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PEDOMAN

KURIKULUM

PROGRAM STUDI
TEKNOLOGI PANGAN

Fakultas Teknik

Universitas Pembangunan Nasional Veteran Jawa Timur

FOREWORD

The curriculum is an important factor in the educational process, determining the competence of graduates. The absence of curriculum renders the learning process ineffective. Therefore, for its existence, it is necessary to have a dynamic design, implementation and dynamic evaluation based on current development, Science, Technology and Art requirements, and competencies needed by the community and users of university graduates. Currently, the rapid development of science and technology necessitates the need for a Study Program Curriculum Document. This Curriculum Guideline is designed to facilitate teaching and learning activities within the Food Technology Study Program.

In order to prepare graduates for resilience in the face of social, cultural, workplace, and technological changes that are rapidly emerging in the era of Revolution Industry 4.0, student competencies must be strengthened in accordance with existing developments. It is necessary to develop a connection and compatibility between higher education graduates not only with the business and industrial sectors but also with the rapidly changing future. The Independent Learning Campus (*Merdeka Belajar-Kampus Merdeka*, MBKM) Curriculum was developed by the Faculty of Engineering, Universitas Pembangunan Nasional (UPN) "Veteran" East Java in alignment with the new higher education policy of the Ministry of Education and Culture through the MBKM program. The Ministry of Education, Research and Higher Education policy aims to grant students the liberty to participate in learning activities for up to three semesters outside their program of study and campus.

The MBKM policy offers students diverse opportunities to broaden their learning experiences and acquire new competencies. These opportunities include student exchanges, internships/practical work, research, independent projects, entrepreneurship activities, humanitarian projects, teaching at schools, and thematic real work courses in villages. In addition, students have the freedom to participate in learning activities outside their study program at the university with a specific amount of credit. These activities can be pursued with the guidance of lecturers, and a cooperation agreement is mandatory if they involve parties outside their study program.


The contents of this curriculum document book consist of 6 chapters starting with Introduction, Curriculum Preparation Process & Learning Outcomes, Science Groups, Courses & Study Materials, MBKM, Learning Signs & Assessment System, and Curriculum & Learning Evaluation. The Curriculum Document Book is intended to present clear and accurate information about the Food Technology Study Program, Faculty of Engineering, UPN "Veteran" East Java to the academic community.

To all those who contributed to the preparation of this Curriculum Document Book, particularly the drafting team, we sincerely express our gratitude. It is our hope that the explanations contained within will prove beneficial to the UPN "Veteran" East Java and the teaching-education process in the Food Technology Study Program. As perfection belongs solely to God, we apologize if there are any mistakes and shortcomings in the preparation of this curriculum book.

Surabaya, June 2023

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CHAPTER 1

INTRODUCTION

1.1 HISTORY OF THE ESTABLISHMENT OF THE STUDY PROGRAM

The Food Technology Study Program is part of the Faculty of Engineering – UPN "Veteran" East Java. Its establishment was based on the Rector's Decree No. SKEP/254/VII/1993 and ratified by the Joint Decree of the Indonesian Minister of Education and Culture and the Indonesian Minister of Defense and Security No. Kep/0307/U/1994 - 10/XI/1994 on November 29, 1994. In 1995, the Food Technology Study Program achieved registered status through the Decree of the Director General of Higher Education of the Ministry of Education and Culture No. 024/Dikti/Kep/1995. Additionally, on November 23, 2000, the Ministry of Education and Culture of the Republic of Indonesia, through the Decree of BAN-PT of No. 0444/AK-I-III-033/UPNPA/XI/2000 accredited the Food Technology Study Program with a rating of B. Since January 26, 2006, the Food Technology Study Program has been accredited A for 5 years from the date of determination, as per the Decree of BAN-PT Depdiknas RI No. 028/BAN-PT/Ak-IX/S1/I/2006,. Additionally, on January 21, 2008 the program received an extension of the operational permit under the Faculty of Industrial Technology with No. 355/D/T/2008. In 2011, the program obtained an operational permit from BAN-PT. In 2016, the Food Technology Study Program received a B Accreditation score. Then, in 2018, a re-accreditation was carried out a B accreditation score.

The Food Technology Study Program requires a minimum of 145 credits to complete over a standard period of 8 to 14 semesters. The scientific requirements comprise knowledge of agricultural products as biological materials, as understanding of the primary process involved in converting biological materials into commodities, familiarity with processing tools and machinery, the capability to analyze problem areas in commodity processing, expertise in conducting process engineering for novel products, proficiency in operating processing units as systems, and the skill to optimize food quality assurance systems and ensure food safety.

Along with technological advances, social and cultural developments, and the demands of the workforce, student competencies must be prepared to meet the current and future needs. In this regard, the current link and alignment must be

adjusted not only between the industrial world and the workforce, but also with future needs, which can change rapidly. The Food Technology Study Program at UPN "Veteran" East Java has implemented the MBKM curriculum since FY 2020/2021. This curriculum is based on Permendikbud Number 3 of 2020, which outlines the implementation of the MBKM curriculum. Through the MBKM curriculum, this program has implemented various activities, including student exchange programs through PERMADI, PERMATA SAKTI, and PERMATA PANGAN, entrepreneurship, internships, independent studies, KKN-Tematik, village assistance and certified internships with industry partners and World of Business, World of Industry (*Dunia Usaha Dunia Industri*, DUDI)

1.2 VISION AND MISSION OF THE STUDY PROGRAM

1.2.1 Vision

To achieve excellence in the field of food technology and industry by utilizing local resources, gaining national and international recognition, and fulfilling the role of State Defense by 2029.

1.2.2 Mission

1. Organize education and develop skilled human resources in the field of food technology and industry with entrepreneurial aspirations, while prioritizing the values of state defense.
2. Conduct research, development, and implementation of food technology innovations using local resources that adhere to national and international standards for health and food safety.
3. Carry out community service by teaching, training, and disseminating research results in the field of food technology science that utilizes local resources as much as possible.
4. Enhancing strategic cooperation among academia, society, government, and national and international food industry sectors.

1.3 OBJECTIVES OF STUDY PROGRAM

Table 1. Educational Objectives of Food Technology Study Program

Code	Description of Educational Objectives of Study Program (<i>Tujuan Pendidikan Program, TPP</i>)
TPP-1	Producing graduates who are competent in the field of food technology and industry, possess an entrepreneurial spirit, and uphold the values of state defense.
TPP-2	Producing graduates who possess the necessary skills to conduct research, develop, and apply innovative food technologies that satisfy local resources' health and food safety aspects, alongside adhering to national and international quality standards.
TPP-3	Producing graduates capable of providing community service through teaching, training, and the sharing of research findings utilizing food science technology that maximizes the use of local resources.
TPP-4	Producing graduates who can effectively communicate and establish cooperation within the community, government, as well as the national and international food industry sectors to build partnerships in the field of food technology.

1.4 GRADUATE COMPETENCIES

1.4.1 Graduate Profile

Graduates of undergraduate programs in food science and technology can pursue careers in industries related to the application of food science and technology. These industries include the food industry (small, medium, or large), upstream agro-industry, food machinery industry, culinary industry, food distribution and ingredient industry, packaging industry, research institutions, educational institutions, financial institutions, and government agencies. Food science and technology graduates have various employment opportunities in the food industry, such as Production Planning and Inventory Control, production, new product development, food quality assurance and control, regulation, warehousing, purchasing/procurement, marketing, and food processing machinery. Additionally, they can find work in government agencies, including formulation of food policies and supervision, and guidance/counseling of the food industry. Graduates have the option to either pursue further education at the master's level or explore entrepreneurship opportunities within the food sector. To ensure a targeted

education approach, the study program should develop a distinctive graduate profile that is reflected in the curriculum's design.

Table 2 Graduate Profile and Graduate Profile Description

No.	Graduate Profile (<i>Profil Lulusan, PL</i>)	Graduate Profile Description
1	PL-1: Expert	<ul style="list-style-type: none"> - Food Technologist - Food Safety Expert - Food Industry Consultant
2	PL-2: Manager	<ul style="list-style-type: none"> - Production Manager - Manager Quality Control / Assurance - Manager Research and Development - Production Planning and Inventory Control Manager - Food Marketing Manager
3	PL-3: Government Employee	<ul style="list-style-type: none"> - Civil Servant - Employees at agencies such as BPOM, BSN, and BRIN - State-Owned Enterprise Employee - Extension Workers
4	PL-4: Academics	<ul style="list-style-type: none"> - Teacher - Laboratory technician
5	PL-5: Entrepreneur	<ul style="list-style-type: none"> - Entrepreneur

Table 3 Correlation of Graduate Profile and Educational Objectives of Study Programs

No.	Graduate Profile (<i>Profil Lulusan, PL</i>)	Educational Objectives of Study Program (<i>Tujuan Program Studi, TPP</i>)			
		TPP-1	TPP-2	TPP-3	TPP-4
1	PL-1	✓	✓		
2	PL-2		✓		✓
3	PL-3		✓	✓	
4	PL-4			✓	✓

No.	Graduate Profile (<i>Profil Lulusan, PL</i>)	Educational Objectives of Study Program (<i>Tujuan Program Studi, TPP</i>)			
		TPP-1	TPP-2	TPP-3	TPP-4
5	PL-5	✓			✓

1.4.2 Competencies and Learning Outcomes

With reference to the formulation of the general description of Indonesian National Qualification Framework (*Kerangka Kualifikasi Nasional Indonesia, KKNI*) level six (Presidential Regulation Number 8 of 2012), graduates of food science and technology undergraduate programs should demonstrate competency in three key areas: mastery of general and specific science; general and specific work skills; and attitude and responsibility aspects. The general work skills and attitude/responsibility aspects of graduates from undergraduate programs refer to Permendikbud Number 3 of 2020. Aspects of mastery of specific science and work skills, as well as attitudes and responsibilities for graduates of food science and technology undergraduate programs are presented in Table 1. These graduate competencies are further formulated in the Graduate Learning Outcomes (*Capaian Pembelajaran Lulusan, CPL*). Study programs can modify or add to the formulation of these CPL, which are adjusted to meet the distinctiveness that they aim to achieve, in accordance with the policies of their respective universities, as well as the vision, mission, and objectives of the study program. This section outlines the competencies of graduates, including statements of graduate profiles and Graduate Learning Outcomes.

CHAPTER 2

CURRICULUM DEVELOPMENT PROCESS & LEARNING OUTCOMES

In order to realize the quality and identity of the Indonesian nation in relation to the education and training system as well as the national human resource improvement program, Food Technology Study Program prepares the Curriculum Guidelines 2022 to achieve the vision and mission of the study program through the stages of curriculum preparation process and refers to several basic policies from the government. The higher education system in Indonesia comprises four main stages: input; process; output; and outcomes. A successful learning process equires various elements, including: (1) precise learning outcomes; (2) a well-organized university organization; (3) transparent and accountable university management; (4) availability of university learning designs in the form of unambiguous curriculum documents that meet labor market needs; (5) competent and professional academic and non-academic human resources; (6) availability of adequate infrastructure and learning facilities. By incorporating the six elements, universities will be able to develop a healthy academic climate that will lead to the achievement of a professional academic community.

The pursuit of an academic environment and society's advancement is internally guaranteed by the Higher Education. Therefore, the government through the Ministry of Research, Technology and Higher Education requires universities to carry out a consistent and accurate quality assurance process to generate competent graduates. With a solid educational foundation, the expectation is that highly qualified graduates will emerge. Some indicators that are often used to assess the success of higher education graduates are (1) grade point average (GPA); (2) duration of study and (3) predicate of graduation. However, these factors alone do not guarantee success. To achieve success, universities must ensure that their graduates can be employed in the job market. The accomplishment of Higher Education lies in its ability to prepare graduates for employment and recognition in the labor market and in society.

2.1 FOUNDATION FOR CURRICULUM DEVELOPMENT

Curriculum design, lecture materials, teaching and learning processes, and management of the academic atmosphere refer to the vision, mission, goals, and objectives that have been set, and it is also guided by:

- (i) Minister of Education Decree No. 045/U/2002, outlining the Core Curriculum for Competency-Based Higher Education;
- (ii) Permendikbud No. 49 of 2014, concerning National Higher Education Standards, which was updated by Permenristekdikti No. 44 of 2015, concerning National Higher Education Standards;
- (iii) The Competency Standards for Food Science and Technology Curriculum according to the Indonesian National Qualification Framework;
- (iv) The Education Standards for Bachelor of Food Technology / Agricultural Product Technology formulated by the Indonesian Food Technology Expert Association (PATPI) are integrated into a graduate profile including attitudes, main competencies, special competencies, and knowledge;
- (v) The Strategic Plan of UPN "Veteran" East Java, 2020-2024;
- (vi) Strategic Plan of Faculty of Engineering, UPN "Veteran" East Java Year 2020-2024;
- (vii) Strategic Plan of Food Technology Study Program, Faculty of Engineering, UPN "Veteran" East Java Year 2020-2024.

Sociologically, the Food Technology Study Program is one of the higher education stakeholders in its field, which cannot be separated from the influence of other stakeholder components which include:

- (i) The Food Technology Study Program academic community includes the program management under the Rectorate, which plays a role in determining the direction and development of the Food Technology Study Program curriculum;
- (ii) Regional, national, and international food and/or agricultural product technology professional organizations;
- (iii) Food Technology Study Program alumni with practical experience implementing science and technology, especially in the field of food technology, both in the workplace and within their community;
- (iv) Private and government-owned industries in the field of food technology;
- (v) Government departments and non-departments in the field of food technology;

- (vi) The general public with an interest in the implementation of food science and technology.

The Food Technology Study Program in accordance with its vision and mission is committed to produce graduates who excel in the field of food technology and industry and have the character of state defense, so the curriculum that is built contains these values as the main characteristics of graduates of the program. The curriculum is based on the Education Standards for a Bachelor's degree in Food Technology/Agricultural Product Technology developed by the Indonesian Food Technologists Association (*Perhimpunan Ahli Teknologi Pangan Indonesia*, PATPI) through Decree No.03/SK-Patpi/XII/2013 (updated in 2022) on the Education Standards for a Bachelor's degree in Food Technology/Agricultural Product Technology and the government policy through Presidential Decree No. 8/2012 dated January 17, 2012 on the Equalization of Graduate Qualifications and KKNI. The curriculum also refers to the policies and directions set by the University through the Rector's Decree Number: SK/67/IX/2014. Subsequently, reviews of the curriculum were carried out in 2016, 2019 and 2021 based on the KKNI.

UPN Veteran East Java has established a policy/standard regulatory reference that serves as an educational reference through the SPMI Standard Document. The document serves as a reference basis to improve the activities of the Higher Education Tridarma, which is subsequently implemented through a strategic plan (Renstra) or operational plan (Renop) at both the university level and work unit levels.

2.2 LEARNING OUTCOME MECHANISM BASED ON SKKNI-PATPI

The learning outcomes of the curriculum for the study program are based on the educational standards set by the government. This educational standard is the minimum standard for the field of food science and technology at the undergraduate level, which includes graduate competency standards, content standards, learning process standards, standards for educators and educational personnel, facilities and infrastructure standards, management standards, and financing standards by referring to Permendikbud Number 3 of 2020 concerning SNPT.

In accordance with the formulation of the general description for KKNI level six (Presidential Regulation Number 8 of 2012), graduates of undergraduate food

science and technology programs must fulfil three aspects of competence: general and specific work skills, mastery of general and specific science, and attitudinal aspects. The attitudes and general skills of graduates from undergraduate education programs refer to Permendikbud Number 3 of 2020.

Table 4 Specific competencies of graduates from food science and technology undergraduate education programs in accordance with KKN level six.

Competency Aspect	Graduate Competency
Knowledge/science	Master the knowledge of food science principles (food chemistry and analysis, food microbiology, food safety, food processing engineering, food biochemistry, nutrition and health) to be applied in integrated food process design techniques.
Specialized employability (skills)	Able to apply the principles of food science and technology to enhance food ingredients and create safe, nutritious, and high-quality food products.
Attitude and Responsibility	Able to think critically and analytically, make decisions, take responsibility for their work independently, work in teams, interact with people from diverse backgrounds, organize and lead in a variety of situations, communicate orally and in writing about technical and non-technical aspects, utilize information sources, and be committed to professionalism and ethical values.

2.3 LEARNING OUTCOMES

The Graduate Learning Outcomes formulated in Table 5 represent the minimum competencies (knowledge, skills, life skills, ethics, and professionalism) for graduates of undergraduate food science and technology programs. The verbs used in the Graduate Learning Outcomes statement indicate the minimum abilities that must be mastered by students. Study programs can adjust learning outcomes to a higher cognitive or skill level by using Bloom's Taxonomy or other appropriate approaches. Study programs can modify or add Graduate Learning Outcomes as a feature that is consistent with the vision, mission, and objectives of the study

program. The formulation of Graduate Learning Outcomes by study programs should incorporate feedback from both internal and external stakeholders.

Additional learning outcomes encompass a variety of study materials, such as (a) proficiency in data literacy, which involves the ability to read, analyze, and use data; (b) proficiency in technological literacy, which involves understanding the mechanics of machines; (c) proficiency in human literacy, which entails understanding the field of humanities, communication, and design; (d) skills that foster high order thinking skills (HOTS), which include communication, collaboration, critical thinking, creative, and thinking; (e) an understanding of knowledge that can be practiced for the common good locally, nationally, and globally; and (f) additional learning outcomes and competencies that can be obtained outside of the study program through the MBKM program.

Table 5 Graduate Learning Outcomes

Code	Description of Graduate Learning Outcomes
CPL-1	Able to master the principles of food science (food chemistry and analysis, food microbiology, food safety, food engineering and processing, food biochemistry, nutrition and health, and applied food science).
CPL-2	Able to apply food science principles in an integrated manner to the food production process on an industrial scale to produce high quality, and innovative foods.
CPL-3	Able to communicate orally and in writing, work in teams, interact with people from diverse backgrounds, organize and lead in various situations.
CPL-4	Able to think critically and analytically, solve problems, take responsibility for work independently, and make appropriate decisions based on reliable information.
CPL-5	Have a commitment to ethical values, morals and national defense character as a professional in the field of food.
CPL-6	Able to identify and capitalize business/corporate opportunities and apply food processing technology, utilize information resources, and maintain professionalism and ethical values.

Table 6. Matrix of the relationship between learning outcomes of study program graduates and educational objectives of study programs

Code	Description of Study Program CPL	TPP-1	TPP-2	TPP-3	TPP-4
CPL-1	Able to master the principles of food science (food chemistry and analysis, food microbiology, food safety, food engineering and processing, food biochemistry, nutrition and health, and applied food science).	✓	✓		
CPL-2	Able to apply food science principles in an integrated manner to the food production process on an industrial scale to produce high quality, and innovative foods.	✓	✓		
CPL-3	Able to communicate orally and in writing, work in teams, interact with people from diverse backgrounds, organize and lead in various situations.			✓	✓
CPL-4	Able to think critically and analytically, solve problems, take responsibility for work independently, and make appropriate decisions based on reliable information.	✓	✓		
CPL-5	Have a commitment to ethical values, morals and national defense character as a professional in the field of food.	✓			✓
CPL-6	Able to identify and capitalize business/corporate opportunities and apply food processing technology, utilize information resources, and maintain professionalism and ethical values.	✓	✓		

2.4 CORE STUDY MATERIALS

The core study materials are grouped into seven categories, namely (1) food chemistry and analysis), (2) food microbiology, (3) food safety, (4) food processing and engineering, (5) food biochemistry, nutrition and health, (6) applied food science, and (7) life skills, attitude and professionalism. These Graduate Learning Outcomes serve as a guide in developing Course Learning Outcomes.

Table 7 Study materials, coverage of study material minimum, essential learning outcomes and Bloom's Taxonomy Level (BTL)

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ₁
Food Chemistry and Analysis (BK-1)	Chemical structure, functions and characteristics of food components including water, carbohydrates, proteins, oils/fats, micro-components (vitamins, minerals, toxic components and bioactive components), and food additives; chemical changes that occur during food processing, storage, and usage, and their effects on the characteristics and shelf life of food; proximate analysis of food components (theory and practice) and principles of instrumentation analysis (spectroscopy and chromatography)	1.1	Explain the chemical structures of food components including their functions, main chemical reactions, and relationship with the characteristics of food ingredients and products.	C2
		1.2	Apply the principles of food chemistry to control chemical reactions that occur in food ingredients.	C3
		1.3	Describe the main chemical reactions that influence deterioration and limit the shelf life of food ingredients and products.	C2
		1.4	Explain the technical principles and methods of chemical analysis of food components.	C2
		1.5	Have skills in performing basic chemical and applied chemical analysis techniques on food ingredients.	C4
		1.6	Select a chemical analysis technique that is appropriate to the characteristics of the material and the needs of the analysis objective.	C4
Food Microbiology (BK-2)	Damage to food products caused by microorganisms; internal and external factors affecting their growth, survival, and control; application of the principles of food preservation and processing using microorganisms; qualitative and	2.1	Identify the types of microorganisms found in foods, including beneficial, pathogenic, and spoilage microorganisms, and their growth conditions.	C2
		2.2	Describe appropriate conditions for killing or controlling spoilage and pathogenic microorganisms in food.	C2

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ₁
	quantitative methods of microbiological analysis; use of microorganisms in the food industry.	2.3	Explain the influence of environmental conditions (internal and external) on the adaptability, growth and inactivation of microbes.	C2
		2.4	Apply the principles of preservation (traditional and modern; thermal and non-thermal) and food processing using microorganisms (fermentation process).	C3
		2.5	Apply microbiological analysis methods to identify microorganisms in food.	C3
		2.6	Select appropriate microbiological analysis methods to identify microorganism in food.	C4
		2.7	Utilization of microorganisms for the food industry	C6
Food Safety (BK-3)	Principles of food safety; microbiological, chemical and physical hazards; sanitation and hygiene practices for control of pathogenic microbes in food production; sampling techniques for ensuring food safety; and implementation of food safety systems (PRP, GMP, SSOP, HACCP, ISO, FSMS)	3.1	Explain the occurrence of food contamination caused by microbiological, chemical, and physical contaminants	C2
		3.2	Evaluate appropriate conditions, including sanitation and hygiene practices, to control pathogenic and spoilage microorganisms in food production.	C2
		3.3	Explain and evaluate the microbiological standards for food using appropriate sampling techniques	C4
		3.4	Develop a plan for a food safety system in a food industry.	C5
Food Processing and Engineering (BK-4)	Principles of food engineering (transport processes, fluid flow, heat transfer, and food processing, mass	4.1	Explain the principles of food engineering (heat and mass transfer, fluid flow, and thermodynamics).	C2

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ₁
	transfer, thermodynamics, principles of mass and energy equilibrium, separation processes, modelling, and simulation), principles of food processing (unit operations and food processing equipment), knowledge of raw materials and their effect on food processing operations, food plant design (process control and automation) and utilities (refrigeration, steam, water and waste handling, and electricity)	4.2	Formulate mass and energy balance for a food production process.	C4
4.3		Explain the sources and diversity of raw food materials and their influence on food processing operations.	C2	
4.4		Design production processes on an industrial scale to produce safe and quality food products.	C4	
4.5		Use unit operations and food processing equipment to produce a food product on a laboratory or pilot plant scale.	C3	
4.6		Explain the effect of preservation and processing methods on the quality of food products.	C2	
4.7		Select the type of food packaging and packaging methods that are suitable for the food's properties, processing and storage conditions.	C4	
4.8		Explain the principles and practices of cleaning and sanitizing food processing facilities.	C2	
4.9		Explain the principles and methods of food processing water treatment, as well as handling food processing waste.	C2	
Food Biochemistry, Nutrition and Health (BK-5)	Principles of biochemistry (basic concepts of biochemical structure and function relationships, reactivity, and thermodynamics),	5.1	Explain biochemical processes, basic concepts of nutrition, and the relationship between food consumption and nutritional status.	C2

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ₁
	basic principles of food nutritional value metabolism of essential nutrients (nutrient components and bioactive components needed by humans, digestive system, absorption, metabolism, interactions and functions of nutrients, nutrient and energy requirements and nutrient deficiencies), basic concepts of nutrition and the relationship between food consumption and nutritional status, the role of nutrients and bioactive compounds, and the effects of food consumption on health, the functionality of food components and laboratory techniques commonly used in applied biochemistry biological testing and the effects of processing and storage on nutrient changes.	5.2	Link food functions (nutrients and bioactive components) to human health (overnutrition or malnutrition).	C3
		5.3	Explain the biological role of food (nutrients and bioactive components) and the positive and negative effects of consuming food in its natural and processed forms on health.	C2
		5.4	Describe changes in nutrients during processing and storage.	C2
		5.5	Apply basic laboratory techniques in the biochemical analysis and biological value of food components.	C3
Applied Food Science (BK-6)				
Sensory Science	Physiological and psychological basis of sensory testing, sensory testing methods for assessing the sensory properties of foods, and experimental design and statistical methods in sensory testing.	6.1.1	Explain the basic physiology and psychology of sensory testing.	C2
		6.1.2	Apply experimental design and statistical methods to be applied in sensory testing.	C3
		6.1.3	Select appropriate sensory testing methods to solve food-related problems.	C4
	Principles of food quality assurance and control, food quality assurance system, halal assurance	6.2.1	Explain the terminology of food quality, quality assurance, and quality control.	C2

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ₁
Management Quality Assurance Food	system, and their application in the food industry	6.2.2	Apply the principles of quality assurance and quality control in the food industry.	C3
		6.2.3	Implement certain food product standards and specifications.	C3
		6.2.4	Evaluate the implementation of food quality control systems (e.g. statistical process control).	C5
Regulations and Legislation Food	Regulations related to the production and marketing process of food products (food security and safety, national food supervision management system, food labeling, halal food production, food additives and food contaminants, and other technical regulations), the mechanism for formulating national regulations, and introduction to the Codex Alimentarius Commission and its role	6.3.1	Describe the government regulation required for food production and marketing.	C2
		6.3.2	Describe the process of formulating food policies and regulations.	C2
		6.3.3	Apply applicable food laws and regulations in accordance with the context.	C3
		6.3.4	Analyze specific cases and relate them to the applicable food regulations.	C4
Life Skills, Ethics and Professionalism (BK-7)				
Oral and Written Communication	Communication techniques to convey ideas of a technical and non-technical nature in written, oral, and visual formats in scientific forums	7.1.1	Write a technical paper appropriate to the context of the problem being studied.	C4
		7.1.2	Demonstrate oral presentation in a scientific forum.	C4
		7.1.3	Prepare visual food science information materials for diverse audiences.	C4
Critical Thinking and Problem Solving	Scientific reasoning and problem solving analytical and critical decision-making in relation to technical aspects train	7.2.1	Utilize sources of information and scientific evidence.	C3
		7.2.2	Apply critical and analytical thinking skills to solve problems and make decisions.	C3

Study Material	Coverage of Study Materials Minimum	Code	After completing undergraduate education field of food science and technology, students are able to	BTL ¹
		7.2.3	Apply the principles of food science to practical problems and real-world situations.	C4
		7.2.4	Select appropriate analysis techniques when faced with practical/real-world problems.	C4
		7.2.5	Evaluate scientific evidence and process it into information to make conclusions or decisions.	C5
Professionalism and Leadership	Organization and management of projects; skills working in teams, interacting with people from diverse backgrounds and leading groups, ability to work under pressure, professional ethics in the food industry	7.3.1	Demonstrate the ability to work independently, and in teams, and as a group leader.	C4
		7.3.2	Perform tasks/projects with good time management to achieve set goals/targets.	C3
		7.3.3	Demonstrate social and cultural skills in a diverse society.	C3
		7.3.4	Describe examples of professionalism and ethics in food science.	C3

¹BTL (Bloom's Taxonomy Levels): knowledge (C1), understanding (C2), application (C3), Analysis (C4), Evaluation (C5) and Synthesis (C6s)

Table 8. Study material relationship matrix based on graduate learning outcomes

CPL	CPL Description	Study Material (BK)						
		BK-1	BK-2	BK-3	BK-4	BK-5	BK-6	BK-7
CPL-1	Able to master the principles of food science (food chemistry and analysis, food microbiology, food safety, food engineering and processing, food biochemistry, nutrition and health, and applied food science).	✓	✓	✓	✓	✓	✓	
CPL-2	Able to apply food science principles in an integrated manner to the food production process on an industrial scale to			✓				

CPL	CPL Description	Study Material (BK)						
		BK-1	BK-2	BK-3	BK-4	BK-5	BK-6	BK-7
	produce high quality, and innovative foods.							
CPL-3	Able to communicate orally and in writing, work in teams, interact with people from diverse backgrounds, organize and lead in various situations.							✓
CPL-4	Able to think critically and analytically, solve problems, take responsibility for work independently, and make appropriate decisions based on reliable information.							✓
CPL-5	Have a commitment to ethical values, morals and national defense character as a professional in the field of food.							✓
CPL-6	Able to identify and capitalize business/corporate opportunities and apply food processing technology, utilize information resources, and maintain professionalism and ethical values.							✓

2.5 STRATEGY FOR ACHIEVING THE STANDARD

The learning content standards contained in SPMI are used to achieve academic standards as stated in the Quality Manual document for Learning Content Standards. The following are some of the efforts that have been made: curriculum review facilitated by UPPS, updating of learning tools, at the end of the semester a lecturer plotting meeting is held according to competence. There are libraries at the university level and reading rooms at the faculty level, laboratory support to support the implementation of education, available roadmap documents that accommodate community service and research activities, and support for internal and external grants for both research and community service. Facilitating online learning facilities for lecturers. Facilitating incentives for the production of educational videos.

The study program strategy to achieve an increase in the quality of graduates produced, through:

- Improving the quality of the learning process.
- Improving the quality of the final project mentoring process.
- Improving the relevance of the curriculum to the needs of graduates.
- Cultivating foreign values through curricular and extracurricular activities.

CHAPTER 3

CLUSTERS OF KNOWLEDGE, COURSES AND STUDY MATERIALS

3.1 CLUSTERS OF KNOWLEDGE AND GROUPING OF LECTURERS' EXPERTISE

The Food Technology Study Program of UPN Veteran East Java currently has a total of 19 lecturers who are divided into 5 groups of expertise groups, namely Food Chemistry and Analysis, Biochemistry and Food Nutrition, Microbiology, and Food Safety, Food Process Engineering, and Applied Food Science. The list of lecturers and their areas of expertise is shown in the table below.

Table 9: Group of lecturers based on area of expertise

No.	Area of Expertise	Lecturer Name
1	Food Chemistry and Analysis	Coordinator: Dr. Dedin F. Rosida, S.TP, M.Kes Member: - Ir. Ulya Sarofa, MM - Dr. Yushinta A. Sanjaya, S.Pi, MP
2	Biochemistry and Food Nutrition	Coordinator: - Dr. drh. Ratna Yulistiani, MP Member: - Riski Ayu A, S.TP, M.Sc - Dr. Yunita Satya P, SP, M.Kes - Dina Mustika Rini, S.TP, M.Sc, Ph.D
3	Microbiology and Food Safety	Coordinator: Dr. Ir. Sri Winarti, MP Member: - Anugerah Dany, S.TP, M.Sc, M.P - Dr. Muhammad Alfid K, S.Pi, M.Si - Rahmawati, S.Pi, M.Sc
4	Food Process Engineering	Coordinator: Dr. Rosida, S.TP, MP Member: - Luqman A. W, S.TP, MP - Andre Yusuf T.P., S.TP, M.Sc
5	Applied Food Science	Coordinator: Dr. Dra. Jariyah, MP Member: - Dr. Hadi Munarko, S.TP, M.Si. - Ifwarisan Defri, S.TP, M.Si,

3.2 COURSES LIST AND CLASSIFICATION

Table 10 List of courses and course classification

SEMESTER 1

Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
UV141111	-	English	3	0	3	W	MKU	-	-
UV141107	-	Pancasila Education	2	0	2	W	MKU	-	-
UV141110	-	State Defense	3	0	3	W	MKU	-	-
FT141101	-	Calculus I	3	0	3	W	MKF	-	-
FT141103	-	Physics	3	0	3	W	MKF	-	-
FT141104	-	Basic Chemistry	2	1	3	W	MKF	-	-
TP141101	TP2313101	Biology	2	1	3	W	MK-PS	MKP	-
TOTAL			18	2	20				

SEMESTER 2

Old Code	New Code	Subject name	Credit			W/P	Subject Type	Science domain	Prerequisites
			T	P	J				
UV141109	-	Bahasa Indonesia	2	0	2	W	MKU	-	-
UV141108	-	Citizenship	2	0	2	W	MKU	-	-
FT141102	-	Calculus II	3	0	3	W	MKF	-	-
UV141101		Islamic religion	2	0	2	W	MKU	-	-
UV141102		Christianity							
UV141103		Catholic religion							
UV141104		Hinduism							
UV141105		Buddhism							
UV141106		Khong Hu Cu religion							
TP141102	TP231302	General Microbiology	3	0	3	W	MK-PS	MKP	-
TP141103	TP231501	Introduction to Food Technology	2	0	2	W	MK-PS	IPT	-
TP141104	TP231101	Advanced Chemistry	2	0	2	W	MK-PS	KAP	-
TP141105	TP231102	Food Ingredient Knowledge	3	1	4	W	MK-PS	KAP	-
TP141109	TP231103	Physical Chemistry and Colloids	2	0	2	W	MK-PS	KAP	-
TOTAL			21	1	22				

SEMESTER 3

Old Code	New Code	Subject name	Credit			W/P	Subject Type	Science domain	Prerequisites
			T	P	J				
TP141106A	TP231401	Food Biochemistry	3	1	4	W	MK-PS	BGP	TP141101, FT141104
TP141107	TP231104	Chemical Analysis	2	0	2	W	MK-PS	KAP	-
TP141108A	TP231303	Food Microbiology & Processing	3	1	4	W	MK-PS	MKP	-
TP141110	TP231201	Industrial Management Food	3	0	3	W	MK-PS	RPP	-
TP141123	TP231502	Statistics	2	0	2	W	MK-PS	IPT	-
TP141118	TP231202	Principles of Food Engineering	2	0	2	W	MK-PS	RPP	-
TP141115	TP231203	Food Industry	3	0	3	W	MK-PS	RPP	-

		Operations Unit I							
TOTAL			18	2	20				

SEMESTER 4

Old Code	Code New	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
TP141114	TP231402	Nutrition Science	3	0	3	W	MK-PS	BGP	TP141106
TP141126	TP231204	Food Industry Operations Unit II	3	1	4	W	MK-PS	RPP	TP141115
TP141116	TP231105	Food Chemistry	3	0	3	W	MK-PS	KAP	TP141104
TP141117	TP231106	Food Analysis	3	1	4	W	MK-PS	KAP	-
TP191137	TP231503	Trial Design	3	0	3	W	MK-PS	IPT	TP141123
TP141127	TP231205	Food Processing Technology	3	1	4	W	MK-PS	RPP	-
TP141240	TP231403	Functional Food	2	0	2	W	MK-PS	BGP	-
TOTAL			20	3	23				

SEMESTER 5

Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
TP141137	TP231304	Food Fermentation Technology	2	0	2	W	MK-PS	MKP	-
TP141124	TP231305	Thermal Process of Food	3	0	3	W	MK-PS	RPP	-
TP141149	TP231206	Industrial Design Processing	2	0	2	W	MK-PS	RPP	-
TP141135	TP231306	Management and Quality Control Food	3	0	3	W	MK-PS	MKP	-
FTI3102	TP231504	Research Methodology	3	0	3	W	MK-PS	IPT	-
TP141156	TP231505	Sensory Evaluation	2	1	3	W	MK-PS	RPP	TP141103
TP141119	TP231506	Food Legislation	2	0	2	W	MK-PS	IPT	-
TP141147	TP231307	Sanitation & Food Safety	2	0	2	W	MK-PS	MKP	-
TP141145	TP231507	Food Product Development	2	2	3	W	MK-PS	IPT	-
TOTAL			21	3	24				

SEMESTER 6

Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
FT141107	-	Engineering Economics	2	0	2	W	MKF	-	-
UV141114	-	Entrepreneurship	3	0	3	W	MKU	-	-
UV21013		Leadership	2	0	2	W	MKU	-	
TP141148	TP231207	Packaging and Storage	3	0	3	W	MK-PS	RPP	-
UV141115	-	Community Service	0	2	2	W	MKU	-	-
FT141108	-	Fieldwork Practice	0	2	2	W	MKF	-	-
		Elective Course 1	2	0	2	P	MK-PS	-	-
		Elective Course 2	2	0	2	P	MK-PS	-	-
		Elective Course 3	2	0	2	P	MK-PS	-	-
		Elective Course 4	2	0	2	P	MK-PS	-	-
TOTAL			18	4	22				

SEMESTER 7									
Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
		Elective Course 1	2	0	2	P	MK-PS	-	-
		Elective Course 2	2	0	2	P	MK-PS	-	-
		Elective Course 3	2	0	2	P	MK-PS	-	-
		Elective Course 4	2	0	2	P	MK-PS	-	-
TOTAL			8	0	8				

SEMESTER 8									
Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
TP141150	TP234001	Thesis	6	0	6	W	MK-PS	-	-
TOTAL			6	0	6				

ELECTIVE COURSES									
Old Code	New Code	Subject name	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
TP141254	TP232508	Coffee, Tea & Cocoa Processing Technology	2	0	2	P	MK-PS	IPT	TP141105
TP141244	TP232509	Flavor Technology	2	0	2	P	MK-PS	IPT	TP141105
TP190321	TP232510	Spice and Seasoning Technology	2	0	2	P	MK-PS	IPT	TP141105
TP190421	TP232511	Bakery Technology	2	0	2	P	MK-PS	IPT	-
TP190521	TP232512	Sugarcane Processing Technology	2	0	2	P	MK-PS	IPT	TP141106 and TP141101
TP190621	TP232513	Tech. Legumes, Cereals and Tubers	2	0	2	P	MK-PS	IPT	TP141105
TP170821	TP232514	Food of the Archipelago	2	0	2	P	MK-PS	IPT	-
TP141232	TP232515	Dairy Technology	2	0	2	P	MK-PS	IPT	TP141105
TP141233	TP232516	Meat and Fish Technology	2	0	2	P	MK-PS	IPT	TP141105
TP141234	TP232517	Fruit and Vegetable Technology	2	0	2	P	MK-PS	IPT	TP141105
TP141243	TP232308	Food Biotechnology	2	0	2	P	MK-PS	MKP	-
TP141212	TP232518	Food Service Industry	2	0	2	P	MK-PS	IPT	-
TP141213	TP232519	Marketing Management	2	0	2	P	MK-PS		-
TP191245	TP232309	Waste Utilization and Handling Technology	2	0	2	P	MK-PS	MKP	-
TP141221	TP232107	Food Additives and Toxicology	2	0	2	P	MK-PS	KAP	-
TP191247	TP232208	Machine and Tool Design	2	0	2	P	MK-PS	RPP	-
TP141238	TP232404	Food Nutrition Evaluation and Processing	2	0	2	P	MK-PS	BGP	-
TP141239	TP232520	Operational Research	2	0	2	P	MK-PS	RPP	-
TP141228	TP232108	Carbohydrate Technology	2	0	2	P	MK-PS	KAP	-

TP141230	TP232109	Fats/Oil Technology	2	0	2	P	MK-PS	KAP	-
-	TP232521	Halal Product Assurance System	2	0	2	P	MK-PS	IPT	-

ENRICHMENT COURSES

Old Code	New Code	Subject type	Credit			W/P	Subject type	Science domain	Prerequisites
			T	P	J				
TP220457		Public Relations	2	0	2	P	MKP-PS	KIP	-
TP220458		Community development	2	0	2	P	MKP-PS	KIP	-
TP220459		Interpersonal Communication	2	0	2	P	MKP-PS	KIP	-
TP220460		Community Outreach	2	0	2	P	MKP-PS	KIP	-
TP220461		Participatory planning and evaluation	2	0	2	P	MKP-PS	KIP	-
TP220462		Organizational Skills	2	0	2	P	MKP-PS	KIP	-
TP220463		Innovation and Creativity	2	0	2	P	MKP-PS	KIP	-
TP220464		Geopolitics and natural resources	2	0	2	P	MKP-PS	KIP	-
TP220465		T. Public Health Management	2	0	6	P	MKP-PS	KIP	-
TP220466		Creative Economy	2	0	2	P	MKP-PS	KIP	-
TP220467		Talent and Professional Development	2	0	2	P	MKP-PS	KIP	-
TP220468		Critical Thinking	2	0	2	P	MKP-PS	KIP	-
TP220469		Scientific Communication	2	0	2	P	MKP-PS	KIP	-
TP220470		Food Entrepreneurship	2	0	2	P	MKP-PS	KIP	-
TP220471		Business Strategy	2	0	2	P	MKP-PS	KIP	-
TP220472		Digital Marketing	2	0	2	P	MKP-PS	KIP	-
TP220473		Event Management	2	0	2	P	MKP-PS	KIP	-
TP220474		Consumer Behavior	2	0	2	P	MKP-PS	KIP	-
TP220475		Teamwork	2	0	2	P	MKP-PS	KIP	-
TP220476		Diversity and Multiculture	2	0	2	P	MKP-PS	KIP	-

Description:

W	: <i>Wajib</i> (Compulsary courses)
P	: <i>Pilihan</i> (Elective courses)
MKU	: <i>Mata Kuliah Universitas</i> (Common university course)
MKF	: <i>Mata Kuliah Fakultas</i> (Common faculty course)
MK-PS	: <i>Mata Kuliah Program Studi</i> (Compulsory study program courses)
MKP-PS	: <i>Mata Kuliah Pilihan Program</i> (Compulsory elective study program courses)
KAP	: <i>Kimia dan Analisis Pangan</i> (Food Chemistry and Analysis)
BGP	: <i>Biokimia dan Gizi Pangan</i> (Food Biochemistry and Nutrition)
MKP	: <i>Mikrobiologi dan Keamanan Pangan</i> (Microbiology and Food Safety)
RPP	: <i>Rekayasa Proses Pangan</i> (Food Process Engineering)
IPT	: <i>Ilmu Pangan Terapan</i> (Applied Food Science)
KIP	: <i>Kelompok Ilmu Pengayaan</i> (Enrichment Courses)

3.3 COURSE MATRIX AND LEARNING OUTCOMES

Table 11 Matrix of Courses associated with Learning Outcomes

No.	Code	Subject name	CPL -1	CPL -2	CPL -3	CPL -4	CPL -5	CPL -6
1st semester								
1	UV141111	English			✓			
2	UV141107	Pancasila Education			✓		✓	
3	UV141110	State Defence				✓	✓	
4	FT141101	Calculus I				✓		
5	FT141103	Physics				✓		
6	FT141104	Basic Chemistry				✓		
7	TP2313101	Biology				✓		
2nd semester								
8	UV141109	Bahasa Indonesia			✓			
9	UV141108	Citizenship					✓	
10	FT141102	Calculus II				✓		
11	UV141101 UV141102 UV141103 UV141104 UV141105 UV141106	Islamic religion Christianity Catholic religion Hinduism Buddhism Khong Hu Cu religion					✓	
12	TP231302	General Microbiology				✓		
13	TP231501	Introduction to Food Technology	✓					
14	TP231101	Advanced Chemistry				✓		
15	TP231102	Food Ingredient Knowledge	✓					
16	TP231103	Physical Chemistry and Colloids	✓					
3rd semester								
17	TP231401	Food Biochemistry	✓					
18	TP231104	Chemical Analysis	✓					
19	TP231303	Food Microbiology & Processing	✓	✓				
20	TP231201	Industrial Management Food		✓				
21	TP231502	Statistics	✓					
22	TP231202	Principles of Food Engineering	✓					

No.	Code	Subject name	CPL -1	CPL -2	CPL -3	CPL -4	CPL -5	CPL -6
23	TP231203	Food Industry Operations Unit I	✓	✓				
4th semester								
24	TP231402	Nutrition Science	✓	✓				
25	TP231204	Food Industry Operations Unit II	✓	✓				
26	TP231105	Food Chemistry	✓	✓				
27	TP231106	Food Analysis	✓	✓				
28	TP231503	Trial Design	✓	✓				
29	TP231205	Food Processing Technology	✓	✓				
30	TP231403	Functional Food	✓	✓				
5th semester								
31	TP231304	Food Fermentation Technology	✓	✓				
32	TP231305	Thermal Process of Food	✓	✓				
33	TP231206	Industrial Design Processing	✓	✓				
34	TP231306	Management and Quality Control Food	✓	✓				
35	TP231504	Research Methodology	✓	✓				
36	TP231505	Sensory Evaluation	✓	✓				
37	TP231506	Food Legislation	✓	✓				
38	TP231307	Sanitation & Food Safety	✓	✓				
39	TP231507	Food Product Development	✓	✓				
6th semester								
40	FT141107	Engineering Economics						✓
41	UV141114	Entrepreneurship						✓
42	UV21013	Leadership			✓	✓	✓	
43	TP231207	Packaging and Storage	✓	✓				
44	UV141115	Community Service	✓	✓	✓	✓	✓	
45	FT141108	Fieldwork Practice	✓	✓	✓	✓	✓	
46		Elective Course 1	✓	✓				

No.	Code	Subject name	CPL -1	CPL -2	CPL -3	CPL -4	CPL -5	CPL -6
47		Elective Course 2	✓	✓				
48		Elective Course 3	✓	✓				
49		Elective Course 4	✓	✓				
50		Elective Course 5	✓	✓				
7th semester								
51		Elective Course 1	✓	✓				
52		Elective Course 2	✓	✓				
53		Elective Course 3	✓	✓				
54		Elective Course 4	✓	✓				
8th semester								
55	TP234001	Thesis	✓	✓	✓	✓	✓	
Elective Courses								
CT	TP232508	Coffee, Tea & Cocoa Processing Technology	✓	✓				
CT	TP232509	Flavor Technology	✓	✓				
CT	TP232510	Spice and Seasoning Technology	✓	✓				
CT	TP232511	Bakery Technology	✓	✓				
CT	TP232512	Sugarcane Processing Technology	✓	✓				
CT	TP232513	Tech. Legumes, Cereals and Tubers	✓	✓				
S	TP232514	Food of the Archipelago	✓	✓				
CT	TP232515	Dairy Technology	✓	✓				
CT	TP232516	Meat and Fish Technology	✓	✓				
CT	TP232517	Fruit and Vegetable Technology	✓	✓				
CT	TP232308	Food Biotechnology	✓	✓				
ST	TP232518	Food Service Industry	✓	✓				
S	TP232519	Marketing Management	✓	✓				
ST	TP232309	Waste Utilization and Handling Technology	✓	✓				
CA	TP232107	Food Additives and Toxicology	✓	✓				

No.	Code	Subject name	CPL -1	CPL -2	CPL -3	CPL -4	CPL -5	CPL -6
T	TP232208	Machine and Tool Design	✓	✓				
TA	TP232404	Food Nutrition Evaluation and Processing	✓	✓				
S	TP232520	Operational Research	✓	✓				
T	TP232108	Carbohydrate Technology	✓	✓				
T	TP232109	Fats/Oil Technology	✓	✓				
S	TP232521	Halal Product Assurance System	✓	✓				
Enrichment Courses								
	TP220457	Public Relations			✓			
	TP220458	Community development			✓			
	TP220459	Interpersonal Communication			✓			
	TP220460	Community Outreach			✓			
	TP220461	Participatory planning and evaluation				✓		
	TP220462	Organizational Skills			✓			
	TP220463	Innovation and Creativity				✓		
	TP220464	Geopolitics and natural resources				✓		
	TP220465	T. Public Health Management			✓			
	TP220466	Creative Economy						✓
	TP220467	Talent and Professional Development				✓		
	TP220468	Critical Thinking				✓		
	TP220469	Scientific Communication			✓			
	TP220470	Food Entrepreneurship						✓
	TP220471	Business Strategy						✓
	TP220472	Digital Marketing						✓
	TP220473	Event Management				✓		
	TP220474	Consumer Behavior						✓
	TP220475	Teamwork			✓			

No.	Code	Subject name	CPL -1	CPL -2	CPL -3	CPL -4	CPL -5	CPL -6
	TP220476	Diversity and Multiculture					✓	

3.3 COURSE DESCRIPTION AND STUDY MATERIALS

UV141111 ENGLISH

Description : English for students is designed to develop reading comprehension, listening comprehension, writing skills, and speaking skills. Introduction to vocabulary or terms commonly encountered in the field of food science and technology.

Study Material: Self introduction and introduction to general english; noun, verb and adjective; pronouns; modal verbs; present and past tenses; future and progressive tenses; perfect and perfect continuous tenses; if clause; noun clause; relative clause; conjunction; phrasal verb; comparative and passive voice; reported speech.

UV141107 PANCASILA EDUCATION

Description : Understanding Pancasila as the Basic Value of the State, the constitutional system of the Republic of Indonesia with historical, juridical, philosophical, ideological studies and understanding pancasila as an actualization paradigm in the life of society, nation, state. Understanding of the nation, state, rights and obligations of citizens, state defense, democratization, archipelago concept, human rights, regional autonomy, environment, national resilience and national strategy politics.

UV141101 ISLAMIC RELIGION

Description : Examines and provides an understanding of the nature of man who needs guidance in life, both individually and socially in order to achieve happiness in this world and the hereafter. By understanding himself and the universe, which has been given rules by its Creator, the rules are called kauniyah and tanziliyah verses. These verses are explained in detail in the discussion of aqidah, shari'ah, akhlaq and Islamic history. The main emphasis is on the application of these teachings to daily behavior, both sourced from the Qur'an and from the Sunnah of the Prophet Muhammad SAW.

Study Material: The concept of religion, the history of human understanding of God, the ability to prove the existence of God, the formation and correlation between the concepts of faith and piety, the signs of faith and piety, piety in individual and community life, the concept of man as a servant and khilafah on earth, the concept of khilafah in social life, Islam and law, human rights, and democracy, Islamic culture and civilization, akhlaq in Islam, worship in Islam, the concept of *rahmatan lil alamin*, *ukhuwah Islamiyah*, *ukhuwah insyanyiah* and *ukhuwah wathoniy*.

FT141101 CALCULUS I

Description : Functions, limits, derivatives of functions, continuity, differential calculus, applications of differential calculus, extreme values of functions, infinite series, limits of certain forms, indefinite integrals, integral of rational/irrational squares, partial integrals, integral reduction formula of rational functions, integrals and substitution method, integral of the product of two trigonometric functions.

Study Material: Real Number System, Equations and Inequalities, Functions and Limits, Derivatives, Use of Derivatives, Indefinite Integrals

FT141103 BASIC PHYSICS

Description :This course is a compulsory course that discusses physical phenomena and their application specifically to food technology.

Study Material: Magnitudes, units and dimensions, energy and the law of conservation of energy, elasticity, static and dynamic fluids, vibrations and waves, kinetic theory of gases, temperature, heat, thermodynamics law and heat transfer, electric fields and potentials, electric currents and barriers, electrical arrays, electromagnetic waves, atomic and nuclear physics.

FT141104 BASIC CHEMISTRY

Description : Discusses stoichiometry, atomic structure, periodic table, chemical bonding and molecular structure, acid and base theory, H-ion

concentration and pH, hydrolysis and anchoring mixtures, redox reactions, colligative properties of a solution, reaction rate.

Study Material: Basic particles and the development of atomic theory, chemical formulas, reaction equations and chemical calculations, the development of the periodic system of elements, solutions, enthalpy changes, and thermodynamic laws, pH, acid-base theory and its laws, hydrolysis events, anchoring solutions, and polyvalent acids and bases, redox reactions and chemical reaction equilibrium, reaction rate and colligative properties of solutions.

Practicum : Concentration, dilution, standard solution, titration, standardization, acid-alkalimetry.

TP141101 BIOLOGY

Description : Knowledge of the classification of living things, knowledge of cells and organisms, life as a whole and life at the cellular level. Function of cell organelles. Cell growth and proliferation: population growth cycle, individual (cell) growth cycle.

Study Material: Understand various things related to the classification of living things, cells, organisms, cell organelle functions, cell reproduction, and population and individual growth.

Practicum :Introduces the parts of microscope and their functions, and how to use them. Study plant cell tissues, animal cells, and microorganisms with prepare.

UV141109 INDONESIAN LANGUAGE

Description : This course is a compulsory course that discusses the development of the Indonesian language personality.

Study Material: Use Indonesian to enrich scientific thoughts, ideas, and attitudes into various forms of quality scientific works (meeting the requirements of objectivity, coherence, cohesion, effectiveness, efficiency, and communicability); critically edit various scientific works and improve them based on the results of editing; utilize skills

in Indonesian to develop themselves throughout life both orally and in writing.

UV141108 CITIZENSHIP

Description : This course is a general course in personality development in understanding about Indonesia, having an Indonesian personality, having a sense of Indonesian nationality, and loving the Indonesian homeland. Thus, it is expected to become a good and educated citizen (smart and good citizen) in the life of the community, nation, state and obey the law.

Study Material: Civic education in developing the full capabilities of students or professionals; National identity as one of the determinants of nation and character building; National integration as one of the parameters of national unity and integrity; The 1945 Constitution and statutory provisions under the Constitution; Obligations and rights of the State and citizens in a democracy based on popular sovereignty and deliberation for consensus; Indonesian democracy based on Pancasila and the 1945 Constitution; Equitable law enforcement; Archipelago as a concept and collective view of Indonesian nationality in the context of world relations; Description of national resilience and defense; State for Indonesia in building collective national commitment.

FT141102 CALCULUS II

Description : This course is a compulsory course that discusses the basics of calculus regarding certain integrals, the use of certain integrals, as well as various forms of differential equations, calculus applications in aspects of food technology (including identification of graphical components).

Study Material: Concept of certain integrals certain integrals for calculating the volume of a rotating body, the area of the skin of a rotating body, and the arc length concept of differential equations various forms of

differential equations: separable variables, homogeneous, exact and nonexact, linear, and Bernoulli.

TP141102 GENERAL MICROBIOLOGY

Description : This course is a compulsory course that discusses the history and scope of microbiology, prokaryotic and eukaryotic cells, growth curves and factors affecting microbial growth, microbial metabolic processes (anabolism, catabolism, and energy production by microbes), properties and characteristics of bacteria, molds, yeasts, and viruses, sterilization and disinfection methods, methods of observation and identification of microorganisms, conventional and rapid methods of microorganisms analysis in foods, and an introduction to microbial genetics.

Study Material: The development of microbiology, branches of microbiology, and the urgency of microbiology in the field of food, cells (cell morphology, structure and components of cells and their functions) and microbial movement mechanisms, bacteria (classification, morphology, structure, colony morphology, and important bacteria in daily life related to food), molds (classification, morphology, physiological properties, reproductive systems and important molds in daily life related to food) and mycotoxins, yeast (classification, morphology, reproductive system and physiological properties) and viruses (characteristics, shape and size, body structure, replication mechanism and viruses in food), microbial growth and factors affecting its growth, microbial metabolism (anabolism and catabolism), principles of sterilization and disinfection, methods of observing, isolating and identifying microbes, principles of conventional and rapid microbial analysis, microbial genetics, and principles of identification using PCR.

TP141103 INTRODUCTION TO FOOD TECHNOLOGY

Description : This course is a compulsory course that discusses the constituent properties of food ingredients, factors and causes of food damage,

ways to preserve food ingredients, factors and methods of processing food ingredients, and their applications in the food field.

Study Material: Introduction to food technology, food constituents, factors causing food deterioration, microbial resistance of foods, factors affecting high temperature and low temperature processing, factors affecting drying; preservation methods using irradiation, fermentation, food additives, traditional food processing, packaging and controlled atmosphere storage.

TP141104 ADVANCED CHEMISTRY

Description : This course is a compulsory course that discusses the basics of chemical-physical properties of solid, liquid and gaseous compounds, the relationship of spectra with atomic and molecular structures, chemical thermodynamics Reactions and reactivity of organic compounds, discussing alkanes, alkenes, alkynes, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, aromatic compounds, organic halogen compounds, stereochemistry, polymers. Reactions in organic molecules (substitution, elimination, esterification, etherification, hydrolysis, amidation, etc.), isometry and stereoisometry, classes of compounds based on functional groups, biomolecular compounds of carbohydrates, proteins, fats.

Study Material: Solid, gaseous, and liquid compounds; spectral relationships and atomic and molecular structures; definition of hydrocarbons; types and properties of functional groups; reactions in organic molecules; properties of carbohydrate biomolecules; properties of protein biomolecules; properties of fat biomolecules.

TP141105 FOOD INGREDIENT KNOWLEDGE

Description : This course explains the characteristics of food commodities, including plant and animal foods. The discussion includes physical and chemical characteristics of food ingredients, quality of

ingredients, handling methods, as well as the suitability of their application in food processing based on their characteristics.

Study Material: Food ingredients, cereals, legumes, fruits and vegetables, tubers, vegetables, fruits, meat, milk, fishery products. Plant-based food commodities include cereals, legumes, tubers, fruits, vegetables, spices, herbs, and plantation products. Animal food products include red meat, poultry meat, milk, eggs, and fishery products.

Practicum : Knowledge of fruits and vegetables, cereals, nuts and tubers, peeling methods, the effect of ethylene on fruit ripening, animal-derived products (milk, eggs, meat and fish), testing of physical properties of food materials and products.

TP141109 PHYSICAL CHEMISTRY AND COLLOIDS

Description : Understand the form of an object, the laws of thermodynamics, solutions and colligative properties of solutions, colloidal systems, emulsions, froth, interfacial tension, diffusion phenomena, osmosis, aggregate formation, nucleation, crystallization, and rheological properties, especially food ingredients.

Study Materials: Gas properties, liquid properties, colloidal systems, interfacial phenomena, colligative properties of solutions, rheological properties, thermal properties of materials, optical properties, micro- and macrostructures in food materials, physical properties of food additives.

TP141106 FOOD BIOCHEMISTRY

Description : In this course, students learn about the principles of biochemistry that discuss the cycle of processes experienced by living organisms, various structures and biomolecules (proteins, carbohydrates, and lipids), and their interactions in water, acids, and bases. Concepts of metabolism and bioenergetics that explain how organisms obtain energy through glycolysis, Krebs cycle, electron transfer, photosynthesis, pentose phosphate pathway,

urea cycle, biological oxidation of fatty acids, and macromolecular synthesis (carbohydrates and lipids).

Study Material: Logic of living cells and their organization, water in living cells, carbohydrates, proteins, protein metabolism, enzymes, biochemical genetics, hormones and their functions, lipid metabolism, lipids, respiration and transpiration processes, vitamin and mineral metabolism processes.

Practicum : Qualitative testing and properties of food ingredients (carbohydrates, oils and fats, proteins, enzymes and starch digestion) as well as respiration and fermentation; identification of functional properties of food components (carbohydrates, proteins, fats and micro-components).

TP141107 ANALYTICAL CHEMISTRY

Description : Explain the general description of analytical chemistry, the basic needs of analytical equipment and their use techniques (both qualitative and quantitative), how to analyze gravimetry, volumetry, acidimetry, alkalimetry, argentometry, permanganometry, yodometry, yodimetry. Theory of error and accuracy in chemical analysis.

Study Material: Scope of analytical chemistry, solvent extraction, fluid testing, theory of accuracy of chemical analysis, use of analytical techniques, techniques of using and selecting tools for qualitative and quantitative analysis, permanganometry, argentometry, yodometry, oxidation-reduction, complexometry, and volumetry.

TP141108 FOOD MICROBIOLOGY AND PROCESSING

Description : Microbial growth, intrinsic and extrinsic factors affecting microbial growth in foods, principles of microbial counting in foods; principles of fermentation processes and the role of beneficial microbes for foods; the role of microbes in the microbiological deterioration of various types of foods and their processed products, as well as

pathogenic microbes in foods and diseases caused by pathogens and principles of controlling these microbes.

Practicum : Media sterilization and aseptic techniques, microbial growth medium, isolation and culture transfer techniques, microbial identification and characterization, microscopic observations (cell morphology of yeast, bacteria, fungi), microbial counts (cup count, MPN, hemacytometer, spectroscopy), microbial growth factors, growth curves, sanitation and personal hygiene testing. environmental influences on microbes, nata de coco, tempe and tape fermentation.

TP141110 FOOD INDUSTRY MANAGEMENT

Description : Understand the concept and application of MIP, SOP, food industry management approach, quality control management, application of HACCP, CPM and PERT, food product quality, strategic planning, marketing and marketing mix.

Study Material: Basic principles of management; characteristics of the food industry; application of planning, organizing, actuating and controlling; application of management planning, production, human resources, quality control, warehousing and marketing in the food industry; steps in preparing SOPs; how to schedule projects; CPM and PERT; management certification in the food industry.

UV141108 STATE DEFENSE

Description : Understand of the values, norms, ethics, moral character and national identity, and have the character of defending the state, including: belief in the supremacy of Pancasila, love for the country, awareness of rights and duties, willingness to sacrifice and have the initial ability to defend the state. Know and understand the factors that affect the awareness of state defense, the national vigilance from inside and outside the country, the policies to foster awareness of state defense, the national vigilance from inside and outside the country, the policies to foster the awareness of state defense, the

understanding of good, clean and authoritative government and governance.

Study Material: The mindset of state defense education; conception of state defense education; character and national self; widya mawat yasa and UPN "Veteran" identity; elements of state defense substance; state defense in national development; influencing state defense awareness; leadership and entrepreneurship; military and non-military threats and national vigilance; policies to foster state defense awareness ; clean and authoritative good governance; anti-corruption; state defense acculturation.

TP141213 MARKETING MANAGEMENT

Description : This course is an elective course that discusses the basic concepts of marketing management. The subjects presented in this course include basic marketing concepts, environmental analysis, competitors and customers, segmentation-target market determination and positioning, marketing mix, and integrated marketing tools in order to create, communicate, and present something of value to customers.

Study Material: The role of marketing in organizations and society; marketing analysis and influencing factors in marketing; marketing segmentation, target market definition and product positioning; various marketing strategies and marketing strategies in the product life cycle; steps in new product development, idea generation and product testing; principles of the marketing mix; planning effective advertising programs; organizing a business and implementing marketing programs.

TP141114 NUTRITION SCIENCE

Description : This course is a compulsory course that discusses the relationship between nutrients and health in meeting energy needs, growth, and maintaining a healthy body. The material studied includes the digestive system and absorption of nutrients (carbohydrates,

proteins, fats, vitamins, minerals), dietary fiber and resistant starch, energy requirements, interrelationships of nutrient metabolism, and diseases resulting from nutrient deficiencies.

Study Material: The digestive system, physiology of nutrients (carbohydrates, proteins, fats, vitamins, minerals, water, and dietary fiber), energy requirements, nutritional adequacy, and malnutrition.

TP141115 FOOD INDUSTRY OPERATIONS UNIT I

Description : Discusses fluid flow systems (both compressible and non-compressible), fluid flow measurement (various measuring instruments, applications, and calculations), mixing and emulsification, material size reduction, and mechanical separation (sedimentation, centrifugation and filtration).

Study Material: System of units and dimensions, mass balance, thermodynamic principles, mass balance, energy balance, fluid flow, evaporation, distillation, and condensation.

TP141116 FOOD CHEMISTRY

Description : This course is a compulsory course that discusses the definition including chemical structure, physico-chemical properties, chemical reactions, roles/functions of chemical components in food ingredients and products including water, carbohydrates, lipids, proteins, pigments, vitamins, minerals, flavors, food additives, and minor components (phenolic compounds, saponins, toxicants, antinutrients, and others). Changes in the physicochemical characteristics of foods due to processing in relation to chemical changes in these food components. Interactions between food components in general.

Study Material: Water chemistry, complex carbohydrate and polysaccharide chemistry, protein chemistry, fat chemistry, rancidity, color in foods, vitamins, minerals.

TP141117 FOOD ANALYSIS

Description : This course is a compulsory course that discusses the samples preparation and sampling techniques. Chemical analysis includes principles and methods of proximate analysis of protein, carbohydrate, fat, water, vitamins, minerals, pigments, as well as an introduction to the antioxidant activity analysis and food additives. Modern food analysis includes basic principles and an introduction to the application of chromatography, electrophoresis, and ELISA techniques in food analysis.

Study Materials: Food analysis methods and quality data; sample preparation and preparation; qualitative and quantitative analysis methods of moisture content and Aw; qualitative and quantitative analysis methods of ash content; qualitative and quantitative analysis methods of protein content; quantitative analysis methods of sugar, starch and fiber content; quantitative analysis methods of vitamins and minerals; quantitative analysis methods of bioactive components and antioxidants; analysing using modern instrumentation namely Spectrophotometer, HPLC, GC, AAS, LC-MS, TLC and UPLC.

Practicum : Proximate and food additive analysis, gravimetric and volumetric methods, application of chromatographic and spectrophotometric methods for qualitative and quantitative determination of food components.

TP141118 FOOD ENGINEERING PRINCIPLES

Description : Application of engineering principles to the quantitative analysis of food processing systems, including unit and dimensional systems, mass balance, thermodynamic principles, energy balance, transport phenomena (including rheology and fluid flow, heat transfer, and mass transfer); as well as engineering and physical principles for food processing and preservation processes including dehydration, evaporation, refrigeration, freezing, and thermal processing principles.

Study Material: Dimensional analysis, mass balance, heat balance, conduction, convection, radiation.

TP141119 FOOD LEGISLATION

Description : Discusses the relationship between food and health, government responsibilities towards businesses and consumers, food law regulations, packaging regulations, food quality standards.

Study Material: Definition of food legislation, rights and obligations of food businesses, food supervision and distribution, labeling, regulation of the use of food additives, food certification, dispute resolution.

TP141220 WASTE HANDLING AND UTILIZATION TECHNOLOGY

Description : This course is an elective course that discusses the understanding, types, principles and technology of the physical, chemical and biological treatment of solid and liquid wastes, and the treatment of wastes generated by the food industry (fruit, vegetables, cereals, meat, seafood, and milk), as well as the application of ISO 14040.

Study Material: Understand various issues related to the handling and utilization of wastes generated by the food industry, starting from the definition, type, nature, impact and importance of waste handling and utilization; physical, chemical and biological properties of industrial wastes and characteristics of food industry wastes; principles of physical, chemical and biological wastes handling techniques; various waste handling methods (ponds, lagoons, activated sludge, aerobic and anaerobic); various techniques and methods related to the utilization of food industry wastes from various commodities; principles and application of ISO 14040: Life Cycle Assessment (LCA) in the food industry.

TP141221 FOOD ADDITIVES AND TOXICOLOGY

Description : This course is an elective course that discusses the types and functions of food additives, their application and role in foods, standards for the use of food additives, concepts and types of toxicology, toxicological classification of food sources and their effects on health.

Study Material: Types, application and role of food additives in foods; regulation of the use of food additives; concept of toxicology, types of toxicology, classification of toxic ingredients in foods from various sources and their impact on health, nutrition.

TP141222 MACHINE AND TOOL DESIGN

Description : The subject of machinery and equipment discusses understanding the specifications and operating principles of food processing equipment and machinery, which includes power generation equipment/machinery, handling/moving materials, including washing, cleaning, size reduction, drying, frying, cooling and freezing, evaporation, crystallization, centrifugation, extrusion, distillation, filtration, and some other food industry equipment.

Study Material: Power generation machines, material handling/moving machines, size reduction machines, drying machines, frying machines, cooling and freezing machines, evaporation machines, crystallization machines, centrifugation machines, extrusion machines, distillation machines, and filtration machines in the food processing industry.

TP141123 STATISTICS

Description : Introduction to basic statistical techniques and their application to experimental design, data collection, data analysis, and oral and written communication. Variability modelling, parameter estimation, and hypothesis testing. Simple regression and correlation analysis.

TP141124 FOOD THERMAL PROCESS

Description : This food thermal processing course discusses food preservation, evaporator heat transfer, types of product testing, the effect of heat on food ingredients, types of packaging materials, how retorts work, Z value calculations, TDT curves, commercial sterilization.

Study Material: Preservation of food, heat load in evaporation process, analysis of various thermal product tests, heat treatment of canned materials, packaging in canning, thermal process, heat effect on microorganisms, enzymes and nutrients, calculation of Z, D, and F₀ values (minimum process time), TDT curves, commercial and absolute sterilization, best process temperature in food sterilization, thermal process temperature by graph method, thermal process formula and Gileppi method.

FT141106 RESEARCH METHODOLOGY

Description : This course is a compulsory course that discusses the principles and methods of research that will be used when conducting research for a thesis or final research project.

Study Material: Knowledge and ethics in research, problem formulation, hypotheses building, research designs according to the chosen method, data collection, processing and discussion of research results, systematics of writing proposals and theses, reference management (Zotero, Mendeley, etc.), scientific presentation techniques, and writing scientific articles.

TP141125 FOOD QUALITY MANAGEMENT SYSTEM

Description : This course studies the theory and concept of quality to control, ensure and improve quality, quality management system, ISO, Halal, as well as the elements of quality, how to monitor quality, quality assurance, GMP and HACCP applied to the food industry.

Study Material: Elements of quality, quality control methods, quality assurance, GMP and HACCP as applied to the food industry, quality theory and

concepts to control, assure and improve quality, as well as an introduction to the ISO quality management system and its development, and halal management system.

TP141126 FOOD INDUSTRY OPERATIONS UNIT II

Description : This Food Industry Operations Unit II course discusses the basics of processes in the food industry including crystallization, cooling, freezing, extraction, drying, evaporation, and distillation.

Study Material: Crystallization operation unit cooling and freezing operation unit extraction operation unit drying operation unit evaporation operation unit distillation operation unit.

Practicum : Develop skills in the application of heat and mass transfer theory to processing. Size reduction/grinding, meat emulsion production, microwave popcorn making, mechanical extraction, solvent extraction, sedimentation, centrifugation, filtration, crystallization, cooling and freezing.

TP141127 FOOD PROCESSING TECHNOLOGY

Description : This course is a compulsory course that discusses the principles of food processing and preservation using high temperature, low temperature, drying, extrusion, fermentation, the use of food additives and non-thermal preservation, such as pulsed electric fields, magnetic field oscillation, and irradiation.

Study Material: Various food processing, food deterioration, preservation principles, refrigeration and its impact on processed foods, blanching, and pasteurization, smoking, and extrusion, the role of BTM in food processing, food preservation methods.

Practicum : The practicum covers the basics of processing such as drying technology, bakery technology, meat and fish processing technology, dairy and soybean processing technology, egg processing technology, technology with smoking, processing technology with sugar, salt, and acid and other preservatives, and

medium water content food technology (IMF: fruit leather, jam, jelly; confectionery).

TP141228 CARBOHYDRATE TECHNOLOGY

Description : The carbohydrate technology course discusses basic knowledge of physical and chemical properties, natural sources, component structures, handling methods and their applications in the food sector. The materials discussed include pectin, chitosan, dietary fiber, resistant starch, hydrocolloids and their applications.

Study Material: Carbohydrate chemistry; starch, its properties and applications; rice technology; chitin and chitosan; pectin; non-rice rice technology; resistant starch; food fiber; alginate; carrageenan; agar.

TP141230 FATS AND OILS TECHNOLOGY

Description : Fats and Oils Technology course equips students with knowledge and skills in vegetable food oil processing technology, oil refining (refining, bleaching, deodorizing), oil characterization and quality standards, oil modification (fractionation, hydrogenation, and interesterification), oil damage (oxidation, hydrolysis), and antioxidants.

Study Material: Introduction to fats and oils technology, coconut oil and VCO processing technology, palm oil processing technology, oil refining (degumming, refining, bleaching, deodorizing), modification of fats and oils including hydrogenation, fractionation and interesterification, damage to fats and oils including hydrolytic and oxidative damage, and antioxidants in preventing damage to food fats and oils.

TP141232 DAIRY PROCESSING TECHNOLOGY

Description : Understand the concept of applying technology to milk processing. Chemical composition and properties of each components. Processing of milk into several products such as condensed milk, powdered milk, butter, cheese, milk yogurt and kefir, and others.

Study Material: Introduction (milk characteristics); milk composition; basic principles of milk processing; high and low temperature milk processing; milk drying; protein preparation; butter; fermented milk; cream; cheese,

TP141233 MEAT AND FISH PROCESSING TECHNOLOGY

Description : In this course, students will learn about the principles of biochemical changes in carcass and skeletal muscle after post-mortem. Control of spoilage and pathogenic microbial contamination in the fresh and processed meat, and fish production chain. Application of preservation principles and value-added processing technologies. Current topics relevant to the meat and fish industry and trade.

Study Material: Nutrition in meat, types of meat preservation and processing, curing process and methods, emulsified sausage products, smoking preservation process, fish drying and canning products, fish processing (surimi, otak-otak, kamaboko, fermented products).

TP141234 FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

Description : Fruit and Vegetable Technology course discusses the principles and methods of processing fruits and vegetables into dried fruits, fruit candy, fruit/vegetable chips, jam-jelly, pickles, juice, wet and dry sweets, and canned fruits/vegetables.

Study Material: Principles and concepts of fruit and vegetable handling and processing technology, damage to fruits and vegetables, storage of fruits and vegetables, various processing techniques and preservation of fruits and vegetables.

TP141136 EXPERIMENTAL DESIGN

Description : In this course, students will learn how to conduct scientific research, including problem determination, identification of experimental research variables and how to design experiments using various types of experimental designs such as RAL, RAK,

Factorial, Randomized Nested and how to conduct experimental tests using non-parametric (Friedman Test, Wilson, and different tests: t-test, BNT and DMRT) and non-experimental designs, observation and data collection, interpretation of experimental analysis results.

Study Material: Introduction and basic definitions and terminology in experimental design; important elements of experimental design; t-test; design theory without grouping: Completely Randomized Design (CRD); multiple comparison test and orthogonal comparison (BNT, BNJ and DMRT tests); Randomized Group Design (RCD); latin square design; factorial experiment; data normality and data homogeneity test; Kruskal Wallis Test; Freadman Test.

FT141107 ENGINEERING ECONOMICS

Description : This course is a compulsory course that discusses the interest rate, cost concepts, annual and present value equivalence, rate of return (RoR), depreciation, taxes, inflation, benefit-cost ratio (BCR), break-even point (BEP), sensitivity analysis, and other technical analysis.

Study Material: Equivalency calculation, depreciation, interest and tax, alternative selection, rate of return analysis, replacement analysis, cost and benefit analysis, break-even point (BEP), investment appraisal.

UV141114 ENTREPRENEURSHIP

Description : This course is a compulsory course that discusses the basic concepts of entrepreneurship, processes, functions, and entrepreneurship models, ideas, opportunities, risks, and business pioneering and development models, business management and entrepreneurial strategies, core competencies including character, creativity, innovation, and competitive strategies in entrepreneurship, business analysis, and business feasibility studies, business ethics, and business plans.

Practicum : Practice of new product development by considering and incorporating socio-cultural aspects in society, consumer behavior, new product development management, new product design, technology selection and engineering in new product development, quality testing, sensory analysis, economic feasibility analysis, and marketing trials.

TP141137 FOOD FERMENTATION TECHNOLOGY

Description : This course discusses the scope of the basic concepts of fermentation technology, preparation and sterilization of fermentation media, isolation and selection of microbes, preparation, maintenance and storage of microbial cultures for fermentation, development of microbial strains, operation of bioreactors, factors influencing the fermentation process, kinetics of microbes and fermentation, harvesting of fermentation products, calculation of fermentation process efficiency and application of fermentation technology.

Study Material: Basic principles and concepts of fermentation technology; the preparation and sterilization of fermentation media; methods of isolation and selection of microbes; preparation, maintenance and storage of microbial cultures for fermentation; the development of microbial strains and the operation of bioreactors; influential factors in the fermentation process, microbial kinetics and fermentation; procedures/methods of harvesting fermentation products, calculating fermentation process efficiency and application of fermentation technology.

TP141138 FOOD NUTRITION EVALUATION AND PROCESSING

Description : This course is an elective course that discusses factors affecting the nutritional value of foods and changes in nutrients (carbohydrates, fats, proteins, vitamins, and minerals) during postharvest handling, processing, and storage with chemical, *in vitro* and *in vivo* evaluation (bioassay) as well as an introduction to experimental animal testing.

Study Material: Scope of nutrition; effects of processing on vitamin and mineral stability; effects of GAP and GHP on nutrition; anti-nutrients; food preparation procedures; chemical and biological evaluation of carbohydrates, fats and proteins; handling of experimental animals.

TP141139 OPERATIONAL RESEARCH

Description : This course is an elective course that discusses optimization techniques that help in making decisions systematically and gradually. The scope of this course includes the use of mathematics in management problems, especially decision-making based on simple mathematical modeling of real-world problems.

Study Material: Introduction to operational research and its role in industry, decision making and optimization using graphical methods, formulation of descriptive problems into linear formulations using linear programming, use of simplex algorithms, duality and its use in solving linear programming problems, sensitivity analysis, transportation.

UV141113 LEADERSHIP

Description : This course helps students to explore the potential of group and individual leadership skills and demonstrate them. Students will learn various leadership concepts and theories, as well as various approaches to personal and group leadership development.

Study Material: Definition, purpose of leadership function, management and organization, characteristics of leadership, management models, theories of organization, forms of organization, organizational structure, manpower needs in every process.

TP141240 FUNCTIONAL FOOD

Description : This course is an elective course that discusses the definition of functional food, distribution and formulation of functional foods, free radicals and degenerative diseases, bioactive components in functional foods including antioxidants, dietary fiber,

phytochemicals, probiotic bacteria, prebiotic components, functional effects of each bioactive component on body health, and formulating functional foods based on local foods.

Study Material: Definition of functional food compared to regular and nutritional food; distribution and formulation of functional food; free radicals and degenerative diseases; bioactive components in functional food including antioxidants, dietary fiber, phytochemicals, probiotic bacteria, prebiotic components; functional effects of each bioactive component on body health; design of functional food formulations.

TP141243 FOOD BIOTECHNOLOGY

Description : This course is an elective course that discusses the definition of biotechnology, the history of biotechnology, the benefits of biotechnology, the differences between conventional and modern biotechnology, genetics, genetic engineering, biotechnology applications in the food industry, transgenic analysis, introduction to bioinformatics, and bioethics.

Study Material: History of biotechnology development, conventional and modern biotechnology, genetics, regulation of gene expression (operon), DNA replication, transformation of genetic material, DNA isolation, Polymerase Chain Reaction (PCR), DNA gel agarose electrophoresis, DNA sequencing, genetic engineering, transgenic analysis, bioethics.

TP141244 FLAVORING TECHNOLOGY

Description : This course is an elective course that discusses the scope, types and benefits of flavor in foods, including flavor extraction, the formation of natural flavor in fruits and vegetables, flavor changes due to fermentation and non-enzymatic browning processes, the formation of flavor in cheese and chocolate meat, the manufacture and application of synthetic flavors in food and beverage products, flavor contamination, and flavor legislation.

Study Material: Biogenesis of natural flavors in fruits and vegetables, flavor changes due to fermentation and non-enzymatic browning, flavor formation in meat, cheese and chocolate, manufacture and application of synthetic flavors in foods and beverages, flavor contamination, and flavor regulation.

TP141145 FOOD PRODUCT DEVELOPMENT

Description : This course is a compulsory course that discusses the scope, idea generation, market research, product quality planning and design, implementation and evaluation in the development of a food product as well as economic aspects, engineering in new product development, business aspects and market opportunities in new product development, and food product application planning. Changes in the business environment that require new product development, socio-cultural aspects in society, consumer behavior studies, consumer research, management principles of new product development, new product design, technology and engineering in new product development, business aspects in new product development, including financial forecasting and market opportunities for new product development.

Study Material: Definition and importance of food product development, stages and factors affecting food product development; product development concepts and ideas; risks in new product development; quality and function of product development; marketing development and marketing strategies; product specification and standardization; competitive evaluation and identification; marketing mix and product cycle; determining customer value.

TP141146 SENSORY EVALUATION

Description : This course is a compulsory course that discusses sensory quality, sensory properties of food ingredients, selection of panelists, laboratory preparation, data analysis and decision making, and

selection of sensory tests (conventional and modern) appropriate for use in the food industry.

Study Material: Sensory quality, sensory properties of food ingredients, selection of panelists, laboratory preparation, data analysis and decision making, and selection of appropriate sensory tests to be applied in the food industry.

Practicum : Organoleptic test preparation, panelist selection, sample preparation, stimulus threshold test, pair-wise discrimination test, triangle, duotrio, description test, ranking test, scoring test, pair-wise comparison test, plural comparison test, hedonic test.

TP141147 FOOD SAFETY AND SANITATION

Description : This course is a compulsory course that discusses the principles of food safety and food sanitation, types and sources of contaminants and how to deal with them, types and sources of allergens, the application of food safety and sanitation aspects in the food industry (through the application of GMP and SSOP, sanitation of personnel, equipment, processing rooms, and the factory environment, to distribution and storage), cleaning and disinfecting materials, food inspection, food poisoning, and food safety management systems (HACCP, FSMS, and ISO).

Study Material: General concepts of food safety and sanitation, including emerging issues and impacts; types and sources of contaminants and how to deal with them; allergies and allergens, and their mechanisms and relationships with food; the role of water, detergents and sanitizers in the food industry; application of GMP and SSOP concepts; sanitation requirements and procedures for food handlers; application of sanitation and hygiene principles in various food industries; definition of losses, urgency and challenges related to food safety; Sources of food safety problems and burdens, foodborne diseases, and food poisoning outbreaks; foodborne diseases and bacterial food-borne diseases (Part 1); bacterial foodborne diseases (Part 2); non-bacterial foodborne

diseases; Food safety management system; Analysis and evaluation of food safety hazard sources and solutions in MSME products.

TP141148 PACKAGING AND STORAGE

Description : This course contains the properties and manufacturing processes of metal packaging, plastic, wood, and glass packaging, active packaging; principles of determining the shelf life of foods, the role of warehouses in food storage, post-harvest pests, and integrated pest control.

Study Material: Metal packaging, plastic, wood, glass packaging, active packaging, principles of determining the shelf life of food, the role of warehouses in food storage, post-harvest pests, and integrated pest control.

TP141149 PROCESSING INDUSTRY DESIGN

Description : The processing industry design course covers market research, process outline and equipment, space and layout.

Study Material: Market research, plant siting, capacity and process selection, mass balance, process equipment specifications, material handling, food processing industry design concepts, food processing industry layout and area requirements, utilities, economic evaluation, organizational structure.

TP141212 FOOD SERVICE INDUSTRY

Description : This course is an elective course that covers menu planning and pre-costing, determining menu standards, food menu production including preparation, serving, and processing. It also covers site planning, licensing, facilities, equipment, purchasing, receiving materials, storage, dispensing materials, distribution and marketing. Apart from that, it also covers the application of safety and sanitation principles, GMP, HACCP implementation, Halal certification in the food service industry.

Study Material: Introduction to the food service industry definitions, types and prospects of the food service industry, planning and pre-costing menus, determining menu standards, food menu production including preparation, serving, and processing. It also discusses location planning, licensing, facilities, equipment, purchasing, receiving materials, storage, dispensing materials, distribution, and marketing. It covers the introduction to the principles of halalan and thoyyibah, sanitation, GMP, the application of HACCP in the food service industry.

TP191250 SPICES AND SEASONINGS TECHNOLOGY

Description : This course is an elective course that discusses the chemical components contained of spices and seasonings, the function and role of bioactive components of spices in health. Spice processing technology is also explained in terms of extraction techniques, oleoresin, essential oils, spice quality problems, handling and processing of several types of spices with high economic value.

Study Material: Types, characteristics and post-harvest handling of spices; quality control in the spice trade; bioactive compounds in spices and their changes during processing; types and roles of spices as flavoring, coloring, food complement and accompaniment; aspects of production, and quality control of essential oils; aspects of production, and quality control of oleoresins; applications of essential oils and oleoresins for food and non-food uses.

TP191251 BAKERY TECHNOLOGY

Description : This course discusses the definition, types and prospects of bakery products, the fermentation process, knowledge of ingredients, types of dough, types of bread making techniques and recipes, and processing preparation including the tools used, product development through various analyses of basic ingredients and recipe development, market development of bakery products, development of packaging and display methods, so that bakery

products are produced that have high quality and meet selling values.

Study Material: Introduction to bakery technology, types and prospects of bakery products, fermentation processes, knowledge of ingredients, types of dough, types of bread making techniques and recipes, and processing preparation including the tools used, product development through various analyses of basic ingredients and recipe development, market development of bakery products, development of packaging and display methods so that bakery products are produced that have high quality and meet sales values.

TP191253 LEGUME, CEREAL AND TUBER TECHNOLOGY

Description : This course is an elective course that discusses legume, cereal, and tuber commodities in terms of raw material characteristics, product diversification, processing technology, and final product characteristics.

Study Material: Types of legumes, cereals, and tubers; commodities of legumes and tubers: characteristics and postharvest handling; processing technology for soybean-derived product: soy protein isolate, textured vegetable protein, meat analogue, and other derived products; processing technology for peanut and mung bean-, other legume-, tuber-derived product; cereal commodities: characteristics and postharvest handling; processing technology for rice-, wheat-, corn-, sorghum-derived product and some other cereal products; noodle technology (wheat and non-wheat noodles, vermicelli, and rice noodles).

TP191252 SUGARCANE PROCESSING TECHNOLOGY

Description : This course is an elective course that covers the profile of the sugarcane commodity, post-harvest handling, processing of the sugarcane and its by-products for food. Learn about the quality standards of processed sugarcane products and their by-products.

Understand the critical point of processing sugarcane products into sugar and its derivatives. Study the types and forms of sugar cane and its application in food products (raw sugar, white crystal sugar, refined crystal sugar, liquid sugar, brown sugar, invert syrup).

Study Material: Processing of sugarcane and its by-products for food; quality standards for processed sugarcane products and by-products; critical points of processing sugarcane into sugar and its derivatives; the types and forms of sugarcane and its application in food products; development of the sugarcane industry in Indonesia; technology of tools and machinery for sugarcane processing; nutritional content of sugar and by-products; damage to sugar and quality control of sugar, packaging and storage technology of sugar and sugarcane by-products, utilization and management of sugar production waste, sugar by-products (MSG, single cell protein and ethanol).

TP141211 COFFEE, TEA AND COCOA PROCESSING TECHNOLOGY

Description : This course is an elective course that covers coffee, tea, and cocoa processing technology (starting from harvesting systems, post-harvest handling, processing, quality control, product development, packaging and labeling).

Study Material: Types of coffee, tea and cocoa in Indonesia; harvest/picking methods of coffee, tea and cocoa commodities; coffee bean processing; ground coffee processing; industrial scale tea processing and tea packaging methods; process methods and development of cocoa processing processes in Indonesia; cocoa powder processing technology; cocoa derivative processing technology.

TP191249 FOOD ARCHIPELAGO

Description : This course discusses the history of archipelago food from social, cultural, economic aspects; food culture of Indonesian people; western Indonesian cuisine, central Indonesian cuisine, eastern

Indonesian cuisine, development of archipelago food that has the potential to become functional food, and basic molecular gastronomy of food processing.

Study Material: Archipelago food as national identity (state defense values), history of Indonesian cuisine from the royal era and its development from time to time, western, central, eastern Indonesian cuisine (history, recipes, processing technology), development of archipelago food into functional food (traditional fermented products and authentic herbal products), development of archipelago food that has the potential to be developed on an industrial scale (seasoning and spice technology, preservation technology, storage and packaging technology), basics of molecular gastronomy.

UV141115 COMMUNITY SERVICE

Description : The implementation of Community Service Program (*Kuliah Kerja Nyata*, KKN) is designed to develop students' ability to identify real problems in the community, organize and work in groups, develop activity plans, manage the provision and use of resources, and work for the community.

Study Material: This course includes an explanation of the subject matter that students must master before participating in activities at the KKN location. The material provided according to the scientific field is given in the faculty briefing, which includes the areas of competence of the study program/department in dealing with various community problems at the KKN location as outlined in the scientific program. Students are also expected to collaborate with other departments to create multidisciplinary programs in solving community problems.

FT141108 FIELD WORK PRACTICE

Description : Develop students' ability to learn directly in food and agricultural production or processing units. Students witness first-hand the application of processing technology in commercial business units,

interact with various parties at the practical work location, critically observe the overall operation of the processing unit, identify technical problems that arise, and prepare implementation reports in systematic and thorough manner.

Study Material: Preparation and search for Field Work Practice (*Praktik Kerja Lapangan*, PKL) partners, PKL administration, communication with partners, PKL debriefing; search for scientific literature as a theoretical basis for PKL implementation; preparation of PKL proposals; PKL implementation at partners; interpretation and analysis of the results of observations and special assignments with PKL partners; presentation of PKL in scientific writing; oral presentation of PKL results.

TP141150 THESIS

Description : The implementation of the thesis is intended to sharpen the ability to think critically and analytically in formulating problems related to the application of food science and technology, challenge creativity in determining alternative problem solving, practice a scientific approach to strengthen self-learning skills from various sources.

Study Material: Determination of thesis topic, search of scientific literature as a theoretical basis for development, or design, or research for thesis, preparation of background, problem formulation, objectives, benefits of thesis, preparation of literature review, preparation of methods, implementation of data collection for research or internship, or implementation of development for entrepreneurship, or testing of technological design work, data analysis and processing, data interpretation.

TP220476 DIVERSITY AND MULTICULTURE

Description : This course emphasizes the content of tolerance, diversity and peaceful dialogue across religions, cultures and beliefs. This course aims to make students understand and live diversity in the context of *Bhinneka Tunggal Ika*, reflect on biases such as stereotypes and

prejudices in diversity relations and build empathetic understanding of others.

Study Material: The concept of culture, cultural characteristics, cultural elements, cultural forms, cultural institutions, national and global culture, intercultural communication, multicultural education, moral education, outlook on life, the concept of mutual cooperation, and tolerance.

TP220475 TEAMWORK

Description : This course discusses the ability to build effective teams to manage various activities through learning stakeholder identification, stakeholder value and interest mapping, and communication strategies.

Study Material: How to build effective teams through various strategies such as: stakeholder identification, stakeholder values and interests, stakeholder influence strategies, team communication strategies.

TP220474 CONSUMER BEHAVIOR

Description : This course discusses issues about consumer behavior when choosing a particular product. This course contains concepts and ways to understand consumer behavior, factors that influence consumer behavior to develop marketing strategies, types of consumers and market segmentation, theories of consumer decision making, marketing strategies, consumerism, consumer protection laws, business ethics and corporate social responsibility.

Study Material: In this course, students will study and implement the concepts of consumer behavior, consumer motivation, consumer personality, consumer perception, consumer attitude, the concept of peer group and family influence, the influence of social class, the influence of culture and subculture, the consumer decision-making process, consumer communication, integrated marketing communication strategies, the influence of advertising, promotion, special events and public relations, direct marketing, and public relations.

TP220457 PUBLIC RELATIONS

Description : Public relations course is a course that studies the functions and duties of public relations in an organization, institution, company, and government. The public relations function is a part that always communicates to parties inside or outside the organization, both locally, nationally, and globally.

Study Material: The history of public relations in the world and in Indonesia; the nature of public relations; the difference between public relations and other fields of study; public and public opinion; public relations; work programs and communication patterns; public media in the field of public relations; government public relations; information disclosure; internal and external media; image planning and public relations goals; public relations etiquette and protocol.

TP220460 EXTENSION SCIENCE

Description : This course is an elective course that studies extension strategies and methods (determining themes, objectives, methods, principles and extension materials), ethics, and evaluation of their implementation.

Study Material: Definition and role of extension science, extension methods and strategies, extension ethics, communication methods, development of extension materials and proposals.

TP220463 INNOVATION AND CREATIVITY

Description : The innovation and creativity course discusses the concepts of innovation and creativity, the basics of creative ideas, finding creative ideas, turning ideas into innovative products, and evaluating innovative products.

Study Material: Basic concepts of creativity and innovation, generating creative ideas, actualizing creative ideas into innovative products, and evaluating and continuously improving innovative products.

TP220470 FOOD ENTREPRENEURSHIP

Description : This course is an elective course in the soft skills cluster that studies the basic concepts of entrepreneurship, the development of entrepreneurship in the scope of food technology, business planning, and the evaluation of entrepreneurial activities that have been carried out.

Study Material: The basic concepts of entrepreneurship, the development of entrepreneurship in the scope of food technology, the nature and behavior of entrepreneurs, ideas and opportunities in food entrepreneurship, analysis of business forms and profiles, business planning, business feasibility analysis, consumer/customer studies and their behavior, market and competitor analysis, risks of a business, and evaluation of the entrepreneurship that has been carried out. The output of this course can be in the form of an entrepreneurship analysis or entrepreneurship plan (business plan) in the scope of food.

TP220459 COMMUNICATION

Description : This course is an elective course that studies the concepts and theories of communication, which include, the importance of communication in human life, the scope of communication among humans, and the development of communication science; models and varieties of communication; listening skills; verbal and nonverbal communication; perception formation process; personal communication and intergroup communication; organizational communication, public speaking skills, and the development of communication science and technology in Indonesia.

Study Material: The urgency of communication in human life, the scope of communication between people, and the development of communication science; models and varieties of communication; listening skills; verbal and nonverbal communication; perception formation process; personal communication; intergroup communication; organizational communication; public speaking

skills, the development of communication science and technology in Indonesia.

TP220469 SCIENTIFIC COMMUNICATION

Description : This course is an elective course where students study effective scientific communication strategies, write scientific papers, and conveys the results of scientific work in formal (seminar or conference) and informal (talk show) scientific presentation activities.

Study Material: Learn and implement basic techniques/methods for communicating scientific topics in various formats and forums. The communication forums that will be trained are scientific and popular scientific forums, such as scientific writing in journals and scientific writing in popular media (newspapers and magazines). Students will also learn and practice techniques for communicating the results of scientific work in formal forums (seminars or conferences) and informal forums (talk shows).

TP220473 EVENT MANAGEMENT

Description : This course provides knowledge of event management, including concepts and practices for planning and managing an event.

Study Material: Event concept to convey messages to audiences; event promotion media; mapping of human resource needs and event budgets; risk management of opportunities that may occur at an event; event planning, execution and evaluation.

TP220462 ORGANIZATION AND MANAGEMENT

Description : The organization and management course covers the basic concepts of organization and management, including the basic concepts of organization, organizational design, organizational structure, organizational processes, conflict and stress

management, communication in organizations, organizational management, and organizational development.

Study Material: Basic concepts of organization and management; organizational structure; organizational culture and values; job design; conflict and stress management, communication, organizational management and organizational development.

TP220472 DIGITAL MARKETING

Description : This course is an elective course in the soft skills cluster that provides students with the ability to understand marketing concepts and strategies through internet-based applications.

Study Material: In this course, students will learn about the concepts and practices of identifying marketing potential through the use of internet-based applications such as e-commerce and e-marketplace, concepts and business models in the digital marketing era, technology related to webstores and open carts, and techniques for marketing a commodity or product through internet-based applications.

TP220458 COMMUNITY DEVELOPMENT

Description : This course explains the theoretical basis of community development related to the context of community development analysis and action in the field by understanding the background and understanding of community development; various issues in community development; basic principles of community development; holistic and integrated approaches to community development; and principles for implementing community development action. After completing this course, students will be able to understand the philosophy of community development and its position in development theories; analyze and diagnose the actual conditions of a community in the context of community development; understand the principles and approaches of community development; and determine community development

approaches that are relevant to the actual conditions of various communities.

Study Material: Definition, scope, objectives, and elements of community development, forms and principles of community development, stages in community development, community organization, mobilization and optimization of cadres in community development, participation and non-formal education for community development, socio-cultural change, and Focus Group Discussion.

TP220467 TALENT AND PROFESSIONAL DEVELOPMENT

Description : Talent and professional development courses study and teach students to understand their potential (strengths and weaknesses) so that they are able to set clear goals and have the ability and skills in communication and leadership. In the end, maximum potential development can build character, professionalism in students to produce local, national or international achievements.

Study Material: In this course, students will learn and implement intrapersonal potential & self-awareness, how to build habits, how to be positive and how to become a proactive individual, how to set goals, how to lead and cooperate with others, and how to communicate orally and in writing.

TP220461 PARTICIPATORY PLANNING AND EVALUATION

Description : This course covers the position of planning and evaluation in community development programs and the relationship between the two; the proper way to evaluate community development programs/projects in a participatory manner; and how to develop a participatory community development program plan.

Study Material: Students analyze the social situation of the community, including programs designed in a participatory manner; use community extension and mentoring techniques from planning to program evaluation; design community program evaluations to build alliances (networks building), implement capacity building activities

(training, promotion, and marketing), organize groups, organizations, and communities; and make decisions based on data and information analysis.

TP220471 BUSINESS STRATEGY

Description : This course is an elective course in the soft skills cluster that provides basic skills and understanding related to strategy in business, from scope to strategy implementation, as well as policy in business.

Study Material: In this course, students will learn about business concepts and policies, the importance of vision, mission, goals and strategies for a company; the evaluation of the company's external environment, resources, capabilities, and competitiveness; the concept of five generic competitive strategies, evaluation of the company's competitive position, strategies to compete in international markets; and the concept of managing a business using the best strategic considerations.

TP220465 PUBLIC HEALTH MANAGEMENT TECHNOLOGY

Description : This course is an elective course that studies the concept of public health science, the concept of health, illness and disease prevention in society, innovation and engineering of appropriate technology to improve public health.

Study Material: In this course, students will learn and implement the concepts of public health science, the concepts of health, illness and disease prevention in the community, conduct community health surveys and data collection, develop innovation plans and appropriate technology engineering to improve public health. The activities to improve public health are innovation and engineering of appropriate technology to improve public health, such as clean water treatment, household waste management, waste management, production of nutritious food products.

CHAPTER 4

INDEPENDENT LEARNING CAMPUS

1.1 INTRODUCTION

In order to prepare students to face the changes in society, culture, the world of work and the rapid technological advances, the students' competencies must be prepared to be more in line with the needs of the times. *Link and match* is not only with the industrial world and the world of work but also with the rapidly changing future. UPN "Veteran" East Java as a university is required to be able to design and implement innovative learning processes so that students can achieve learning outcomes covering aspects of attitude, knowledge, and skills optimally and always relevant.

The learning process and the concept of MBKM is expected to be the answer to these demands. The Merdeka Campus is implemented in order to realize an autonomous and flexible learning process in higher education to fulfill the right to study for three semesters outside the program of study, namely in the form of 1 semester of opportunity to take courses outside the program of study and 2 semesters to carry out learning activities outside the college.

In order to support the MBKM program, Food Technology Study Program provides opportunities for students to implement the guidelines prepared at the study program level. The forms of MBKM activities that can be carried out include internships/work practice in industry or other workplaces, community service projects in villages, participation in student exchanges, research, entrepreneurial activities, and independent studies/projects. The MBKM program is expected to provide contextual field experiences that will improve the overall competence of the students and make them employable or create new jobs.

The implementation of the MBKM program in the Food Technology Study Program, Faculty of Engineering, UPN "Veteran" East Java is:

1. Provide the right to study for three semesters outside the study program to improve the competence of graduates, both soft skills and hard skills, to be more relevant to the demands of the times.

2. Prepare the graduates as future leaders of the nation with superior personality and character as the hallmark of the State Defense campus.
3. Realize the collaborative activities between universities and non-universities, government and private sectors that are implemented in the form of education, research and community service.

1.2 FORM OF ACTIVITY



Figure 1. Forms of learning activities for MBKM program

The form of learning activities in the MBKM program is in accordance with Permendikbud No. 3 of 2020, Article 15 paragraph 1. Learning can be carried out within the study program and outside the study program, which includes eight programs consisting of student exchange, internship/ work practice, teaching assistance in educational units, research/research, humanitarian projects, entrepreneurial activities, independent studies/projects, and villages development/thematic real work courses. Food Technology Study Program offers students the opportunity to implement 6 of the 8 programs. The purpose of this limitation is to keep MBKM activities in line with the competencies of PS-TP graduates.

1.2.1 Student Exchange

The form of student exchange in the Food Technology Study Program consists of two programs, namely PERMADI (Lecture program between study programs at UPN "Veteran" East Java); PERMATA PANGAN (Lecture program in the same study program outside UPN "Veteran" East Java).

2.1.1 PERMADI

PERMADI is a form of student exchange program between study programs at UPN "Veteran" East Java. In the PERMADI program, students from the Food Technology Program are given the opportunity to attend courses in other study programs at UPN "Veteran" East Java.

2.1.2 FOOD GEMS

PERMATA PANGAN is a form of student exchange program from the same study program outside the UPN "Veteran" East Java campus. Students of Food Technology Program UPN "Veteran" East Java can enrich the knowledge, experience, and scientific context obtained by the Food Technology and Agricultural Products Study Program from other universities that have uniqueness or a vehicle to support learning to optimize Graduate Learning Outcomes.

1.2.2 Internship/Work Practice

The internship/work practice program provides an opportunity for Food Technology Study Program UPN "Veteran" East Java students to engage in experiential learning in the workplace. During the internship, students will gain hard skills (skills, complex problem solving, analytical skills, etc.) as well as soft skills (professional/work ethics, communication, cooperation, etc.). Meanwhile, industry gets talents that can be directly hired if suitable, thus reducing recruitment and initial training/induction costs. Students who already know the workplace will have a more stable entry into the world of work and their careers. Through this activity, industry problems will flow to universities to update teaching and learning materials for lecturers and research topics in universities will be more relevant.

The Food Technology internship program can be undertaken by students for a minimum of one semester and a maximum of two semesters, organized through collaboration between Food Technology Study Program and partners such as the food industry, government institutions, start-ups, or other agencies. In

addition, the implementation of internship/work practice programs can also be organized through cooperation between the Ministry of Education and Culture and partners such as Certified Internship and Independent Study Programs and Matching Fund.

1.2.3 Research

For Food Technology Study Program students who have an interest in becoming researchers, independent campus learning can be realized in the form of research activities at research institutions/study centers. Through research, students can build a critical way of thinking, explore, understand, and be able to better perform research methods. Laboratories / research institutions sometimes lack research assistants for short-term research projects (1 semester - 1 year), so this is an opportunity for students.

1.2.4 Entrepreneurial Activities

Based on the Global Entrepreneurship Index in 2018, Indonesia only scored 21% of entrepreneurs from various fields of work, or ranked 94th out of 137 countries surveyed. Meanwhile, according to research conducted by IDN Research Institute in 2019, 69.1% of millennials in Indonesia are interested in entrepreneurship. Unfortunately, the entrepreneurial potential of the millennial generation has not been well managed so far. The MBKM Policy encourages the development of students' entrepreneurial interests with appropriate learning activity programs. PS-TP students can take advantage of the entrepreneurship program to develop businesses in the food sector that they have while doing off-campus learning, which can be converted into 20-40 credits for 1-2 semesters.

1.2.5 Independent Study/Project

Many students have the interest and desire to realize internationally competitive masterpieces or work on innovative ideas. Ideally, independent studies/projects are designed to complement the curriculum that students are already taking. Colleges or faculties may also create independent studies to complement topics that are not included in the lecture schedule but are still available in the syllabus of program or faculty. Independent project activities can be carried out in the form of interdisciplinary group work.

1.2.6 Village Assistance/KKN

Village assistance/KKN is a form of education by providing learning experiences for students to live in the community outside the campus, who working directly with the community to identify potentials and address problems, so that they are expected to be able to develop village/regional potentials and concoct solutions to problems in the village. Village assistance/KKN activities are expected to hone the soft skills of partnership, interdisciplinary/scientific teamwork (cross-competency), and student leadership in managing development programs in rural areas.

The implementation of village assistance/KKN is carried out to support cooperation with the Ministry of Villages and other Ministries/Stakeholders. The government through the Ministry of Village PDDT distributes village funds of 1 billion per village to a total of 74,957 villages in Indonesia, which based on the 2019 Village Development Index (IDM) data, there are 6,549 very underdeveloped villages and 20,128 underdeveloped villages. The implementation of Village Assistance/KKN is carried out in very underdeveloped, underdeveloped and developing villages, whose human resources do not yet have the ability to plan development with these large funding facilities.

1.3 PROGRAM IMPLEMENTATION

The implementation of MBKM Food Technology Study Program UPN "Veteran" East Java activities can be taken for 6 months (one semester). For students who take the MBKM- program for 6 months, the maximum credit load that can be equalized is 20 credits. Equalization of the number of credits with the MBKM activity time, namely:

Total activities 1 credit = 170 minutes/week/semester;
or
2,720 minutes/semester
or
45 hours/week/semester.

The criteria, stages, implementation requirements and system of assessment of the MBKM program are explained in more detail in the MBKM GUIDELINES OF THE FOOD TECHNOLOGY STUDY PROGRAM. Furthermore,

more detailed implementation instructions are explained in the JUKNIS MBKM PROGRAM STUDY OF FOOD TECHNOLOGY for each activity program.

CHAPTER 5

LEARNING SIGNS AND ASSESSMENT SYSTEM

The learning system is built based on planning that is relevant to the objectives, learning domains, and their hierarchy. Learning is carried out using various challenging strategies and techniques that encourage students to think critically, explore, create, and experiment using various sources. The implementation of learning has a mechanism to periodically monitor, review, and improve lecture activities (attendance of lecturers and students), preparation of lecture materials, and assessment of learning outcomes. Lecture SOP and learning process is prepared to ensure that the lecture process can run well in accordance with the applicable regulations. The mechanisms included in the SOP include:

1. Every lecturer, when giving lectures, is required to fill in the attendance and lecture material titles in the lecturer information system (*Sistem Informasi Dosen*, SIDOS) account with the link <https://sidos.upnjatim.ac.id/login.asp>. The lecturer's attendance is recorded in the "Lecture and Teaching Attendance" menu found in SIDOS by clicking the "start" button to start the lecture, then continue by filling in the lecture material according to the Lecture Program Unit and "end" to end the lecture and fill in the student attendance.
2. If the lecturer is unable to attend according to the specified schedule, the lecturer must report the Department of Education and Teaching to change the agreed lecture schedule, so that it can be recorded on SIDOS.
3. The Program Coordinator will evaluate the lecturer's attendance at mid-semester so that lecturers who have not met the number of meetings required by the academic calendar can make improvements.
4. At the end of each semester, the study program's quality assurance team monitors student satisfaction with each course and the teaching and learning process of the course instructor.
5. Lecturer or teacher provides assessment of student activities during teaching and learning process .

6. Periodic internal quality audits are conducted by the university quality assurance team.

Mechanism for preparing course materials:

1. Lecturers or teachers are authorized to develop teaching materials by involving lecturers who have similar fields of science.
2. During the preparation of the teaching materials, a team of cognate lecturers was assigned to check the suitability of the teaching material with the Lecture Program Unit syllabus and course competencies.
3. In team-taught courses, there must be coordination of teaching materials and lecture times.

The monitoring and evaluation of lecturers in learning recorded in SIDOS is used for the assessment of Lecturers' Performance Load at the end of the semester through the Integrated Resource Information System (*Sistem Informasi Sumberdaya Terintegrasi*, SISTER) platform with the link <http://sister.upnjatim.ac.id/auth/login>.

1. Eligibility for the End of Semester Examination

At the end of each lecture and practicum period, an end-of-semester exam is held. This semester's final exam is one component of the academic assessment used to obtain the final grade for a course. The requirements for taking the final semester examination are as follows:

- a. Students enrolled specific courses (authorized in S)
- b. Student attendance must be $\geq 75\%$ of lecturer attendance
- c. Have paid tuition fee instalments as stipulated

2. Assessment Composition

2.1 Non-Project Based Learning Courses

- a. Mid-semester Grade (MSG) consists of:

Attendance	: 10%
Quizzes/Tasks	: 30%
Mid-semester exam	: 60%
- b. The Final Semester Grade (FSG) consists of

Attendance : 10%

Quizzes/Assignments : 30%

Final exam : 60%

c. Final Grade (FG) = (MSG + FSG) / 2

2.2 Project-based learning courses

Project activities : 20%

Project results : 30%

Quiz : 10%

Assignment : 10%

Mid-term exam : 15%

Final exam : 15%

3. Grading system :

Score	LETTER	Grade point
≥ 80 - 100	A	4,00
≥ 76 - < 80	A -	3,75
≥ 72 - < 76	B+	3,50
≥ 68 - < 72	B	3,00
≥ 64 - < 68	B -	2,75
≥ 58 - < 64	C+	2,50
≥ 54 - < 58	C	2,00
≥ 50 - < 54	C -	1,75
≥ 46 - < 50	D+	1,50
≥ 42 - < 46	D	1,00
≥ 00 - < 42	E	0,00

4. Provisions for KKN, PKL and Thesis

During their studies, students of the Faculty of Engineering are required to do Community Service Program (KKN), Field Work Practice (PKL) and Thesis. Students can program these activities when they have accumulated 100 credits for KKN, 110 credits for PKL and 136 credits for Thesis. Detailed provisions on matters related to KKN, PKL and Thesis are contained in the KKN, PKL and Thesis Guidebook.

5. Study Period Limit and Drop Out

a. The maximum length of study for undergraduate programs is 7 years or 14 semesters

b. Drop out (DO)

A student is declared to have dropped out of study when he/she fails to meet the academic requirements within the study period/duration according to the applicable regulations, so that he/she is not allowed to continue his/her studies and must leave the faculty or study program concerned.

Things that cause DO are :

1. Exceeding the maximum study period limit of more than 7 years (14 semesters)
2. Failure to achieve the minimum number of credits within a specified time period as follows:
 - Failure to accumulate at least 36 credits and a GPA of less than 2.00 at the end of 4th semester. If the number of credits earned is more than 36 credits and the GPA is less than 2.00, the GPA calculation will be based on the lecture period with the best grade of 36 credits. (FT Academic Guide - UPN "Veteran" East Java, Page 16).
 - At the end of 8 consecutive semesters have not been able to collect at least 110 credits and GPA less than 2.00. If the number of credits earned is more than 110 credits and the GPA is less than 2.00, the GPA calculation will be based on the semester with the best grade of 110 credits.

Grades \leq C- are not allowed in any course taken in the Food Technology program, and if students get a grade \leq C-, they must repeat the course.

CHAPTER 6

CURRICULUM AND LEARNING EVALUATION

6.1 CURRICULUM AND LEARNING EVALUATION

The stages of curriculum design of Food Technology Study Program at the Faculty of Engineering UPN "Veteran" East Java refer to the Indonesian National Curriculum Framework, Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 49 of 2014 on National Higher Education Standards, as well as the Strategic Plan of Higher Education, University, and Study Program (Figure 2). The explanation of the flowchart for the design and evaluation of the Food Technology PS curriculum at the Faculty of Engineering UPN "Veteran" East Java is as follows.

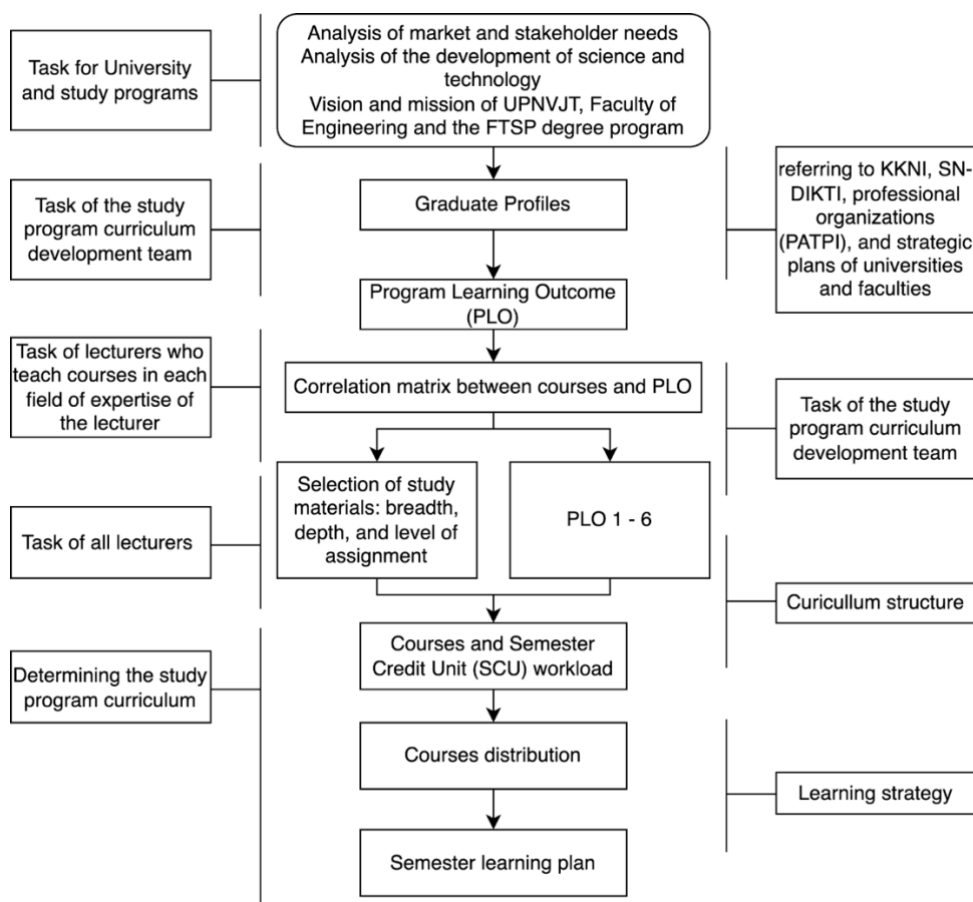


Figure 2. Flow chart of curriculum design and evaluation of Food Technology Study Program, Faculty of Engineering UPN "Veteran" East Java

6.2 INPUT FROM VARIOUS STAKEHOLDERS

Food Technology Study Program, Faculty of Engineering, UPN "Veteran" East Java formulates a vision and mission that reflects the vision and mission of the Faculty and the University. The vision and mission become the basis for the preparation of the learning curriculum at the Food Technology Study Program which refers to the Curriculum Standards made by the Indonesian Association of Food Technologists (PATPI). The learning curriculum at the Food Technology Study Program also refers to the input obtained from various stakeholders, such as industry, state-owned and private enterprises, government agencies, and the community. The formulated curriculum will be evaluated periodically (5 years) based on the academic situation and conditions.

1. Evaluation of Academic Learning Activities from Internal and External Parties
This evaluation will be held at least once a year to collect input from internal and external parties. Internal parties are the academic community of the Food Technology Study Program consisting of lecturers, teaching staff, students, and alumni, while external parties are leaders and employees from various industries, state-owned and private enterprises, government agencies, and the community.
2. Curriculum Evaluation
The existing curriculum has been developed based on KKNi, SN Dikti, as well as Renstra from Dikti, University, and Study Program with Graduate Learning Outcomes that have been formulated.
3. Curriculum Development Team
The Curriculum Development Team is appointed by the Food Technology Program Coordinator and authorized through an assignment letter from the faculty. The task of the Curriculum Development Team is to ensure that the entire process of preparation and evaluation works well. The graduate's profile and the formulation of the Graduate Learning Outcomes (CPL) are formulated by the Curriculum Development Team and agreed upon by the entire academic community. This team also creates a matrix that connects courses to CPL consisting of attitudes, knowledge, general skills, and specific skills. This matrix is the basis for the creation of the Learning Plan (*Rencana Pembelajaran*, RPS) which includes course learning outcomes,

study materials, success indicators, learning methods, credit, assessment weight, and references used.

4. Curriculum Structure

The Food Technology Study Program curriculum consists of common university courses, common faculty courses, compulsory study program general basic courses, and compulsory and elective study program courses. The curriculum that has been formulated is authorized by the Faculty through a Decree signed by the Dean of the Faculty of Engineering.

5. Learning Strategy

The learning strategy is formulated based on the curriculum structure of the Food Technology Study Program by each lecturer teaching the course as outlined in the RPS. The lecturers also determine the course materials, course evaluations, and supporting books to be used. The RPS is made as a learning guideline for one semester and can be used and developed in the next period, based on the progress and development of science and technology.

6.3 LEARNING EVALUATION

The provisions for evaluating the implementation of learning are as follows:

- Evaluation of success in learning activities can take the form of exams, quizzes, assignments and/or case study reports or project-based reports.
- Examinations are conducted in at least two stages, namely the mid-semester exam and the final semester exam. The schedule of both exams is adjusted to the academic calendar set by the university.
- The mid-semester exam is held at the end of the mid-semester, after approximately half of the course material has been completed, which is approximately after the lecture has lasted at least 7 times.
- The final semester exam is held at the end of the semester, after all course materials have been completed (after a minimum of 14 face-to-face lectures).
- Incidental evaluation can be done by a lecturer to get feedback on the learning process of the courses he/she teaches.

- Students are only eligible to take the final semester exam if they have taken the mid-semester exam and have met the minimum attendance requirement of 75% in face-to-face meetings, as evidenced by the attendance list.
- The implementation of learning evaluation is part of the responsibility of the Quality Assurance Team. Therefore, the supervision of the implementation of the examination must be carried out by the team of lecturers in charge of the course. The faculty will provide facilities and logistics for the implementation of the exam, and may help in providing additional supervisors if needed. Evaluation of student attendance is the responsibility of the study program and the lecturer in charge of the course.
- Exam questions should be submitted and validated by the Food Technology Study Program Coordinator at least three days prior to the exam for duplication by the Food Technology Study Program.
- Repairs to exam questions during the exam may only be made by the lecturer of the course.
- The exam supervisor has the right to reprimand students who are considered to be dishonest (cheating) during the exam and to record all events that occur during the exam in the Record of Test Execution. Additional exam supervisors do not have the right to make changes to the examination paper.
- The archiving of the exam questions is carried out by the Food Technology Study Program and the lecturer in charge of the course.
- The examination procedure refers to the Exam Rules formulated by the Food Technology Study Program.

6.4 MONITORING AND EVALUATION METHODS AND INSTRUMENTS

The monitoring and evaluation methods used in this activity are as follows.

- Interviews with Food Technology Study Program coordinator
- Document review
- Discussion, question and answer session
- Field review
- Data and information analysis

- Data verification
- Confirmation of findings
- Recommendation for revision

Monitoring and evaluation (M&E) of curriculum and learning is carried out by team of auditors (2 people) who are tasked with monitoring and evaluating all lecturers teaching courses in the Food Technology Study Program course. The team uses an agreed curriculum monitoring and evaluation instrument. This instrument is needed as a standard to assess the curriculum and learning evaluation process in the Food Technology Study Program. This M&E instrument contains several aspects and a rating scale in Table 1. The final weight of the assessment uses the final score with a Likert scale (A-D) with the following information.

- A highly suitable 80-100%
- B 75-80% compliant
- C less suitable 60-75%
- D not suitable $\leq 60\%$

Curriculum and learning evaluation results need to be analyzed based on the following parameters.

1. Curriculum Structure
2. Learning Outcomes

Table 12 Monitoring and Evaluation Form of Food Technology Study Program Curriculum

No.	Assessment Aspect	Assessment Scale*				Description
		1	2	3	4	
1	The curriculum reflects the vision and mission of the university					
2	The curriculum reflects the vision and mission of the faculty					
3	The curriculum reflects the vision and mission of the study program					
4	Curriculum content shows a good balance between attitudes, knowledge, general skills, and specific skills					
5	Graduate learning outcomes are clearly formulated in accordance with the Food Technology Study Program Graduate Profile					
6	The curriculum shows the breadth and depth of the courses					
7	The curriculum shows Common University Courses, General Basic Courses, Common Faculty Courses, Compulsory and Elective Study Program Courses.					
8	Curriculum content is updated in accordance with applicable regulations and policies and in accordance with standards set by scientific/professional associations and other stakeholder needs.					
9	The curriculum is developed by course lecturers who adjust to the development of science and technology.					
10	Curriculum development involves scientific/professional associations and stakeholder needs					
11	The curriculum is evaluated every academic year					
12	Student evaluation in accordance with course and curriculum objectives					
13	Stakeholder feedback is used for measurable curriculum improvement (implementation)					
14	Lecturers deliver lectures in accordance with the RPS					

15	Assessment of student abilities in each course is carried out periodically, namely quizzes, assignments, as well as mid- and final semester exam.					
16	Assessment schemes and methods are always quality assured and require continuous improvement.					

3. * Number 4 = very suitable; 3 = suitable; 2 = less suitable; 1 = not suitable

CHAPTER 7 CLOSING

In order to prepare graduates who can withstand rapid social, cultural, professional, and technological changes in the era of the industrial revolution 4.0, it is necessary to strengthen student's competencies in accordance with existing developments. Graduates should be linked not only to the business and industrial worlds but also to the constantly evolving future. Based on this, the Faculty of Engineering Study Program, UPN "Veteran" East Java developed the MBKM Curriculum in accordance with the new policy of the Ministry of Education and Culture in the field of higher education through the MBKM program. The policy of the Ministry of Education, Culture Research and Higher Education aims to provide freedom for students to participate in learning activities outside their study program and campus for a maximum of three semesters of study.

Thus, this guidebook serves as a practical resource for the UPN "Veteran" East Java community and as a reference for the implementing the MBKM. It is hoped that the UPN "Veteran" East Java Food Technology Study Program can produce competitive, adaptive, and intellectually astute graduates who uphold the fundamental values of state defense.