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

CHED MEMORANDUM ORDER
No. 07
Series of 2019

SUBJECT: POLICIES, STANDARDS AND GUIDELINES FOR THE BACHELOR OF SCIENCE IN FOOD TECHNOLOGY

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "*Higher Education Act of 1994*," in pursuance of an outcomes-based quality assurance system as advocated under CMO 46 s. 2012, and by virtue of Commission en banc Resolution No. **087-2018** dated **March 6, 2018** the following policies, standards and guidelines (PSGs) are hereby adopted and promulgated by the Commission.

ARTICLE I
INTRODUCTION

Section 1. Rationale

Based on the *Guidelines for the Implementation of CMO 46 s 2012*, this PSG implements the "shift to learning competency-based standards/outcomes-based education." It specifies the 'core competencies' expected of BS Food Technology graduates "regardless of the type of HEI they graduate from." However, in "recognition of the spirit of outcomes-based education and... of the typology of HEIs," this PSG also provides "sample HEIs to innovate in the curriculum in line with the assessment of how best to achieve learning outcomes in their particular contexts and their respective missions ...."

ARTICLE II
AUTHORITY TO OPERATE

Section 2. Government Recognition

All private higher education institutions (PHEIs) intending to offer BS Food Technology must first secure government recognition and proper authority from the Commission in accordance with these PSGs. All PHEIs with an existing BS Food Technology program are required to shift to an outcomes-based education approach based on these PSGs and must secure approval for such a shift. State universities and colleges (SUCs), and local colleges and universities should likewise strictly adhere to the provisions in these policies and standards.

ARTICLE III
GENERAL PROVISIONS

Section 3. The Articles that follow give minimum standards and other requirements and prescriptions. The minimum standards are expressed as a minimum set of desired program outcomes which are given in Article IV Section 6. The CHED designed a curriculum to attain such outcomes. This curriculum is shown in Article V of the BS Food Technology curriculum. The number of units of this curriculum is here prescribed as the "minimum unit requirement" under Section 13 of RA 7722. In designing the curriculum, the CHED employed a curriculum map which is shown in Article V Section 11 of the BS Food Technology curriculum map.

Using a learner-centered/outcomes-based approach CHED also determined appropriate curriculum delivery methods shown in Article V Section 12. The sample course syllabi given in Article V Section 13 show some of these methods.

Based on the curriculum and the means of its delivery, CHED determined the physical resource requirements for the library, laboratories and other facilities and the human resource requirements in terms of administration and faculty. See Article VI.

Section 4. The HEIs are allowed to design curricula suited to their own contexts and missions provided that they can demonstrate that the same leads to the attainment of the required minimum set of outcomes, albeit by a different route. In the same vein, they have latitude in terms of curriculum delivery and in terms of specification and deployment of human and physical resources as long as they can show that the attainment of the program outcomes and satisfaction of program educational objectives can be assured by the alternative means they propose.

The HEIs can use the **CHED Implementation Handbook for Outcomes-Based Education (OBE) and the Institutional Sustainability Assessment (ISA)** as a guide in making their submissions for Sections 1 to 6 of Article VII.

These PSGs are based on the new 12-year basic education system and the revised GE curriculum. They reflect the reforms towards outcomes-based education and the K + 12 program.

ARTICLE IV
PROGRAM SPECIFICATIONS

Section 5. Program Description

5.1 Degree Name

The degree program shall be called Bachelor of Science in Food Technology.

5.2 Nature of Field of Study

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 and nutrition security, safety and the well-being of individuals, families and communities.

It also includes the social, cultural, economic, managerial and entrepreneurial, and environmental aspects of food systems as well as the art of food preparation.

5.3 Program Educational Objectives/Program Goals

The program focuses on a mix of pure and applied science, engineering, business and entrepreneurial skills. It aims to produce professionals who have the capacity to apply the science and technology and related fields of study in post-harvest handling, preparation, processing, packaging, storage, distribution and marketing of food to ensure food and nutrition security, safety, quality and environmental sustainability.

5.4 Specific Professions and Careers/Occupation for graduates

a. Food manufacturing and engineering, quality control/assurance, product development and innovation, food analysis, food microbiology, marketing, distribution and sales.
b. Research, extension, instruction and training in the food industry and government research institutions.
c. Food Control and Regulatory Officers in Agencies and Bureaus of Government (e.g. Food and Drug Administration, Department of Agriculture, Department of Science and Technology, Department of Trade and Industry, Department of Health), state and local health departments and other agencies.
d. Food service
e. Academe
f. Entrepreneurship

5.5 Allied Fields

The BS Food Technology program is closely related to the fields of Nutrition, Agriculture, Biochemistry, Microbiology, Fisheries, Engineering (e.g. Food, Chemical, Industrial, Agricultural, Sanitary), Pharmacy, Veterinary Medicine and Chemistry.

Section 6. Program Outcomes

The minimum standards for the BS Food Technology program are expressed in the following minimum set of program outcomes:

6.1 Common to all programs in all types of schools

a) Articulate and discuss the latest developments in the specific field of practice (PQF level 6 descriptor);
b) Effectively communicate orally and in writing using both English and Filipino;
c) Work effectively and independently in multi-disciplinary and multi-cultural teams (PQF level 6 descriptor);
d) Act in recognition of professional, social, and ethical responsibilities;
e) Preserve and promote "*Filipino historical and cultural heritage*" (based on RA 7722);

6.2 Common to the discipline

f) Generate and share knowledge relevant to agriculture;
g) Formulate and implement plans and programs in food technology in support of agriculture;

6.3 Specific to sub-discipline

h) Demonstrate communication skills (i.e. oral and written) that lead to success in a food technology career including preparation of proposals, position papers, technical reports, communicating technical information to a nontechnical audience, making formal and informal presentations;
i) Explain the functionality of different food ingredients and chemical changes occurring during post-harvest handling, preparation, processing, packaging and storage, including reactions involving carbohydrates, proteins, and fats;
j) Understand the international and local regulations required for the manufacture, distribution and sale of food products, either fresh or processed;
k) Understand the role of microorganisms in postharvest handling, preparation, processing and preservation, packaging and storage with respect to pathogenic, spoilage, and fermentative microorganisms;
l) Understand and apply the principles of engineering as they relate to converting agricultural commodities to the finished products;
m) Understand and apply the principles and various facets of food technology, including sensory evaluation, in practical situations, problem solving and environmental sustainability;
n) Understand and apply the basic elements of sanitation and quality assurance programs to assure food safety;
o) Evaluate the microbiological, physical, chemical, sensory and functional properties of food; and
p) Create new product ideas, concepts and procedures leading to innovative food technologies.

6.4 Common to a horizontal type as defined in CMO 46 s 2012

1. For professional institutions: a service orientation in one's profession;
2. For colleges: an ability to participate in various types of employment, development activities, and public discourses particularly in response to the needs of the communities one serves;
3. For universities: an ability to participate in the generation of new knowledge or in research and development projects.

Graduates of State Universities and Colleges must, in addition, have the competencies to support "national, regional and local development plans." (RA 7722)

A PHEI, at its option, may adopt mission-related program outcomes that are not included in the minimum set.

Section 7. Sample Performance Indicators

Performance Indicators are specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence.

PROGRAM OUTCOME	SAMPLE PERFORMANCE INDICATORS
Demonstrate communication skills (i.e. oral and written) that lead to success in a food technology career including preparation of proposals, position papers, technical reports, feasibility studies, communicating technical information to a nontechnical audience, making formal and informal presentations.	• Write clear and concise proposals, position papers, technical reports and feasibility studies. • Communicate clear and concise technical presentations and data to technical and nontechnical audience.
Explain the functionality of different food ingredients and chemical changes occurring during post-harvest handling, preparation, processing, packaging and storage, including reactions involving carbohydrates, proteins, and fats.	• Identify and explain the chemistry underlying the properties (functional, physical and chemical) and reactions of various food components. • Describe the major chemical reactions that affect the quality and shelf life of foods. • Design and conduct shelf life studies of foods. • Apply the principles of food analysis. • Recommend appropriate analytical technique when presented with a practical problem.
Understand the international and local regulations required for the manufacture, distribution and sale of food products, either fresh or processed.	• Explain the Codex Rules, Standards, WTO, SPS-TBT and other International guidelines. • Apply local food laws and regulations (Food Safety Act, Consumer Act, Food Labeling, Food Sanitation Law, ASIN Law, Halal, Food Fortification Act, Environmental policies and regulations) in the manufacture, distribution and sale of food products.
Understand the role of microorganisms in postharvest handling, preparation, processing and preservation, packaging and storage with respect to pathogenic, spoilage, and fermentative microorganisms.	• Identify the important pathogens and spoilage microorganisms in foods and the conditions under which they will grow. • Identify the conditions under which the important pathogens are commonly inactivated, killed or made harmless in foods. • Apply the principles involving food preservation via fermentation processes. • Discuss the role and significance of microbial inactivation, adaptation and environmental factors (i.e., Aw, pH, temperature) on growth and response of microorganisms in various environments. • Identify the conditions, including sanitation practices, under which the important pathogens and spoilage microorganisms are commonly inactivated, killed or made harmless in foods.
Understand and apply the principles of engineering as they relate to converting agricultural commodities to the finished products.	• Describe the source and variability of raw food material and their impact on food processing operations. • Explain the spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage. • Explain the principles that make a food product safe for consumption.

	• Describe the transport processes and unit operations in food processing as demonstrated both conceptually and in practical laboratory settings. • Apply the mass and energy balances for a given food process. • Describe the unit operations required to produce a given food product. • Explain the principles and current practices of processing techniques and the effects of processing parameters on product quality. • Explain the properties and uses of various packaging materials. • Describe the basic principles and practices of cleaning and sanitation in food processing operations. • Identify the requirements for water utilization and waste management in food and food processing.
Understand and apply the principles and various facets of food technology, including sensory evaluation, in practical situations, problem solving and environmental sustainability.	• Apply the principles and incorporated the principles of food science in practical, real-world situations and problems. • Demonstrate ability to use software to solve food science problems (e.g. Design Expert, Heat Penetration software, etc). • Apply statistical principles to food science such as control charts, optimization, etc. • Apply the principles of food science to control and assure the quality of food products. • Explain the basic principles of sensory analysis. • Explain the basic principles of environmental sustainability in the food industry.
Understand and apply the basic elements of sanitation and quality assurance programs to assure food safety.	• Apply the principles of food science to control and assure the safety of food products. • Develop and implement QA and food safety systems (eg GMP, SSOP, HACCP).
Evaluate the microbiological, physical, chemical, sensory and functional properties of food.	• Conduct tests for physico-chemical, chemical and functional properties of food with linearity (LOD, LOQ, range), precision (repeatability and reproducibility) and accuracy. • Conduct microbiological analysis of food. • Conduct sensory evaluation of foods. • Interpret results of physico-chemical, chemical, functional, microbiological and sensory analyses of foods.
Create new product ideas, concepts and procedures leading to innovative food technologies.	• Demonstrate proficiency in basic terminology and techniques for culinary arts in food preparation and presentation. • Develop plans, procedures and new approaches in food manufacturing and in assessing food quality and safety. • Design innovative food processes to develop new products.

ARTICLE V
CURRICULUM

Section 8. Curriculum Description

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. An outcome-based approach was used in developing this curriculum. It is the intent of this curriculum to foster rigorous training on food science and technology to develop professional skills of students. It emphasizes the development of competencies of the graduate towards better application of the principles of food technology in the global setting.

This curriculum is designed to prepare well-rounded food technology professionals with competencies (Annex A) in the principles and practice of food science and technology.

Section 9. Sample Curriculum

9.1 Certificate of Food Technician (88 units)

Components

a) General Education Courses — 27 units
b) Tool Courses — 20 units
c) Professional Courses — 22 units
d) On-the-job Training — 5 units
e) National Service Training Program (NSTP) — 6 units
f) Physical Education (PE) — 8 units

9.2 Bachelor of Science in Food Technology (165 units)

Components

a) General Education Courses — 36 Units
b) Tool Courses — 26 Units
c) Professional Courses — 74 Units
d) Electives — 6 units
e) Thesis and On-the-job Training — 9 units
f) Physical Education (PE) and National Service Training Program (NSTP) — 14 units

General Education Courses	Units
GE 1: Understanding the Self/Pag-unawa sa Sarili	3
GE 2: Readings in Philippine History/Mga Babasahin hinggil sa Kasaysayan ng Pilipinas	3
GE 3: The Contemporary World/Ang Kasalukuyang Daigdig	3
GE 4: Mathematics in the Modern World/Matematika sa Makabagong Daigdig	3
GE 5: Purposive Communication/Malayuning Komunikasyon	3
GE 6: Art Appreciation/Pagpapahalaga sa mga sining sa kasalukuyang lipunan	3
GE 7: Science, Technology and Society/Agham, Teknolohiya at Lipunan	3
GE 8: Ethics/Etika	3
GE Elective 1	3
GE Elective 2	3
GE Elective 3	3

Mandated Course Life and Works of Rizal	3
Tool Courses	
1. Chemistry	
a. Quantitative Chemistry	3
b. Qualitative Chemistry	3
c. Organic Chemistry	3
d. General Biochemistry	3
e. Physical Chemistry	3
2. Mathematics	
a. Calculus (Integral and Differential)	5
b. Applied Statistics	3
3. Applied Physics	3
Professional Courses	
1. Introduction to Food Science and Technology	1
2. Food Processing	
a. Food Processing 1	3
b. Food Processing 2	3
3. Food Chemistry	
a. Food Chemistry 1	5
b. Food Chemistry 2	5
4. Food Analysis	5
5. Food Microbiology	
a. General Microbiology	5
b. Food Microbiology	5
6. Food Packaging and Labeling	3
7. Food Laws	3
8. Food Engineering	5
9. Food Quality Assurance	3
10. Food Safety	3
11. Sensory Evaluation	3
12. Post-harvest Handling Technology	3
13. Food Product Development and Innovation	3
14. Basic Food Preparation	3
15. Basic Nutrition	3
16. Environmental Sustainability in the Food Industry	3
17. Business Management and Entrepreneurship	3
18. Undergraduate Seminar	1
19. Methods of Research in Food Science and Technology	3
On-the-job Training and Thesis	
1. Thesis	3
2. On-the-job Training 1	5
3. On-the-job Training 2	6
Electives	
1. Biotechnology	3
2. Business Economics and Accounting	3
3. Marketing	3
4. Culinary Science and Technology	3
5. Fruit and Vegetable Processing	3
6. Cereal Science and Technology	3
7. Meat Science and Technology	3
8. Dairy Science and Technology	3
9. Fish Science and Technology	3
Other Required Courses	
1. National Service Training Program (NSTP)	6
2. Physical Education (PE)	8

Section 10. Sample Program of Study

The institution may enrich the sample/model program of study depending on the needs of the industry, provided that all prescribed courses/competencies required in the curriculum outline are offered and prerequisites and co-requisites are observed.

FIRST YEAR

First Semester	Units	Lect units	Lab units		Second Semester	Units	Lect units	Lab units
Introduction to Food Technology	1	1			GE Elective 1:	3	3	
GE 1	3	3			Calculus	5	5	
GE 2	3	3			Applied Physics	3	3	
GE 3	3	3			GE 5	3	3	
GE 4	3	3			Qualitative Chemistry	3	2	1
Quantitative Chemistry	3	2	1		NSTP	3		
NSTP	3				PE	2		
PE	2							
TOTAL	21				TOTAL	22		

SECOND YEAR

First Semester	Units	Lect units	Lab units		Second Semester	Units	Lect units	Lab units
Basic Food Preparation	3	2	1		GE 7	3	3	
GE 6	3	3			Business Mgt & Entrep	3	3	
Organic Chemistry	3	2	1		General Biochemistry	3	2	1
General Microbiology	5	3	2		Food Processing I	3	2	1
Food Chemistry I	5	3	2		Food Microbiology	5	3	2
PE	2				PE	2		
TOTAL	21				TOTAL	19		

*Summer	Units	Lab Hrs
OJT-1	5	250

*One (1) unit is equivalent to 50 practicum hours. For students who wish to qualify as Food Technician ONLY.

The OJT-1 gives the student an overview of the basic practice in food technology. They are expected to assist in the area of research, analysis and processing. OJT-1 may also provide student actual experience in entrepreneurship.

All students who satisfactorily completed the first 2 years and 5 units of OJT-1 training with a total of 88 units, shall be awarded the Certificate of Food Technician which the students may use for immediate employment as Food Technician in manufacturing, food service, research and laboratories and as an Entrepreneur.

THIRD YEAR

First Semester	Units	Lect units	Lab units		Second Semester	Units	Lect units	Lab units
Physical Chemistry	3	2	1		Food Engineering	5	3	2
Food Chemistry II	5	3	2		GE 2: Elective	3	3	
Food Processing II	3	2	1		Food Safety	3	3	
Sensory Evaluation	3	2	1		Food Analysis	5	3	2
Applied Statistics	3	3			Food Packaging and Labelling	3	2	1
Post-harvest Handling Technology	3	2	1		GE 8	3	3	
TOTAL	20				TOTAL	22		

Summer	Units	Lab hrs
OJT-2	6	300

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

The OJT-2 shall hone the skills and practical perspective of students in the field of food technology. This is intended to give the graduating students a holistic view of food technology as a profession. They are expected to get involved in all areas of the business operations including but not limited to research and development, training, analysis, procurement, processing, manufacturing, marketing and sales.

FOURTH YEAR

First Semester	Units	Lect units	Lab units		Second Semester	Units	Lect units	Lab units
Food Laws	3	3			Elective 2	3	3	
Food Quality Assurance	3	2	1		Life and Works of Rizal	3	3	
Elective 1	3	3			Undergraduate Seminar	1	1	
Basic Nutrition	3	3			Thesis	3		
Food Product Development and Innovation	3	2	1		Environmental Sustainability in the Food Industry	3	3	
Methods of Research in Food Science and Technology	3	3			GE 3: Elective	3	3	
TOTAL	18				TOTAL	16		

Summary (BS Food Technology)

1st year	1st sem	21 units
	2nd sem	22 units
2nd year	1st sem	21 units
	2nd sem	19 units
3rd year	1st sem	20 units
	2nd sem	22 units
Summer	6 units	
4th year	1st sem	18 units
	2nd sem	16 units
TOTAL		**165 units**

Section 11. Sample Curriculum Map

11.1 Sample Curriculum Map

Curriculum map is "a matrix relating all the courses listed in the program curriculum with one or more of the declared program outcomes."

The HEIs/LUCs/SUCs shall create a complete curriculum map of their current existing BS Food Technology Curriculum. Refer to Annex B for a sample curriculum map that relates all the courses in the sample curriculum with the minimum set of program outcomes.

Section 12. Sample Means of Curriculum Delivery

Sample Means of Curriculum Delivery

The BS Food Technology curriculum adheres to a learner-centered paradigm. It begins with clearly stated competencies that students must acquire and demonstrate at the end of the four-year program. Appropriate teaching-learning strategies facilitate the acquisition of these competencies. Under this paradigm, students are the subject of the learning process enabling them to achieve their full potential. The teaching-learning process is interactive, participatory, collaborative and experiential. The teacher is a mentor, facilitator and collaborator.

Section 13. Sample Syllabi for Core Food Technology Courses (Refer to Annex C)

ARTICLE VI
REQUIRED RESOURCES

Section 14. Program Administration

14.1 Department Chairman and/or Program Coordinator

Qualification of a Department Chair and/or Program Coordinator

- The Chair of the department must be at least a master's degree holder in Food Technology/Food Science, or a master's degree holder in an allied program identified in the policies and standards. Program coordinator must have at least a master's degree in Food Technology/Food Science.

- At least three (3) years teaching experience, two (2) years on research/extension work and/or two years' work experience in Food Industry.

14.2 Faculty

a. Qualification of faculty

- At least 50% of the faculty teaching professional courses must have a Bachelor's degree in Food Technology and a Master's degree in Food Technology/Food Science or in any allied field.

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

b. Faculty Development

The institution is suggested to have a system of faculty development. It should encourage the faculty to:

- Pursue graduate studies
- Attend seminars, symposia and conferences for continuing education
- Undertake research activities and to publish their research output
- Give lectures and present papers in national/international conferences, symposia and seminars.

The institution is also requested to provide opportunities and incentives such as:

- Tuition subsidy for graduate studies
- Study leave with pay
- Deloading to finish a thesis or carry out research activities
- Travel grants for academic development activities such as special skills training and attendance in national/ international conferences, symposia and seminars.
- Awards and recognition

Section 15. Library

Library personnel, facilities and holdings should conform to existing CHED requirements for libraries which are embodied in separate CHED issuances. The library must maintain a collection of updated and appropriate/suitable textbooks and references used for the core courses in the curriculum. Library resources should complement curriculum delivery to optimize the achievement of the program outcomes for the BS Food Technology program.

Section 16. Facilities and Equipment

16.1 Laboratory requirements

a. **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
- Product Development Laboratory
- Food Pilot Plant/Food Processing Laboratory
- Chemicals/Supplies Storage Room
- Instrument Room

16.2 Laboratory equipment

The specific equipment/instrument and glassware needed are listed in the course specifications (Annex D).

16.3 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 17. 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 VII
COMPLIANCE OF HEIs

Using the ***CHED Implementation Handbook for OBE and ISA*** as reference, a HEI shall develop the following items which will be submitted to CHED when they apply for a permit for a new program or the approval of the transformation of existing programs to outcomes-based framework:

Section 18. The complete set of program outcomes, including its proposed additional program outcomes.

Section 19. Its proposed **curriculum**, and its justification including a curriculum map.

Section 20. Proposed **performance indicators** for each outcome. Proposed measurement system for the level of attainment of each indicator.

Section 21. Proposed **outcomes-based syllabus** for each course.

Section 22. Proposed system of program assessment and evaluation

Section 23. Proposed system of program **Continuous Quality Improvement (CQI)**.

ARTICLE VIII
TRANSITORY, REPEALING and EFFECTIVITY PROVISIONS

Section 24. Transitory Provision

All private HEIs, state universities and colleges (SUCs) and local universities and colleges (LUCs) with existing authorization to operate BS Food Technology program are hereby given a period of three (3) years from the effectivity thereof to comply with all the requirements in this CMO. However, the prescribed minimum curricular requirements in this CMO shall be implemented starting Academic Year 2019-2020.

Section 25. Repealing Clause

Any provision of this Order, which may thereafter be held invalid, shall not affect the remaining provisions.

All CHED issuances or parts thereof inconsistent with the provision in this CMO shall deemed be modified and repealed.

Section 26. Effectivity Clause

This CMO shall take effect fifteen (15) days after publication in the Official Gazette or in a newspaper of national circulation. This CMO shall be implemented beginning Academic Year 2019-2020.

Quezon City, Philippines August 20, 2019

For the Commission:

J. PROSPERO E. DE VERA III, DPA
Chairman

ATTACHMENTS:
Annex A – Duties and Competencies
Annex B – Sample Curriculum Map
Annex C – Sample Course Syllabi
Annex D – Laboratory Facilities and Equipment

Commission on Higher Education
TECHNICAL PANEL FOR AGRICULTURE EDUCATION

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	

ANNEX B

Sample Curriculum Mapping

The graduate of the BS Food Technology program should have developed the ability to:

h) Demonstrate communication skills (i.e. oral and written) that lead to success in a food technology career including preparation of proposals, position papers, technical reports, communicating technical information to a nontechnical audience, making formal and informal presentations;
i) Explain the functionality of different food ingredients and chemical changes occurring during post-harvest handling, preparation, processing, packaging and storage, including reactions involving carbohydrates, proteins, and fats;
j) Understand the international and local regulations required for the manufacture, distribution and sale of food products, either fresh or processed;
k) Understand the role of microorganisms in postharvest handling, preparation, processing and preservation, packaging and storage with respect to pathogenic, spoilage, and fermentative microorganisms;
l) Understand and apply the principles of engineering as they relate to converting agricultural commodities to the finished products;
m) Understand and apply the principles and various facets of food technology, including sensory evaluation, in practical situations, problem solving and environmental sustainability;
n) Understand and apply the basic elements of sanitation and quality assurance programs to assure food safety;
o) Evaluate the microbiological, physical, chemical, sensory and functional properties of food; and
p) Create new product ideas, concepts and procedures leading to innovative food technologies.

Legend:
I- Introduce (facilitates learning of competencies)
P- Practice (allows student to practice competencies)
D- Demonstrate

	RELATIONSHIP TO PROGRAM OUTCOMES								
COURSE	h	i	j	k	l	m	n	o	p
Food Processing 1	P	IP	IP	IP	P	I	IP	D	
Food Processing 2	P	IP	IP	IP	P	I	IP	D	
Food Chemistry 1	P	IP			P	I		D	
Food Chemistry 2	P	IP			P	I		D	
General Microbiology	P		IP		P	I	IP	D	
Food Microbiology	P		IP		P	I	IP	D	
Food Packaging and Labeling	P	IP	IP	IP	P	I	IP	D	
Food Laws			I	I	I	I	IP	D	
Food Engineering		IP	I	IP		I	IP		
Food Quality Assurance	P	IP	IP		P	IP	IP	D	
Food Safety		IP	IP		P	IP	IP	D	
Sensory Evaluation	P	IP				IP		D	
Food Analysis	P	IP			P	I		D	
Food Product Development and Innovation	PD	IP	IP	IP	P	IP		D	D
Undergraduate Seminar	P								
Basic Food Preparation	P	P	P	P		P	P	P	PD
Nutrition		IP			P	P		D	

Environmental Sustainability in the Food Industry		IP	IP	IP	P	IP			
Basic Management & Entrepreneurship	PD					P			D
Methods of Research in Food Science and Technology	PD	P	P	P	P	P			D
Post-harvest Technology		IP	IP	IP	P	IP	IP	D	
Thesis	D	D	D	D	D	D	D	D	D
On-the-job Training	P	P	P	P	P	P	P	D	

ANNEX C

Sample Syllabi

COURSE TITLE	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY			
COURSE DESCRIPTION	An overview of food science and technology, career opportunities of food technologists and their responsibilities to society			
COURSE CREDIT	1 unit			
PREREQUISITES	None			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Understand the philosophy of Food Science and Technology as a discipline and profession 2. Discover interface of Food Science and Technology with other disciplines. 3. Discuss the knowledge, skills and competencies required for a Food Technologist 4. Examine the role and responsibilities of a Food Technologist to society 5. State and discuss cases or examples of challenges/issues and concerns in Food Science and Technology	• Definition of Food Science and Technology • Philosophy/History of Food Science and Technology • Interface of Food Science and Technology with other sciences and disciplines • Training and competencies required for a Food Technologist • Food Science and Technology Education (Global, Local) • Code of professional conduct for a Food Technologist (Global, Local) • Career opportunities • Current issues and concerns in Food Science and Technology	• Lectures • Class discussions • Film showings • Career talks • Interviews/Tracer studies • Field trips	• Reflection papers • Academic journals	• LCD/TV monitor • Laptop
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28. www.ift.org
29. www.iufost.org
30. http://www.fao.org/fao-who-codexalimentarius/en/
31. http://nco.uplb.edu.ph/

COURSE TITLE	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			
COURSE CREDIT	5 units (3 units lecture and 2 units laboratory)			
PREREQUISITES	General Microbiology			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/ LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Identify the major types of microorganisms that are important in foods. 2. Explain the occurrence of spoilage indicators as a function of microbial action. 3. Understand the growth requirements of common food borne pathogens and spoilage microorganisms. 4. Understand intrinsic and environmental aspects of foods and how they can be modified to affect the growth and metabolism of food borne microorganisms to include spoilage, pathogenic, and beneficial organisms. 5. Identify the various microbes of public health significance in relation to food processing. 6. Classify spoilage microorganisms according to the food or foods they are most likely to affect based on the intrinsic and environmental characteristics of the food and compare to various storage methods to	Introduction: general effects of microbes in food • Major types of microorganisms in food • Extrinsic and intrinsic factors in food affecting microbial growth • Microbiological causes of spoilage Microbes of public health significance i.e. specific pathogenic yeast, mold and bacteria Utilization of conventional and rapid methods of assessing microbial loads in various food commodity. Predictive microbiology and risk assessment • PMP – Pathogen Modeling Program (U.S. Dept. of Agriculture) • ComBase – Common Database for predictive microbiology (Institute of Food Research, U.K.)	• Lecture and discussion • Class presentation • Group presentation • Assigned readings Laboratory exercises: • Yeasts and Molds in Foods • Reactions of Lactic Acid Bacteria • Sporeformers in Foods • Microbial Growth at various conditions • Demonstrating the types of microbes that grow in various food groups i.e dry, salty, acidic, low acid, high sugar etc. • Measurement of spoilage indicators like TVBN • Demonstrating the inactivation of microbes upon exposure to various treatments i.e. UV light, boiling water, refrigerated temperature, acidification etc. • Detection of Coliforms and Fecal Coliforms in Food	Quizzes Examination Laboratory report Group presentation Survey output	LCD/TV monitor Laptop Food Microbiology lab (see Annex)

determine which method would be most appropriate for the given food product. 7. Analyze the advantages and disadvantages of emerging food preservation technologies and their implications to microbial food safety and food quality. 8. Present the application of food microbiology in quality assurance programs. 9. Discuss the use of microbes in food processing. 10. Be able to attribute the characteristics of a food borne illness with unknown etiology to the most likely organism. 11. Carry out a series of laboratory experiments aimed at isolating and identifying common food borne microbial pathogens. 12. Design and carry out a laboratory experiment to evaluate the microbial safety of a common food product.	Biosecurity, food-borne illness, host factors, what is FBI Microbiological hazards and Good Manufacturing Practices (GMP) Beneficial microbes in food processing i.e. starter cultures, probiotics, food from microbes	• Detection of *Staphylococcus aureus* in Foods • Detection of *Salmonella* in Foods • Demonstration on the use of databases for predictive microbiology • Identification and assessment of practices of street food vendors in relation to food safety • Yogurt processing • Nata de coco processing		

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COURSE TITLE	FOOD CHEMISTRY 1			
COURSE DESCRIPTION	Chemistry of major food components: their structure, properties and changes during postharvest handling, preparation, processing, storage and utilization of food			
COURSE CREDIT	5 units (3 units lecture, 2 units laboratory)			
CO-REQUISITES	Biochemistry			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Relate the chemical structure of food macrocomponents to their properties and functions 2. Identify the sources of carbohydrates, lipids, and proteins 3. Explain the chemistry of changes in macro-components of foods and their effects on physico-chemical, sensory, storage, and nutritional properties and safety of food 4. Describe the technologies for the extraction, treatment, and modification of food macrocomponents 5. Demonstrate logical, analytical, and critical thinking in practical situations related to changes in food macro-component chemistry 6. Critique recent journal articles on food macrocomponents and assess their impact on individuals, families, society, and the local food industry 7. Express insights, opinions, suggestions, and questions relevant to major food components 8. Competently demonstrate basic food chemistry laboratory techniques	Water/Moisture in Foods • The water molecule: structure, physical and chemical properties • Forms of water in foods • Functions of water in food processing • Water hardness and effects in food processing • Water treatment • Water activity • Water sorption properties of foods Carbohydrates • Structure and classification of carbohydrates • Occurrence and functions of carbohydrates in foods • Properties of selected carbohydrates • Modification of carbohydrates • Changes in carbohydrates Lipids in Foods • Structure and classification of lipids	• Lecture and discussion • Assigned reading • Critique writing • Reflection • Problem set • Special problem Laboratory exercises: • Determination of moisture sorption properties of foods • Determination of critical moisture content of foods • Sensory properties of sugars • Reducing properties of sugars • Reducing sugar content determination • Solubility of sugars • Preparation of starch • Microscopic examination of starches • Effect of different factors on starches • Properties of gums • Agar extraction • Test for methoxyl content • Effect of different factors on pectins • Differentiation of native vs. modified cellulose	• Quizzes • Examination • Critique • Reflection extract • Problem set • Laboratory performance • Laboratory report • Special problem report	• LCD/TV monitor • Laptop • Food Chemistry lab (see Annex)

9. Determine the effects of the various intrinsic and extrinsic factors on major food components in model systems 10. Interpret scientific data and draw inferences from a given set of information/ observation 11. Infer appropriate methods to control the changes in major food components during post-harvest handling, preparation, processing, storage and distribution of food from collected data 12. Demonstrate the ability for quick and analytical thinking, and the value of honesty in reporting results of analysis 13. Write clear, accurate, concise, cohesive and coherent technical reports using library resources 14. Effectively communicate results and interpretation of experiments performed through oral presentation	• Occurrence and functions of lipids in foods • Physico-chemical properties of lipids • Lipid technology, refinement and modification • Lipolysis/ degradation reactions of lipids • Effects of lipid degradation • Emulsions and emulsifiers Proteins in Foods • Composition, structure and classification of amino acids and proteins • Occurrence and functions of proteins on foods • Functional properties of proteins • Food proteins • Denaturation • Protein degradation	• Effect of calcium and acid on alginate gelation • Winterization of oils • Water-absorbing capacity of fats • Test for emulsion stability • Emulsion preparation • Hydrolytic rancidity of oils • Oxidative rancidity of oils • Effect of pH on protein solubility • Preparation of soy protein isolate and tofu • Spun fiber preparation • Heat coagulation of proteins		

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COURSE TITLE	FOOD CHEMISTRY 2			
COURSE DESCRIPTION	Chemistry of minor food components: their structure, properties and changes during postharvest handling, preparation, processing, storage and utilization of food			
COURSE CREDIT	5 units (3 h lecture, 6 h laboratory)			
PRE-REQUISITE	Food Chemistry I			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/ LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Relate the chemical structure of minor food components to their properties and functions 2. Explain the chemistry of changes in food microcomponents and their effects on physico-chemical, sensory, storage, and nutritional properties and safety of food 3. Evaluate measures to control reactions of minor components of food 4. Describe the technologies for the extraction, treatment, and modification of minor components of foods 5. Demonstrate logical, analytical, and critical thinking in practical situations related to changes in the chemistry of minor components of foods	Enzymes in Foods • Nomenclature and classification of enzymes • Properties and functions of enzymes • Enzyme kinetics and reactions • Factors affecting enzyme activity • Enzyme immobilization • Applications of enzymes in food processing Browning reactions in foods • Enzymatic browning • Non-enzymatic browning o Maillard reaction o Caramelization or active aldehyde theory o Ascorbic acid theory o Lipid browning • Control of browning reactions Colorants in Foods • Structure, classification, and properties • Changes during processing and storage	• Lecture and discussion • Assigned reading • Critique/reaction paper writing • Reflection paper writing • Games Laboratory exercises: • Effect of some chemicals and temperature on enzymatic browning • Measurement of polyphenolase activity through spectrophotometry • Effect of proteolytic enzymes on fresh albumen egg • Effect of low temperature and substrate on enzyme activity • Effects of different factors on Maillard reaction • Effect of pH and temperature on caramelization • Effect of temperature and oxygen on ascorbic acid browning • Effect of pH on plant pigments • Effect of blanching temperature on color of heat-treated green vegetables	• Quizzes • Examination • Critique/reaction paper • Reflection extract • Game scores • Laboratory performance • Laboratory report	• LCD/TV monitor • Laptop • Food Chemistry lab (see Annex)

6. Critique recent journal articles on minor food components and assess their impact on individuals, families, society, and the local food industry 7. Express insights, opinions, suggestions, and questions relevant to minor food components 8. Competently demonstrate basic food chemistry laboratory techniques 9. Determine the effects of various intrinsic and extrinsic factors on minor food components in model systems 10. Interpret scientific data and draw inferences from a given set of information/observation 11. Infer appropriate methods to control the changes in minor food components during post-harvest handling preparation,	• Control of changes in pigments and colorants Flavor and aromatic compounds in foods • Classification, structure, and occurrence of compounds responsible for basic tastes, aroma, and chemesthetic sensations • Properties and reactions • Production of food flavorings Vitamins • Classification, structure, and properties • Changes during processing and storage • Fortification, enrichment, restoration • Optimization of vitamin retention Minerals • Classification, structure, and properties • Changes during processing and storage • Fortification, enrichment, restoration • Optimization of mineral retention Additives • For sensory property improvement • For shelf-life extension • For processing enhancement	• Effect of storage temperature on natural and synthetic pigments • Effect of microwave radiation on plant pigments • Effect of sulfiting on anthocyanins • Effect of various packaging materials on flavor transmission • Effect of temperature on fruit flavors • Effect of temperature on sweetness of artificial sweeteners • Familiarization with various flavors • Effects of solutes on water activity and shelf life of foods • Antioxidant property of tocopherol and EDTA • Effect of citric acid and monosodium glutamate on vitamin C • Function of food additives • Effects of ingredients and process variables on action of leavening agents and dough improvers • Phenolic compounds in various plant food materials • Effects of process variables on sterols in oil seeds and grains		

processing, storage and distribution of food from collected data 12. Demonstrate the ability for quick and analytical thinking, and the value of honesty in reporting results of analysis 13. Write clear, accurate and concise technical reports 14. Effectively communicate results and interpretation of experiments performed through oral presentation	• For nutritive quality improvement • For special and dietary requirements Bioactive Compounds in Promoting Health • Structure, properties and functions • Changes during processing and storage • Factors affecting activity • Control of changes Toxicants • Naturally-occurring toxicants • Process-induced toxicants • Contaminants • Toxic residues • Adulterants • Factors affecting toxicity • Control measures			

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COURSE TITLE	FOOD PROCESSING 1			
COURSE DESCRIPTION	Food processing and preservation techniques: heat processing, non-thermal processing, and chemical preservatives			
COURSE CREDIT	3 Units (2 units Lecture, 1 unit laboratory)			
PREREQUISTE	Food Microbiology			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES

1. Describe the reasons for food processing and the factors impacting it.
2. Discuss the general principles of food preservation and their application.
3. Demonstrate understanding of science and technologies related to thermal processing.
4. Explain the principle of thermal death kinetics of foodborne microorganisms in achieving the desired preservation and the effects on product quality.
5. Use the principles of food preservation including effects of high temperatures and heat penetration to evaluate adequacy of thermal processing.
6. Assess the adequacy of the heat process applied through process calculations,
	• Food processing and the food industry
	• General principles of food processing and preservation
	• Basic concepts of thermal processing
	• Classification of foods by acidity
	• Microbiology of thermally processed foods
	• Packaging of heat processed foods
	• Concept of D value and TDT curve
	• Heat penetration curves
	• Thermal process calculations
	• HTST and Aseptic packaging
	• Minimally processed foods
	• Non-thermal processes
	  • Pulsed electric field
	  • Ohmic heating
	  • Irradiation
	  • Ultrasound processing
	  • High hydrostatic pressure
		• Lecture and discussion
		• Film showing
		
		Laboratory exercises:
		• Vacuum in canned foods
		• Measurement of can seams
		• Heat penetration studies of starch solutions
		• Bench scale production
		• Cut-out tests
			• Quizzes
			• Examinations
			• Laboratory report
			• Laboratory performance
				• LCD/TV monitor
				• Laptop
				• Food Processing Lab (see Annex)

microbiological, physico-chemical, sensory and nutritional analyses of the finished product. 7. Demonstrate understanding of science and technologies related to non-thermal process 8. Demonstrate understanding of hybrid technologies that integrate suitable non-thermal, novel-thermal technologies to conventional technologies and their applicability in industrial context. 9. Critically analyze scientific and technological literature related to innovative and emerging non-thermal food processing technologies 10. Discuss the importance of chemical preservatives 11. Assess the proper use of chemical preservatives 12. Apply chemical preservatives in food products.	• Pulsed light • Electron beam • Oscillating magnetic field • Ozone • Gas, cold plasma • Chemical preservatives • Classification, functions, sources and applications			

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COURSE TITLE	FOOD PROCESSING 2			
COURSE DESCRIPTION	Food processing and preservation techniques: fermentation, refrigeration and freezing, drying and dehydration, concentration, hurdle technology			
COURSE CREDIT	3 Units (2 units Lecture, 1 unit laboratory)			
PREREQUISTE	Food Microbiology			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES

13. Identify the basic production method of the fermentation process.
14. Identify the principles of fermentation in food processing.
15. Demonstrate understanding of science and technologies related to refrigeration and freezing.
16. Demonstrate understanding of science and technologies related to moisture control.
17. Demonstrate understanding of science and technologies related to concentration.
18. Articulate the use of hurdle technology and food preservation in the control of foodborne pathogens in food systems
	• Fermented product manufacturing
	  • Ethanolic
	  • Lactic acid
	  • Mixed acid
	• Refrigeration and freezing
	• Moisture control
	  • Drying and dehydration
	  • Salting
	  • Osmotic dehydration
	• Concentration
	  • Evaporation
	  • Freeze concentration
	  • Membrane processes for concentration
	• Hurdle technology
		• Lecture and discussion
		• Film showing
		
		Laboratory exercises:
		• Alcoholic fermentation
		• Lactic acid fermentation (dairy, meat, vegetables, fruits)
		• Mixed acid fermentation
		• Refrigeration and freezing of foods
		• Drying and dehydration of foods
		• Salting of foods
		• Osmotic dehydration of foods
		• Food concentration
			• Quizzes
			• Examinations
			• Laboratory report
			• Laboratory performance
				• LCD/TV monitor
				• Laptop
				• Food Processing Lab (see Annex)

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COURSE TITLE	FOOD ANALYSIS			
COURSE DESCRIPTION	Principles, methods, and techniques necessary for quantitative physical and chemical analyses of food and food products			
COURSE CREDIT	5 units (3 h lecture, 6 h laboratory)			
PRE-REQUISITE	Food Chemistry 2			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Describe the role played by food analysis in solving problems in food science and technology 2. Appreciate the importance of good laboratory practices and quality assurance in the food laboratory 3. Identify possible sources of error in food analysis and prescribe means of error control 4. Explain the principles, instrumentation, applications, and limitations of analytical methods for food and food products 5. Evaluate sampling and analytical methods and determine those appropriate for various food forms	Introduction • Course goal, outcomes, and requirements • Overview of the course • Grading system • Why are foods analyzed? • Who analyzes foods? • What food properties are analyzed? • How are analytical methods chosen? Good Laboratory Practices & Quality Assurance in Food Analysis • Sampling, Sample Handling and Storage • Definition and importance • Concepts: randomness and representativeness • Sampling methods and techniques for various food types Statistical Methods for Data Analysis (review) Errors in Food Analysis • Types of errors • Sources of errors • Error control	• Lecture and discussion • Recitation • Assigned reading • Reflection • Assigned task (finding and examining a sampling plan) Laboratory exercises: • Moisture determination • Crude fat determination • Crude protein determination • Total available carbohydrate determination • Crude/Total dietary fiber determination • Ash determination • Alcohol Content Determination • Ascorbic Acid Content Determination • Nitrate Content Determination • Phosphate Content Determination • Filth analysis	• Quizzes • Examination • Problem set • Reflection extract • Laboratory performance • Laboratory report	• LCD/TV monitor • Laptop • Food Analysis lab (see Annex)

6. Perform calculations required in determining food composition and properties 7. Express insights, opinions, suggestions, and questions relevant to various aspects of food analysis 8. Critique recent journal articles on advances in food analysis and assess their impact on the family, society and the food industry 9. Demonstrate proper sampling and analytical techniques for various food components and matrices 10. Perform appropriate statistical methods for data analysis 11. Correctly interpret the results of analysis 12. Demonstrate the ability for analytical thinking and the value of honesty in reporting of results of analysis	Basic Instrumental Methods – Principles, Instrumentation, Applications, Advantages and Limitations • Potentiometry • Hygrometry • Densimetry • Thermometry • Spectrophotometry Filth analysis • Definition and significance • Classification of filth • Methods of isolation of filth • Examination, identification and quantitation of filth Advanced Instrumental Methods – Principles, Instrumentation, Applications, Advantages and Limitations • Chromatography o Liquid chromatography ▪ Adsorption chromatography ▪ Partition chromatography ▪ Ion exchange chromatography ▪ Size exclusion chromatography ▪ Affinity chromatography o Supercritical fluid chromatography o Gas chromatography • Electrophoresis o Capillary electrophoresis o Gel electrophoresis • Spectrometric methods o UV-Visible spectrometry o Fluorescence spectrometry o Infrared spectrometry o Atomic absorption spectrometry o Atomic emission spectrometry o Nuclear magnetic resonance spectrometry			

13. Acquire proficiency in technical report-writing 14. Effectively communicate results and interpretation of experiments performed through oral presentation	○ Electron spin resonance spectrometry • Mass spectrometry • Voltammetry • Microscopy ○ Scanning electron microscopy ○ Transmission electron microscopy • Atomic force microscopy Biological/ Biochemical methods • Immunoassay • Bioassay ○ for toxins ○ for protein quality • for glucose, cholesterol and triglycerides Antioxidant Assays • HAT-based ○ Oxygen radical absorbance capacity (ORAC) assay ○ Total radical-trapping antioxidant parameter (TRAP) assay ○ Low-density lipoprotein (LDL) oxidation method • SET-based ○ Trolox equivalent antioxidant capacity (TEAC) assay ○ Ferric reducing antioxidant power (FRAP) assay • HAT- and SET-based ○ 2,2-Diphenyl-1-picrylhydrazyl (DPPH) assay • Total phenolics: Folin-Ciocalteu (FC) method Molecular methods			

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COURSE TITLE	FOOD QUALITY ASSURANCE			
COURSE DESCRIPTION	Principles and methods of quality control and assurance in foods			
COURSE CREDIT	3 units (2 units lecture, 1 unit laboratory)			
PRE-REQUISITES	Food Processing 1 & 2, Food Safety, Applied Statistics			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Explain the principles of management systems directed towards the control of food quality. 2. Examine food laws and regulations governing the quality of foods. 3. Develop procedures and approaches to identify food safety hazards in food processing. 4. Apply preventive measures and control methods to minimize microbiological hazards and maintain quality of foods. 5. Illustrate the wide variety of parameters affecting food quality. 6. Design quality control strategies.	• Introduction to food quality assurance • Quality characteristics of food and their measurement • Defects in Food • Standards and Specifications • Statistical Quality Control (e.g., Basic tools, Control Charts, Acceptance Sampling) • Principles and parameters of quality planning and implementation • Subjective methods of food quality assessment • Objective methods of food quality assessment • Food safety and quality assurance • Food control and legislation • Overview of total quality management and selected food quality management systems • Food Quality Systems including Total Quality Management, HACCP and ISO quality standards.	• Lectures • Class discussion • Group dynamics • Reporting (Oral and Written) • Laboratory case studies on quality related problems (e.g., Root cause analysis, Control charts) • Laboratory exercises (Ishikawa diagram, pareto charts, scatter diagram)	• Quizzes • Written exams • Lab reports • HACCP Plan • Quality specification and manual	• LCD/TV monitor • Laptop • Laboratory facility • Food analytical instruments • Statistical software

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COURSE TITLE	FOOD SAFETY			
COURSE DESCRIPTION	Safety of foods and ingredients, best practices, risk analysis, traceability, regulatory developments and scientific and technical advancements			
COURSE CREDIT	3 units (lecture)			
PREREQUISITES	Food Microbiology, Food Processing 1 and 2			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/ LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Explain the basic principles of food safety 2. Recognize the importance of food safety 3. Identify and characterize foodborne hazards 4. Explain the principles of risk analysis 5. Identify local and global food safety regulations governing food safety 6. State and discuss the importance of various food safety intervention systems 7. Examine and discuss a food safety management document 8. Be familiar with current and future implications concerning food safety hazards and risks. 9. Critically evaluate the scientific evidence underpinning the management of specific food-related health risks 10. Apply knowledge of risk principles and prescribed food safety standards to evaluate food safety programs and design a food premise	• Introduction o Definition and importance of food safety o Framework of food safety o General issues and concerns on food safety o Food safety requirements • Foodborne illness outbreak investigation and management • Microbiological food risks • Allergens • Non-microbial hazards (chemical and physical) • Risk assessment, risk management and risk communication o Risk-based food safety standards • Global issues impacting food safety and risk management • International and local food standards and codes, legislations, policies • Food safety prerequisite programs o Personnel hygiene o Sanitation o Good Manufacturing Practices • Food safety management systems o Quality and food safety manuals o Standard operating procedures (SOP's) o Food safety preventive controls (HACCP/HARPC)	• Lectures • Class discussions • Case studies • Film showing • Focus group discussion • Class presentation of term project	• Quiz • Case analysis • Exam • Term project	• LCD/TV monitor • Laptop

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COURSE TITLE	ENVIRONMENTAL SUSTAINABILITY IN THE FOOD INDUSTRY			
COURSE DESCRIPTION	Sustainability and Environmental Issues in the Food Industry			
COURSE CREDIT	3 units (3 units lecture)			
PREREQUISITES	Food Processing 1 & 2, Food Analysis, Food Safety			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/ LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Demonstrate knowledge on the sustainable approaches to primary production of food, in order to reduce environmental impact and to increase food security: increasing water and nutrient use efficiency, reducing pesticide inputs. 2. Demonstrate knowledge on the technologies available for water/wastewater management in the food industry, especially innovative and more sustainable techniques. 3. Identify the environmental laws and policies applicable to the food industry. 4. Discuss the current trends in green technologies in food production and processing. 5. Critically evaluate innovative methods of valorization of food industry by-products to produce high added-value products with application in different sectors.	• Introduction to the concepts of sustainability and environmental balances and their role in food production, food processing and food consumption • The state of the Philippine environment and the Food Industry • Sustainability in the Food System • Sustainability Engineering • Energy demand • Water conservation • Waste reduction • Environmental aspects of globalization of food production, food processing and transport. • Environmental standards/ legislation to food industry (ISO 14001, Eco-labelling, Green Consumerism, Cleaner Production) • Life cycle assessment (LCA) of food production and processing • Footprinting methods for assessment of the environmental impacts of food production and processing	• Lectures • Class discussions • Film viewing • Case studies	• Quizzes • Examinations • Group presentation • Oral recitation	• LCD/TV monitor • Laptop

	• Environmental management systems and their application in the food industry • Different methodological approaches on estimating environmental impact of food industry.			

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COURSE TITLE	FOOD PRODUCT DEVELOPMENT AND INNOVATION			
COURSE DESCRIPTION	Development and optimization of food products with traditional and novel food ingredients and processes – theory and practice.			
COURSE CREDIT	3 units (2 units lecture, 1 unit laboratory)			
PRE-REQUISITES	Food Processing 1 & 2, Food Packaging and Labelling, Sensory Evaluation, Food Analysis			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Explain the processes involved in the invention process, formulation, and development of new food products. 2. Apply the principles of quality assurance, food safety and GMP to a food product design. 3. Successfully produce food prototypes or food concepts. 4. Formulate products by preparing laboratory samples and sourcing raw materials. 5. Develop formulations to meet cost targets, ingredient statement, nutrition profile and sensory attributes of desired product. 6. Select optimal packaging system and materials that align packaging requirements with product quality attributes, product compatibility, line processing, sustainability and costs. 7. Determine label and nutrition facts specifications according to	• Introduction/Overview • Steps in New Product Development • Ideation and Evaluation of Ideas (Market survey and Basis for product development, trends in product development and innovation) • Strategies and Tactics • Formulations (Optimization of product using RSM, Recipe formulation, product and packaging specification) • Requirements in Product Development (Food Quality and Safety Requirements; Shelf life Requirements and Food legislation, standards and labelling Requirements) • Marketing and Market Segments (Market survey and analysis, Marketing strategy and costing) • Product trends (i.e. Bakery products, Food supplements, etc) • Product Launch Plan and Pitching	• Lectures • Class discussions • Brainstorming • Group dynamics • Reporting (Oral and Written) • Experimental food product formulation (or reformulation) • Development of prototypes • Participation in food product development exhibits and competitions • Product pitching	• Oral and written reports • Quizzes and Exams • Homework • Project proposal • Final Product Report • Prototypes • Product presentation • Product pitching	• LCD/TV monitor • Laptop • Food laboratory • Kitchen tools and equipment • Sensory evaluation booth • Food processing equipment • Packaging materials

regulations for nutrition, product naming, and claims. 8. Determine food preservation technologies to address microflora in products or ingredients. 9. Assess microbiological risks from raw ingredients to finished product. 10. Design effective food safety plans (HACCP). 11. Create and present effective product development communication materials.	• Intellectual Property Rights			

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COURSE TITLE	POST HARVEST HANDLING AND TECHNOLOGY			
COURSE DESCRIPTION	Basic principles on handling primary and secondary processing of agricultural food produce			
COURSE CREDIT	3 units (3 h lecture)			
PREREQUISITES	Food Microbiology, Food Chemistry II			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Define important terminologies related to biological, chemical and physical properties of durable and perishable commodities 2. Discuss physiological and biochemical changes that occur post harvest, including nature or causes, and how such changes lead to the deterioration of the produce 3. Identify desirable characteristics of durable and perishable commodities which can be considered in developing post harvest technologies 4. Display basic knowledge about pre-harvest and harvest factors affecting post harvest quality 5. Identify and describe packing house operations based on international standards 6. Discuss the effect of transport and storage conditions and practices on fruits and vegetables quality 7. Identify and describe physiological disorders / diseases of fruits and vegetables, including causes and control and/or prevention	Introduction Definition of terms • Durables: cereals, nuts, coconut, coffee, cacao, pulses • Perishables: fruits, vegetables, root crops, fish, meat, egg, milk • Primary Processing • Secondary Processing Population, food supply and availability Kinds, nature/ causes of post-production losses in agricultural products Biological basis for post harvest practices Physical and chemical basis of post harvest handling Physical properties of fresh produce for post harvest technology development Importance of primary and secondary processing in relation to minimizing losses and availability of agricultural	• Lecture and discussion • Exposure trip • Assigned readings • Video presentations	• Quizzes • Examination • Reflections	• LCD/TV monitor • Laptop

8. Discuss systematic preparation, handling and quality control of fresh cuts 9. Discuss the importance of primary and secondary processing in maintaining quality, minimizing losses and in sustaining the availability of animal products 10. Identify the raw material quality requirements for processing animal products 11. Describe the nature, causes, factors affecting and methods of minimizing deterioration in animal products. 12. Explain the different primary operations done on animal products before marketing, distribution or consumption. 13. Discuss good handling practices during primary processing of animal products to reduce health and environmental risks	products Pre-harvest and harvest factors affecting post harvest quality of fruits and vegetables: • Pre-harvest modifiers of quality • Metabolism of Harvested products • Harvesting Packing house operations, structures and equipment: • Post-harvest handling procedures • Management of Physical environment of produce Physiological disorders Controlling disorders Post-harvest pest management Preparation and handling of fresh cuts Quality Assurance of fresh cuts Quality of animal products: • Quality attributes • Quality evaluation and monitoring • Quality requirements for primary and secondary processing • Good agricultural and manufacturing processes to assure quality and food safety			

	Deterioration in animal products: • Nature of deterioration in fresh and processed products • Factors affecting product deterioration • Methods of alleviating deterioration Appropriate maturity/ age of raw materials for primary and secondary processing Appropriate handling procedures for marketing and primary processing of raw materials Primary processing principles for animal products: • Meat • Fish, shell fish and crustaceans • Egg • Milk Packaging, storage, marketing and distribution Health and environmental issues in processing HACCP Waste Management Ethical considerations			

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COURSE TITLE	SENSORY EVALUATION			
COURSE DESCRIPTION	Principles and techniques in sensory evaluation; statistical analysis and interpretation of sensory evaluation data; and their relations to physico-chemical tests			
COURSE CREDIT	3 units (2 h lecture, 3 h laboratory)			
PRE-REQUISITES	Applied Statistics			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Describe the characteristics and roles of sensory testing in food industry 2. Describe sensory attributes on food product 3. Describe the influence of physicochemical and psychological factors on sensory testing to anticipate the kind of psychological errors in sensory testing. 4. Conduct sensory tests that comply with good sensory practices and demonstrate how to organize laboratory requirement, prepare and sample serving, and panel preparation. 5. Use and compare different types of different test (coverall and attribute difference 6. test) in food process control and food quality. 7. Apply and compare descriptive tests to identify and characterize the sensory properties of foods 8. Apply and compare types of affective tests (qualitative and quantitative) in food product acceptance.	Introduction • Evolution of the sensory science discipline • Philosophy of sensory science Statistics for sensory and consumer science Senses and Sensory Attributes Requirements for Sensory Tests Good Sensory Practice (Ethical standards concerning conduct of sensory evaluation consent form) Measurements/Scaling Difference Tests Descriptive Tests Consumer Tests Correlation of Sensory and Physico-chemical data Threshold Tests	• Lecture and discussion • Group discussion • Reporting (oral and written) Laboratory exercises • Taste and odor recognition tests • Planning for sensory evaluation • Sample preparation and presentation • Scaling exercises • Difference tests • Quantitative consumer tests • Qualitative consumer tests • Descriptive tests (screening, training, evaluating)	• Quizzes • Examinations • Assigned readings • Laboratory reports	• LCD/TV monitor • Laptop • Sensory evaluation laboratory • Food analysis laboratory

9. Apply the principle and statistical methods to analyze sensory data and evaluate the results	Recent developments in sensory science			
REFERENCES				

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COURSE TITLE	FOOD LAWS			
COURSE DESCRIPTION	An introduction to food law and regulations including areas of the law that would impact food science professionals. This course deals with the understanding of food technology as a profession and the regulation governing, handling, processing up to distribution of goods. It also hones the student's awareness and compliance to food laws and regulations in manufacturing and distribution of foods in the local and international markets.			
COURSE CREDIT	3 units			
PRE-REQUISITE	Food Processing 1 and 2			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Become familiar with government statutes and regulations that contribute to a safe, nutritious and wholesome food supply. 2. Understand how technological, social and political forces interact in the development of food laws and regulations and food policies domestically and globally. 3. Learn basic principles and concepts of food law and the legal system in the Philippines. 4. Learn how to identify and analyze legal issues that may arise as food science professional. 5. Distinguish the roles of government, industry and consumers in protecting the food supply. 6. Explain the meaning and importance of standardization and food standards. 7. Discuss the major food law legislation and its	Introduction National Regulations • History and Rationale of Food Law • Consumer Act • Food Labeling • Nutritional Labeling • Food Sanitation Law • ASIN Law • Halal • Food Fortification Act • IPR-R.A. 155 International regulations • Codex • Halal/Kosher Mark • Organic Food • FSMA • EU • ASEAN • Canada/ US Trading Regulations • Export regulations • Import regulations • Concept of Food defense Registration and certification of products	• Lecture and discussion • Recitation • Assigned readings • Reflections/journals	• Quizzes • Examination • Reflection/journal papers	• LCD/TV monitor • Laptop • Internet

importance to current regulations. 8. Discuss the role of regulatory agencies in enforcing current food laws. 9. Be able to locate, retrieve and interpret specific laws, regulations, guidelines and directives relating to food, its manufacture, labeling, distribution and sale. 10. Recognize the general definitions and assess the role of food technologist as a profession 11. Examine and understand the role of food laws in commercial and food labeling 12. Identify and recognize international groups and laws concerning food safety, agricultural practices and cultural differences 13. Compare and analyze the differences of our national laws from international laws 14. Technically understand and recognize the different trade regulations 15. Technically understand and assess the requirements in food manufacturing 16. Understand and recognize government support programs in the	• License to operate • Certification of product registration Incentives for the food industry • Incentives and benefits • Sulong program • NPP Government Regulating and Policy-making Agencies • DTI • DOH-FDA, BOQ • DA-NMIS, NDA, BPI, BFAR, SRA, PCA, NFA, FPA, BAPS • DILG			

advancement of food industry 17. Identify each government agencies and understand their mandate in formulating food policies and regulations				

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COURSE TITLE	METHODS OF RESEARCH IN FOOD SCIENCE AND TECHNOLOGY			
COURSE DESCRIPTION	Introduction to research proposal writing, research methodologies, and foundational research theories and protocols.			
COURSE CREDIT	3 units			
CO-REQUISITE	Food Product Development and Innovation			
Intended Learning Outcomes	Topics	Teaching/Learning Activities	Assessment	Resources
1. Understand research terminologies. 2. Understand the ethical principles of research, ethical challenges and approval processes 3. Understand the philosophies and approaches used in research related to the food science and technology 4. Describe quantitative, qualitative and mixed methods approaches to research 5. Formulate and clarify research questions 6. Identify the components of a literature review process 7. Critically analyze published research 8. Design a research protocol 9. Acquire the skills to negotiate access to data and know the techniques to obtain primary and secondary data 10. Make informed decision on the statistical analysis to be used	Introduction to research and the research process • Concept of Research • Objectives and requirements • Definitions • Values of research Research ethics and integrity Quantitative, qualitative and mixed methods research The Research Process • Characteristics of research • Problem Identification and sources Tools of Research • Gathering of information • Use of library & other resources Planning the research project (design, data collection and analysis)	Lecture Interactive class discussion Brainstorming Library work/research	Quizzes Recitation Topic defense Peer evaluation Research proposal	LCD Projector Smart TV Laptop

11. Develop long-life learning skills in research report presentation				

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COURSE TITLE	FOOD ENGINEERING			
COURSE DESCRIPTION	Engineering concepts and principles as applied to food processing			
COURSE CREDIT	5 units (3 h lecture, 6 h laboratory)			
PREREQUISTE	Food Processing 1			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Describe the common unit operations involved in food processing. 2. Apply the principles of mass and energy balance to food processing systems. 3. Describe operating principles of food and beverage processing, handling and packaging systems. 4. Describe the construction and operating principles of heating and cooling food processing systems, boilers, pumps and heat exchangers, pneumatic fluid power and vacuum systems. 5. Explain Newtonian and non-Newtonian behavior of fluids and their relevance to food rheology principles. 6. Critique recent advances and innovations in food engineering and technology related to safety, quality assurance and health.	Introduction • Course goals, outcomes, and requirements • Overview of the course Review of Mathematical Principles and Applications in Food Processing Units and Dimensions Material and Energy Balances Physical properties of food materials Fluid flow • Rheology • Newtonian and non-newtonian fluids • Pumps Heat transfer • Thermodynamic concepts • Conduction • Convection • Radiation • Heat exchangers Energy use in food processing Modeling in food engineering	• Lecture and discussion • Diagnostic Exercises • Assigned readings • Reflections/journals Laboratory exercises • Tools of engineering • Heat and mass balance • Physical properties of foods • Fluid pressure and continuity law, lab demonstration of fluid flow • Friction losses and pump power • Steady- and unsteady-state heat transfer • Unsteady-state heat transfer (continued) and natural convection • Forced convection and radiation • Heat exchanger calculations • General method of process calculation • Formula method of process calculation	• Quizzes • Examination • Laboratory Report • Problem Sets	LCD/TV monitor Laptop Pilot food plant/food processing laboratory

	Emerging technologies • Nanotechnology • Membrane technology • Plasma technology • Extraction (solid-liquid, supercritical fluid) • Ultrasonics Food engineering in human health			

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Weiss, J., Takhistov, P. and McClements, D.J., 2006. Functional materials in food nanotechnology. *Journal of food science*, *71*(9).

COURSE TITLE	BASIC NUTRITION			
COURSE DESCRIPTION	Fundamentals of nutrition science as they relate to human life and growth. It includes the study of nutrients-their nature, functions, interrelationships and utilization in the body, food sources, requirements and deficiencies.			
PREREQUISITE	Basic Food Preparation, General Biochemistry			
COURSE CREDIT	3 units (3h lecture)			
INTENDED LEARNING OUTCOME	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Define and explain common terms and basic concepts in nutrition. 2. Identify key events and relevant individuals in the field of nutrition. 3. Discuss the characteristics of food and food quality. 4. Identify the factors that affect food choices. 5. Discuss the three principles of diet planning and how each principle helps in diet planning. 6. Enumerate the ten nutritional guidelines for Filipinos. 7. Compute nutrient adequacy based on RENI. 8. Distinguish health claims from functional claim. 9. Identify the basic concepts and definitions in nutrition assessment. 10. Describe the characteristics and use of each method of evaluating. 11. Perform basic calculations:DBW;BMI; WC;WHR and macronutrient distribution 12. Discuss the digestion process.	Introduction to Nutrition • Definition of Terms • History of Nutrition • Characteristics of food and food quality • Factors that affect food choices Basic Tools In Nutrition • Description, uses and interpretation of: • Basic Food Guides, food pyramids and dietary guidelines • Philippine Dietary Recommended Intake • Food Exchange List • Food Composition Tables • Nutrition Labels Use of ICT in Nutrition • FCT and menu Evaluation • E-Calc • Nutribase • Calorie Counter • iFNRI Nutrition Assessment • Basic Concepts and Definitions • Four General Methods of Nutrition Assessment	• Lecture and discussion • Meal planning • Board exercises • Demonstration/simulation • Assigned readings	• Quizzes • Examination • Recitation • Reports	• LCD/TV monitor • Laptop

13. Discuss functions of carbohydrates, proteins, fats, vitamins and minerals in the body. 14. Discuss principles of weight management. 15. Discuss relation between nutrition and wellness	• Basic Dietary Calculations Digestion, Absorption and Transport • Digestion • Absorption • The Circulatory System • Regulation of Digestion and Absorption Carbohydrates • Classification • Digestion, Absorption and Metabolism • Functions • Sources • Carbohydrates in Health Promotion Proteins • Structure • Classification • Digestion, Absorption and Metabolism • Functions • Sources • Proteins in health Promotion Lipids/Fats • Classification • Digestion, Absorption and • Metabolism • Functions in the body • Sources • Fats in health • Promotion Energy Balance • Definition of terms • Measurement of Energy exchange in the body:direct and indirect calorimetry		

	• Body weight and body composition • Factors influencing the total energy requirement • Energy Balance in Health Promotion Vitamins and Minerals • Classification • Function • Food Sources • Digestion, absorption and metabolism • Recommended Intakes • Effects of excessive and deficient intakes		

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COURSE TITLE	BASIC FOOD PREPARATION			
COURSE DESCRIPTION	Basic elements of food preparation			
COURSE CREDIT	3 units (2 units lecture, 1 unit laboratory)			
PREREQUISITE	None			
INTENDED LEARNING OUTCOME	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Increased knowledge on the nutritional, social, economic and other factors that affect food selection and preparation 2. Understand the principles and techniques related to acquisition, production and consumption of foods 3. Understand and apply the scientific and aesthetic principles of food preparation that lead to desired product standards 4. Practice a wide variety of food preparation techniques 5. Follow recipes and apply cooking principles using a variety of cooking methods to prepare nutrition dishes and meals, incorporating presentation and budgetary considerations	• Food selection • Sensory criteria • Nutritional criteria • Cultural criteria • Religious criteria • Psychological and sociological criteria • Food evaluation • Food preparation basics • Heating foods • Measuring ingredients • Mixing techniques • Foods • Protein – meat, poultry, fish, dairy and eggs • Phytochemicals – vegetables, fruits, soups and salads • Complex carbohydrates – cereals, flour and breads • Desserts – refined carbohydrates and fat • Water - beverages	• Lecture and discussion • Film showing Laboratory exercises: • Food measurements • Meat cookery • Poultry cookery • Fish and shellfish • Dairy cookery • Egg cookery • Fruits • Vegetables and legumes • Soups, salads and gelatin • Cereal grains and pastas • Flour mixtures • Starches and sauces • Quick breads • Yeast breads • Cakes and cookies • Pies and pastries • Candy • Frozen desserts • Beverages	• Quizzes • Examination • Recitation • Laboratory reports • Laboratory performance	• LCD/TV monitor • Laptop • Food laboratory/Kitchen

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SAMPLE ELECTIVE SYLLABUS

COURSE TITLE	FRUIT AND VEGETABLE PROCESSING			
COURSE DESCRIPTION	Preservation and Processing of Fruits and Vegetables			
COURSE CREDIT	3 units (2 h lecture, 3 hr laboratory)			
PREREQUISITES	Food Microbiology			
INTENDED LEARNING OUTCOMES	TOPICS	TEACHING/LEARNING ACTIVITIES	ASSESSMENT	RESOURCES
1. Discuss the importance of fruits and vegetable processing in solving problems related to food security. 2. Discuss the biochemical processes in raw materials during postharvest storage and processing or transformation into food products. 3. Discuss and apply the principles involved in high sugar preservation and dehydration of fruits and vegetables. 4. Discuss and apply the principles involved in juice processing and concentration, fermentation and pickling, low temperature preservation, use of food additives in food preservation and thermal processing of fruits and vegetables. 5. Examine major packaging materials and evaluate the suitability of packaging materials for	Introduction General properties of fruit and vegetables Deterioration factors and their control Methods of reducing deterioration Fruit, vegetables and health Improving the nutritional quality of processed fruits and vegetables General procedures for fruit and vegetable preservation Fruit specific preservation technologies Vegetable specific processing technologies Developments in packaging of fresh and processed fruits and vegetables	• Lecture and discussion • Assigned readings Laboratory exercises • Processing of sugar concentrates, candied fruits and dehydrated vegetables at semi commercial scale • Processing of frozen fruits and vegetables at semi-commercial scale • Processing of fruits and vegetable products with application of food additives • Juice Processing and Concentration • Thermal processing of high acid and low acid fruits and vegetable products at semi commercial scale	• Quizzes • Examination • Laboratory Report • Laboratory Performance	• LCD/TV monitor • Laptop • Pilot food plant/food processing laboratory • Physico-chemical laboratory

fruits and vegetable products. 6. Analyze the operations involved in packaging material manufacture. 7. Review legal, environmental and quality aspects associated with packaging materials and operations used in the food industry.	Bioactive compounds from vegetable and fruit by-products New technologies to maximize quality of processed fruits and vegetables			

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ANNEX D
Laboratory Equipment and Facilities

<table>
<tr><th colspan="2">Requirement</th></tr>
<tr><td colspan="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
• Product Development Laboratory
• Chemicals/Supplies Storage Room
• Instrument Room</td></tr>
<tr><td colspan="2">2. Laboratory Equipment</td></tr>
<tr><td>Can Line Equipment
• Pressure Canner Retort
• Mechanical Can Sealer
• Water Bath for Pasteurization
• Weighing Scale
• Heat Penetration Set-up</td><td>Cut-Out Testing
• Vacuum Gauge
• Seam Micrometer
• pH Meter
• Incubators
• Autoclave
• Set of glasswares (petri plates, pipettes, flasks, etc)
• Analytical balance
• Water activity meter
• Blender</td></tr>
<tr><td>Food Processing Equipment
• Fermentor
• Thermometer
• Refractometer
• Drum for Smoking
• Oven/Solar Dryer
• Moisture meter
• Salinometer
• Freezer</td><td>Food Microbiology
• Microscopes
• Autoclave
• Distillation set-up
• Bunsen burners
• Set of glasswares (petri plates, pipettes, flasks, etc)
• Incubators
• Fermentation set-up
• Isolation room or biosafety cabinet
• Anaerobic system</td></tr>
<tr><td>Sensory Laboratory
• Panel boards with controlled lights and humidity
• Small kitchen appliances (refrigerator, freezer, stove, oven, microwave, water bath, etc)</td><td>Food Laboratory for Food Product Development
• Small kitchen appliances (food processor, blender, microwave, stove, silent cutter, grinder, juicer, deep fryer, etc)
• Refrigerator
• Thermometers/Refractometers</td></tr>
</table>

Food Chemistry	Food Analysis
• Beam/Top loading balance • Analytical balance • Blender • Burner • Centrifuge • Colorimeter • Desiccators • Differential scanning calorimeter • Dryer, convection • Extruder • Flavor library • Freezer • Frequency generator • Gas stove • Gas meter • Hot plate • Metal trays • Microscope • Munsell book of colors • Nephelometer or Spectrophotometer • Proximity equilibrium cells • Refrigerator • Titration apparatus • Vacuum oven • Viscosimeter • Water Activity meter • Water bath • Water Distilling Unit • Water containers, 10-gal. capacity	• Babcock fat extraction set-up • Circulating water pump • Consistometer • Digestion apparatus for protein analysis • Dean and Stark distillation apparatus • Fat Extraction apparatus • Freezer • Fume hood • Furnace • Hydrometers • Hygrometer • Infrared Moisture balance • Nitrogen distillation apparatus • Pycnometer • Refrigerated centrifuge • Shaking water bath • Analytical balance • Air oven • Blender • Distillation set-up • Pipettor • Refrigerator • Spectrophotometer • Titration apparatus • Vacuum oven • Vortex mixer