of aspects and impacts a. Mitigation of negative impacts b. Enhancement of positive impacts 6. The International Standards Org. 9000 a. The Environmental Management System 7. Green consumerism a. Eco-labelling 8. Food waste characteristics a. Food waste treatment and disposal options 9. Waste minimization or Cleaner production concept a. Generation of cleaner production options 10. Calculation of economic and environmental benefits a. Case studies of CP options for food processing industry 11. Development of Environmental Management Plan
TEXTBOOKS AND REFERENCES	1) Food Industry and the Environment: Practical Issues and Cost Implications – Edited by J.M. Dalzell 2) Food Processing Waste Management – Green Kramer 3) Chemistry Fundamentals: An Environmental Perspectives 2nd ed. Sudbury 4) CP Assessment Manual -IPCT-DOST 5) Phil. Environmental Quality Report – EMB-DENR 6) RA 9003 7) RA 8749 8) RA 6969 9) RA 9275 10) Phil EIS System, NEUF, Effluent Standards 11) ISO 9000 Quality Systems; Applications in Food Technology John Wiley & Sons 2001

COURSE NAME	Basic Business Management
COURSE DESCRIPTION	This deals with the fundamentals of business organizations and management. The theories and principles of organization and management, as well as their application in business and industry are thoroughly discussed. The functions of management and the different types of organizational structures with their strengths and weaknesses from part of the course coverage. The course covers the benefits derived from entrepreneurship and importance of social responsibility as another goal of business.
OBJECTIVES	On completion of the course, the student will be able to: 1. define management and the role it plays in development; 2. differentiate the various types, tasks, skills and responsibilities of managers; 3. explain the theories and practices of entrepreneurship; 4. discuss the relationship of the firm to its environment; 5. compare the various forms of business organization in the Philippine business scenario; 6. relate the various roles of a manager as they apply to management process 7. develop a business plan
NO. OF UNITS	3 Units (3 units lecture)
CONTACT HOURS/ WEEK	3 hours per week (3 hours lecture)
PREREQUISITE	Food Engineering; Food Processing; Food Laws; Environmental Management in Food Industries
COURSE OUTLINE	1. INTRODUCTION a. Managers & Development b. Origins of Contemporary Management c. The Firm & Its Environment d. Forms of Business Organizations in the Philippines 2. THE MANAGEMENT PROCESS a. Planning ❖ Issues in Planning b. Organizing ❖ Issues in Organizing c. Staffing ❖ Issues in Staffing d. Directing ❖ Issues in Directing e. Theories in Leadership f. Control ❖ Control Tools & Technique ❖ Issues in Control 3. BUSINESS MANAGEMENT FUNCTIONS ❖ The Management Process and the Business Management Functions ❖ Developing a business plan
REFERENCE	RODRIGUES, RAFAEL A. and ERLINDA S. ECHEMIO. 1997. Fundamentals of Management: Text and Philippine Cases 3rd Edition Diwata Publishing, Inc. Metro Manila. ROBBINS, S.P. and CENSO, D.A. 2nd edition., 1998. Fundamentals of Management. LUSSIER, R.N. 1997. Management (Concepts, Applications, Skills Development. ZULUETA, DE LARA, and NEBRES, 1999. Management Theory and Practice, Academic Publishing. PUTA, GUTIERREZ and GARCIA, 6th edition.1995. Business Organization and Management, Franco, Pinoy Management. FAJARDO, F.R. 1997. Management. LORENZANA, C.C. 1997. Management Theory and Practice. FRANCO E.A. 1988. Management in the Philippine Setting,National Book Store Inc.