

**PROGRAM OF FOOD TECHNOLOGY – BRAWIJAYA UNIVERSITY**  
**COURSE SYLLABI OF CURRICULUM 2019**

**RELIGION, MPK61001, 3 credit hours**

This course discusses about the history and development of five religions (Islam, Protestants, Catholics, Buddha, Hindu) in Indonesia, relationship between human and God, Role of religion to human life.

**INDONESIAN LANGUAGE, MPK61007, 3 credit hours**

The procedure for writing, use of punctuation, spelling and terminology, writing abbreviation. Making sentences. Writing and development of paragraph, Development of essays, quotations. Presentation language in public services. The procedure for writing official letters and e-mails. Presentations technique. Systematic of writing. The use of bahasa in business. The use of Indonesian in scientific writing, editing of scientific writing.

**PANCASILA, MPK61008, 2 credit hours**

This course provides the ability to understand Pancasila as the state in implementing daily activities. Discussion: basis and objective of Pancasila education, national identity, history of the struggle of Indonesia. UUD 1945, body & company 1945, Implementation of the constitution 1945 and Pancasila as a system of philosophy and political ethics system. Pancasila as an ideology of state and in the context of history of the Republic of Indonesia. Pancasila paradigm of life in society and the state. State, national defense and archipelago. The constitution and democracy. National security strategy and national politics and autonomy.

**BIOLOGY, TPF61001, 3 credit hours**

The course describe scope of biology, biological material, genetic cell, bioenergetics cell, growth and cell development, organism classification, atom cycle, ecology, biodiversity, plant, animal and microorganism also its application in field of agriculture technology and biotechnology.

**PHYSICS, TPF61002, 3 credit hours**

The course covers the basic concepts and principles of physics. Topics include dimensions and units, scalar and vector quantities, mechanics, work and energy, fluids, thermodynamics, waves, electromagnetism, optics, relativity, and modern physics.

**GENERAL CHEMISTRY I, TPP61001, 3 credit hours**

General chemistry I is designed to administer an introduction to the fundamental principles in analytical chemistry on distinct chemical reactions. The fundamental principles covered chemistry labs introduction and safety, fundamental laws, electrons and nucleus, periodic tables, chemical bonds, intermolecular bonds and solubility, unit conversions in chemistry and stoichiometry. The chemistry reactions studied solution and colloids, acid base reaction, buffer solution, redox reaction, precipitation reaction and also basic of spectrophotometry analysis. One credit of practical work in the laboratory was done to emphasize their quantitative skills.

**CALCULUS, TPP61002, 3 credit hours**

A study of basic principles of calculus. Topics include limits, derivatives, differentiation, linear approximation, curve sketching, optimization, the chain rule for polynomials, integrals, trigonometric functions, and exponential functions.

**INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY, TPP61003, 2 credit hours**

The course discusses role of food science and technology and introduction of food chemistry and biochemistry, food processing and engineering; food microbiology and biotechnology, food nutrition. Role of food science and technology covers role of food science and technology in Indonesia development, food sovereignty and security, local food development and food safety.

**CIVICS, MPK62001, 3 credit hours**

The course aims to develop knowledge, understanding and awareness of National Defense and Security (HANKAMNAS) in the environment of students in the framework of National Defense (TANNAS), in addition to help raise awareness of the national discipline. Introduction, Archipelago, National Security and Political Defense National Security Strategy as a basis in understanding the system of People's Defense and Security.

**PERSONALITY DEVELOPMENT AND PROFESSIONAL ETHICS, TPF62001, 2 credit hours**

The course discusses about definition ethics and morality, ethical code and professionalism. Implementation of profession in an institution (student ethics, lecturer ethics, education ethic, academic ethic). Shrewdness, personality, communication, and empathy related to professional ethic. Ethics in utilization of Food Science and Technology related to food ethic in various field. Competency in field of food technology, specification and duty dedication in field of Food Science and Technology. The course discusses about standardization status of profession and profession organization related to food (national and international).

**STATISTICS, TPF62002, 3 credit hours**

The courses explain basic principle of statistics used in designed experiment and descriptive experiment, skill to operate related statistic computation software.

**ORGANIC CHEMISTRY, TPF62003, 3 credit hours**

Organic Chemistry course explore the concept of chemical bonding, structure, properties, reactions in organic molecules, isometry and stereoisometry, and classification of compound based on functional groups (alkanes, alkenes, alkynes, aromatic compounds, alkyl halides, alcohols, ethers, aldehydes and ketones, carboxylic acids and their derivatives, phenols, amines, fats, amino acids, carbohydrates), biomolecule compound and other natural organic compound.

**GENERAL CHEMISTRY II, TPP62001, 3 credit hours**

General Chemistry II comprises basic knowledge in energy-based chemical transitions and reaction equilibriums. The topics covered thermochemistry, electrochemistry, state of matter and phase diagrams, ideal gas laws and problems, partial pressures and vapor pressure, law of multiple proportions, equilibrium equations, solubility equilibrium, and chemical kinetics. This

course also contained principles in chemistry analysis include gravimetry, volumetry, instrumental, and nuclear analysis.

### **GENERAL MICROBIOLOGY, TPP62002, 2 credit hours**

History of microbiology, basic principles of microorganisms, prokaryotes and eukaryotes, viruses. classification and morphology of bacteria, molds and yeasts, microbial cell structure and function, metabolism, microbial genetics, microorganism metabolism and factors that influence microbial growth. Principles qualitative and quantitative microbiological analysis, conventional microbes identification (morphology and biochemistry).

### **LABORATORY WORK OF GENERAL MICROBIOLOGY, TPP62003, 2 credit hours**

This laboratory work is designed to provide basic skill of practise in microbiology laboratories. Laboratory work topic include: aseptic and sterilization; microbiological growth media; basic isolation techniques; cultivation and preservation of culture; microbial enumeration techniques; and microbial growth curves.

### **COMMUNICATION SKILLS, TPP62004, 2 credit hours**

The course discuss about basic knowledge of communication, definition and characteristic of inter-personnel communication, human perception, verbal and non-verbal message, effective communication, aspect of norm value, critical thinking ability, case discussion applying critical thinking skills, audience centered analysis and its application.

### **FOOD ENGINEERING I, TPP62005, 3 credit hours**

An introduction to the principle of food engineering, including basic concept of mass and energy balance, gases and vapors, mass transfer, psychrometry and dehydration.

### **ENGLISH, TPF61003, 2 credit hours**

Ability to active communicate (orally and written) and also passive communicate (listening and reading) in English. Formal and informal oral presentation. Writing a scientific article/report/research. English for career purpose (job interview, witting job application, curriculum vitae, etc).

### **ACADEMIC WRITING, TPF61004, 2 credit hours**

This course discuss the scientific writing starting from abstract, introduction including problem identification, literature review, method including research variable, result and discussion, and literature. At the end of the lecture is also taught the writing of scientific journal articles and preparing an effective presentation (including ppt).

### **BIOCHEMISTRY, TPP61004, 4 credit hours**

The course is designed to learn about overview of bio-organics on food macro components such as: carbohydrate, protein, fat/oils, vitamin, enzymes, nucleic acid and bioenergetics. The subjects also discuss biosynthesis and metabolism of main component of bioorganic materials, such as: carbohydrate, protein and fats/oils. Signal transduction, transport across membranes, DNA

replication and repair, transcription and translation, molecular motors, and the biosynthesis of natural products.

### **NUTRITION PHYSIOLOGY AND METABOLISM, TPP61005, 2 credit hours**

This course discuss basic physiology in relation to digestion of food macronutrients, mechanism of nutrients absorption, transport of nutrients through circulation and nutrients uptake by cells and their metabolism. The course also discuss the function of macro and micronutrients, nutrient-nutrient interaction, the regulation of nutrients utilization in the human body in different physiological conditions and the coordinative works to achieve homeostasis.

### **FOOD CHEMISTRY, TPP61006, 3 credit hours**

This course discusses the chemical structure, classification, physico-chemical properties, chemical reactions, functions of food components including water, carbohydrate, protein, lipids, pigments, vitamins, minerals, flavors, and other components. The changes, stability, the roles, functions, and reactions of food components during food processing and storage are also covered. This course also discusses chemical reactions that limit the food shelflife, and the chemistry underlying the properties and reactions of food components. The methods for controlling the reactions of food components are also covered.

### **FOOD PHYSICAL CHEMISTRY, TPP61007, 2 credit hours**

This course discusses the basic physicochemical properties of foods, including particle size, types of substances (gas, liquid, solid), solutions and their properties (electrolyte and non electrolyte), colloidal, suspension, emulsion, foam, and dispersion systems. Basic principles that governs the physicochemical properties of foods are also covered, including adsorption, absorption, surface tension, osmosis, diffusion, aggregation, sedimentation, nucleation, crystallization. Basic principle of food rheology of foods is also discussed in this course.

### **FOOD ENGINEERING II, TPP61008, 3 credit hours**

A study of basic principles of heat transfer and flow of fluids related to food technology and an application of food engineering principles in mixing, size reduction, and crystallization.

### **FOOD MICROBIOLOGY I, TPP61009, 2 credit hours**

This course covers the characteristic of microbial growth, intrinsic and extrinsic factors and their relationship to microbial growth; spoilage microorganisms in foods and the conditions under which they grow, the role and significance of microbial inactivation, adaptation and environmental factors (i.e.,  $A_w$ , pH, temperature) on growth and response of microorganisms in various environment. The role of beneficial microbes, food preservation via fermentation processes.

### **FOOD MATERIAL SCIENCE, TPP61010, 3 credit hours**

This course discusses characteristics of food commodities including egg, dairy, meat/muscle foods, fish, tubers, legumes, cereals, spices, seaweeds, fruits, vegetables, food estate products (cocoa, coffee, tea, palm and others), and other commodities. The discussions comprise of main chemical components and their characteristics, structural properties, post harvest physiology, and their relationship to processing and utilizations.

**NUTRITION EVALUATION, TPP62006, 2 credit hours**

This course covers integrate nutritions contained in food and those advantage in human body. Some factors affecting nutritive value of food (antinutrition compounds, processing effects, nitrification, etc). Evaluation methods of nutritional value of food by 'in vivo' and 'in vitro'. Moreover, introduction of laboratory animal handling.

**FOOD MICROBIOLOGY II, TPP62007, 2 credit hours**

This course covers pathogenic microorganisms, infection and intoxication, mycotoxin, viruses and parasites, host-microbes interaction, and the role of microorganisms in disease and immunity. Various physical and chemical methods to control of pathogenic microorganisms in foods.

**FOOD ANALYSIS, TPP62008, 3 credit hours**

This course is about chemical and physical analysis of foods, that covers sample pre treatment (size reduction, sieving, etc), sampling techniques, extraction techniques; a brief explanation about conventional and modern-sophisticated analysis; qualitative and quantitative analysis in food analysis; principles of proximate analysis including proteins, carbohydrates, fats and oils, water, vitamins, minerals, an analysis of pigments, antioxidants, anti nutrition, food additives, and toxicants; basic principles of chromatography, electrophoresis, and ELISA in food analysis; application of microscopic analysis in foods; and physical analysis of foods including color, texture profile analysis, and rheology.

**LABORATORY WORK OF FOOD BIOCHEMISTRY AND ANALYSIS, TPP62009, 2 credit hours**

The laboratory work is designed to give a hands-on laboratory and practical experience to increase student's understanding on the qualitative biochemical molecules analysis. Changes due to enzymatic processes carbohydrates, proteins, and fats was analysis. Enzyme extraction, activity assays and enzyme kinetics. Sampling techniques, analysis of levels and characteristics of the protein, carbohydrates, fats, water, vitamins, minerals, anti-nutritional substances, additives, the physical properties of food products (color, viscosity, texture, elasticity) analysis are also practiced.

**FOOD ENGINEERING III, TPP62010, 3 credit hours**

A study of basic principles of thermal process and an application of food engineering principles in evaporation, refrigeration and freezing, distillation, extraction, membrane separation, filtration and centrifugation.

**FOOD PROCESSING TECHNOLOGY, TPP62011, 3 credit hours**

This course discusses a set of technologies (traditional and modern food preservation methods) used to convert raw materials into food products (good sensory, safe, nutritious and healthy, and met consumer demand) including to maintain food quality during distribution and storage. Necessity of food preservation, relationship between factors causing physical, chemical and microbiological damage with water. The process technologies studied are the principles and examples of applications of material cleaning, sorting, grading, blending, size reduction, mixing, emulsification, filtration, centrifugation, extraction, heat processing (blanching, pasteurization, sterilization, baking, frying, roasting, extrusion, evaporation, drying), fumigation, cooling, freezing,

crystallization, non thermal processing (chemically, salting, acidification, fermentation / enzymatic) and irradiation.

### **LABORATORY WORK OF FOOD PROCESSING TECHNOLOGY, TPP62012, 2 credit hours**

The laboratory work include basic processing methods such as density measurement, rheology measurement, WHC measurement, syneresis, drying technology, thermal processing technology, bakery technology, cooling and freezing technology, frying technology, preservation technology by using sugar, salt, acid and other preservatives and intermediate moisture food (IMF) technology.

### **SANITATION AND WASTE TREATMENT, TPP62013, 3 credit hours**

Definition of food industry sanitation includes sanitation of food production area, processing tools, water, worker, fresh material and industrial environment. Pest management and water supply in food industry. Continuous technology design for wastewater and solid waste treatment, sanitary landfill and harmful waste treatment, recycle technology: reduction of wastewater nutrition, energy production from wastewater and solid waste, product recovery.

### **QUALITY MANAGEMENT SYSTEM AND HALAL ASSURANCE, TPP62014, 2 credit hours**

This course covers the concepts and the definition of quality, its history, quality terminology, quality management system, quality audit, certification and accreditation. It is expected that students will able to establish quality documents, quality manual as well as quality standards, including halal quality management system.

### **ENZYMولوجY, TPP62015, 2 credit hours**

The enzymology course presents an introduction to the basic principles of enzymology and enzyme technology in the field of food processing and technology. In the initial part, the definition of enzymes, enzymology, the history of enzyme development and enzyme technology are discussed. Then the structure and function of the enzyme as a biocatalyst, classification and factors that affect the activity of the enzyme. The next topic is the purification of enzymes and their characteristics including the mechanism and kinetics of enzymatic reactions. After that, students are introduced to enzyme technology such as immobilization, application of enzymes in the food industry (dairy, bakery, convectionary glucose / fructose processing, detergents and others).

### **EXPERIMENTAL DESIGN, TPF61005, 2 credit hours**

This course covers research variable and parameters identification as well as how to design an experimental work, such as completely randomized design, completely randomized block design, nested, factorial, as well as optimization. Both parametric and non-parametric approach will also be studied. The structure of non-experimental work will also be explained, including how to manage data collection, relevan statistical analysis and its interpretation.

### **LABORATORY WORK OF NUTRITION EVALUATION, TPP61011, 1 credit hour**

This course covers 'in vitro' methods to evaluate of food and nutrition quality; bioavailability; processing effects and antinutritions. And basic skills of laboratory animal handling.

### **LABORATORY WORK OF FOOD MICROBIOLOGY, TPP61012, 2 credit hours**

This laboratory work is designed to provide practical ability in a laboratory about food microbiology analysis. Practical material includes general techniques and standard procedures for microbiological analysis, isolation and identification of microorganisms, microbial biochemical activity tests, the effect of food processing on microorganism resistance, microbial control by chemical treatment, and food preservation through the fermentation process (making fermented products).

### **SENSORY ANALYSIS, TPP61013, 2 credit hours**

This course covers the basics and the fundamental concepts of sensory science as well as technical aspects of basic sensory methodology, including discriminative test, preference test, acceptability test as well as descriptive test. Relevant statistical analysis related to the experimental design of the test will be required to master.

### **LABORATORY WORK OF SENSORY ANALYSIS, TPP61014, 1 credit hour**

This practical work enhance the student understanding the basic tests of sensory evaluation, including difference test, preference and acceptability test, and descriptive test. Sensory threshold measurement will also be conducted. Not only demonstrate the test, it is also expected that relevant statistical analysis will be mastered.

### **QUALITY CONTROL, TPP61015, 2 credit hours**

This course covers conceptual and definition of quality, operational scope of quality control, the relevance of quality and controlling process, quality attributes and standards. The scope is emphasized on the practical aspect of quality control particularly on the quality control tools and statistical process control using computer application.

### **FOOD ADDITIVES AND INGREDIENTS, TPP61016, 3 credit hours**

This course contains of food additives including preservatives, emulsifiers, stabilizers / thickeners, artificial sweeteners, food coloring, acid, flavor, antioxidants and other food additives such as developers, anti-clumping, and others. Discussion include: type, chemical structure, function of the product, physical and chemical properties, mechanism of action, mode of use, usage limits and safety aspects, as well as nutrition of specific food components in food products. This course also discusses about the characteristics and application of various ingredients that are widely used in the food industry. The discussion also covers related regulations and standards. The learning process is emphasized on the ability to determine its use in food production, as well as being able to do problem solving related to the use of materials in food processing. Knowledge of industrial materials learned includes: milk derivatives (skim milk, cream, butter milk, anhydrous milk fat, casein, whey, etc.), starch, modified starch, dextrin, maltodextrin, flour, sugar alcohol, sugar (high fructose syrup, glucose / dextrose, lactose, high corn syrup, etc.), industrial ingredients of meat products including curing agent, vegetable oils / fats (cocoa butter, cocoa butter substitute, partially hydrogenated vegetable oil, coconut oil, soybean oil, frying fat, etc.), fortification food, premix vitamins and minerals for fortification and processing, eggs and their derivatives, oligosaccharides, prebiotics, probiotics, isolates and protein concentrates, enzymes for processing (rennet, protease), seasoning, lecithin, and other food industry materials.

**FOOD PACKAGING AND STORAGE, TPP61017, 3 credit hours**

Knowledge of various types of packaging materials (plastic, paper, metal, and glass), its properties (resistance to heat, permeability to gas and water), various methods of packaging and application. This course also studies about determination of food products shelf life by reaction prediction methods and shelf life plot (Arrhenius, linear, and Q10), etc.

**ENTREPRENEURSHIP, TPF62004, 3 credit hours**

This course discuss about the entrepreneurial perspective (the characteristics and significance of entrepreneurship, entrepreneurial thinking, entrepreneurial and entrepreneurial intentions, international entrepreneurship opportunities, case studies), creating and starting agroindustry enterprises (analysis of creativity, business ideas and opportunities, intellectual property and legal issues employers, business plans, marketing plans, organizational plans, financial plans, cases), financing of new agro-industries (capital sources, stock quotes, cases), managing, developing and terminating an agro-industry company (entrepreneurial strategy , strategies to grow, entering global markets, acquiring external resources, ending a company, cases), leadership (definition, leadership type, strategy), communication (communication theory, presentation techniques, negotiation techniques, conflict management).

**PRODUCT DEVELOPMENT, TPP62016, 2 credit hours**

Changes in the business environment which necessitates the development of new products, the social aspects of culture in society, the study of consumer behavior, consumer research, the principles of management of new product development, design new products, technology and engineering in new product development, business aspects in the development of new products that include financial forecasting and market opportunities for new product development, the latter part of the lecture discussed several case studies and discussion of subjects covered by the review. Measurement of sensory characteristics. Testing of products in the development and marketing stage.

**FOOD REGULATION, TPP62017, 2 credit hours**

This course is designed to provide awareness of both national and international food regulation and their respected bodies/agencies. Food claim, adulteration as well as food safety aspects are within the scope of the subject. Current issues in food trade including its system and procedure are also elaborated.

**FOOD SAFETY AND TOXICOLOGY, TPP62018, 3 credit hours**

This course contains the concept of toxicology, the classification of toxic materials in foods (natural animal, plant, microbe toxin, environmental toxicants, heavy metals, pesticides, etc.). This course also learn about the mechanisms of toxicity include absorption, distribution and metabolism. Furthermore, this course learn about food allergens, food additives and detoxification mechanisms (biotransformation).

**FOOD PROCESSING UNIT DESIGN, TPP62019, 4 credit hours**

The course covers the theories underlying the planning process of a processing unit, process flow diagram, mass balance and heat balance, the need of processing tools and machinery, utilities, management of occupational quality, safety and economic analysis and its application in practice for planning processing unit.

**ANIMAL PRODUCT PROCESSING TECHNOLOGY, TPP61018, 3 credit hours**

Characteristics and physiological properties of animal product of food. Post-harvest handling techniques of livestock and fish product for consumption and raw material. Processing techniques of livestock and fish product into refined products that have economic value. Handling techniques and industrial waste treatment and processing of livestock and fish industry.

**SUPPLEMENTS AND FUNCTIONAL FOODS, TPP61019, 3 credit hours**

This course is a study about of supplements and functional food for health. Discussion on food bioactive components for the development of supplement products and functional food, especially those based on local resources. Aspects include: the relationship between food, nutrition and health; the efficacy of the bioactive component in preventing health problems; types of supplement products and functional foods; Regulation, prospects and trends of supplements and functional food.

**CULINARY MANAGEMENT, TPP61020, 3 credit hours**

This course covers basic knowledge of the scope and development culinary including food services, culinary industry and catering services. The aspects discussed cover quality, nutrition and economic aspects including the provision of materials, menu planning, processing and preparation for presentation, design and layout, organization, personnel, and marketing. In addition, this course also discusses aspects of meal experience and satisfaction in culinary industry as well as its testing methods.

**PLANTATION CROP PRODUCT TECHNOLOGY, TPP61021, 2 credit hours**

This course discusses the handling and processing technology of plantation crops such as processing cocoa, tea, coffee, coconut, oil palm. Technology for handling fresh commodities and their processed products.

**SUGAR AND POLYSACCHARIDES TECHNOLOGY, TPP61022, 2 credit hours**

This course explains the various types of polysaccharides, natural resources of polysaccharides, specific characteristics and their functions in food products. Also discusses about the hydrolysis method of some polysaccharides into sugar. Natural and alternative sugar sources, the effect of sugar on the characteristics of food products.

**FATS AND OILS TECHNOLOGY, TPP61023, 2 credit hours**

This course contains of technology and processing of fats/oils source, processing fats/oils source into edible fats/oils and their derivative product. Edible fats/oils topic consist of principle of technology/methode, machine, extraction process, purification (degumming, refining, washing, bleaching, deodorisation, fractination). Derivative product of fats/oils consist of technology, processing equipment, controlling process, applied product (butter, margarine, shortening, frying fats, virgin coconut oils or VCO, cocoa butter substitute/replacer/alternative, fat replacer/ mimetic, hydrogenated fats, salad oil, fish oil, creamer, medium chain triglyceride or MCT).

**SNACKS AND CANDY TECHNOLOGY, TPP61024, 2 credit hours**

This course discusses about the processing technology of some snacks and confectionery, the components of making snacks and candy, ingredients used, the role of snacks and in healthy food patterns and consumer's need for healthy snack and candy.

**MOLECULAR GASTRONOMY, TPP61025, 2 credit hours**

This course is designed to understand molecular gastronomy and its relevance to food science. The topics include gastronomy, sensory perception mechanism, physico-chemistry and engineering aspects of cooking and application of molecular cooking techniques and advanced cuisine to optimize eating and drinking experience.

**INNOVATIVE FOOD TECHNOLOGY AND ENGINEERING, TPP61026, 3 credit hours**

A study of a novel processing technique to obtain healthier and safer food product, including non-thermal processing, encapsulation, emulsification, nanotechnology, microwave applications, ohmic heating, electrochemical technique, and a novel materials for food, including bio-surfactant and catalyst.

**SPICES AND ESSENTIAL OIL TECHNOLOGY, TPP61027, 2 credit hours**

This course discusses various types of spices and their functions for food and health, the effects of processing on their functional properties, methods of extracting essential oil and products that can be developed from the processing of essential oils.

**THERMOBACTERIOLOGY, TPP61028, 2 credit hours**

The course introduces important aspects in thermal treatment of food material so that a food product is safe to eat and retaining nutrients. The course will be opened by introduction to history and development of thermal process application in food products and continued with the microbial aspects that are important in thermal processes, including microbial resistance to thermal processes. At a half of semester the course will be followed by strengthening evaluation of thermal process.

**FERMENTED FOODS, TPP61029, 3 credit hours**

This course provides basic knowledge on processed products which process using microbes. Processing and fermentation of processed product development, both traditional and modern, includes fermentation of fruits and vegetables, cereals, tubers and grains, as well as animal products. Ways to control the process, the determination of the quality of the final product. Fermentation based functional foods.

**WORK HEALTH AND SAFETY, TPP61030, 2 credit hours**

This course is designed to introduce awareness of work health and safety, including its principles and its importance for food industry. The scope also covers development of health and safety management documents, including how to identify and manage the potential risk and hazard.

### **POST HARVEST PHYSIOLOGY AND TECHNOLOGY, TPP62020, 2 credit hours**

The course discusses about fresh commodity physiological process include description about respiration and respiration pattern. Effect of respiration pattern on commodity shelf life, transpiration, physico-chemical alteration during maturation of product. Effect of temperature, RH and gas composition on commodity physiology, pathology, postharvest loss, and quality standard.

### **COMMUNITY NUTRITION AND PUBLIC HEALTH, TPP62021, 2 credit hours**

This course is a study about on Community Nutrition Issues and Food Security, Nutrition Improvement and Food Diversification Program, Nutrition Epidemiology, Balanced Menu and Desirable Dietary Pattern. Explain the calculation of nutritional needs and adequacy (RDA), as well as nutrition for special groups. Community nutritional status assessment methodology. Overview of malnutrition, degenerative diseases and public health indicators.

### **TRENDS IN FOOD AND NUTRITION, TPP62022, 2 credit hours**

This course is a study about the latest trends in food, nutrition and health technology. This course includes coverage of immune system, cancer, vegetarian diet, sport nutrition, food security and malnutrition, fat burning food, food and diabetes, emergency food, food and anti-aging, nutrigenomics, gastronomy, nanotechnology in nutrition, and other actual issues.

### **FOOD AND NUTRITION INTERVENTION, TPP62023, 2 credit hours**

This course discusses the principles and concepts of planning, organizing, implementing and evaluating nutrition and food intervention programs in solving problems in the community. This course also examines the concepts of behavior and socio-culture in relation to nutrition and health issues; intervention methods and strategies; design material, media, assessment and intervention approach techniques (individual, group and mass).

### **CONSUMER STUDY, TPP62024, 2 credit hours**

This course is designed to introduce awareness of principal theories related to consumer behaviour, detail aspect of consumer background and market decision as well as current issue of food market changes. General method for consumer study is also discussed.

### **NATURAL PRESERVATIVES, TPP62025, 2 credit hours**

This course studies the history of food preservation, food preservation methods, food preservatives, factors that affect the effectiveness of preservatives, the dangers of synthetic preservatives and the benefits of natural preservatives, natural preservatives based on microbial, natural preservatives based on plant, natural preservatives based on animals, food products which utilizes preservatives.

### **FOOD CROP PROCESSING TECHNOLOGY, TPP62026, 2 credit hours**

This course discusses various sources of local crops commodities and their specific characteristics, fresh handling, processing technology, processed products based on food crop commodities.

**HORTICULTURAL PRODUCT TECHNOLOGY, TPP62027, 3 credit hours**

This course deals with a variety of methods for processing fruit and vegetables, physical and chemical changes during processing, fruit beverage products, dried fruit and vegetables, fruit and vegetable flour, fruit peel pigments extraction, fruit and vegetable fermentation.

**BIOASSAY, TPP62028, 3 credit hours**

This course introduces some bioassay techniques to test the biological activity of nutrient compounds (macro and micro-nutrients) and bioactive compounds. The techniques to be studied are in vivo and in vitro models. Some basic principles of in vivo experiments are introduced such as type of animal used, feeding methods, feed formulation, methods of animal induction, animal handling, euthanasia techniques etc. In vitro methods such as using cell lines, primary cells from organ body, etc are also introduced.

**INTERNSHIP, UBU60007, 3 credit hours**

An activity of dedication to the community in certain areas, implemented in groups, integrated among departments, coordinated at the Faculty level, preferably non-physical activities in agricultural technology, aims to help the community to improve the level of knowledge and skills so that it is expected to improve their welfare. Real work college activity is divided into 4 stages of activities, namely briefing, implementation of on-site activities, implementation reports and evaluation.

**UNDERGRADUATE THESIS, UBU60001, 3 credit hours**

A scientific paper based on the data resulting from the research (experimental in the laboratory or in the field, simulation/modeling, survey, or case study in the company) or scientific reports of apprenticeship work, technological design work, entrepreneurship or competitive scientific papers, which is equipped with literature study, under the guidance of Supervisor(s).