

**T.C.**  
**ZONGULDAK BULENT ECEVIT UNIVERSITY**  
**FACULTY OF ENGINEERING**  
**DEPARTMENT OF FOOD ENGINEERING**  
**BACHELOR'S DEGREE LESSON CONTENT**

**1<sup>st</sup> ACADEMIC SESSION**

**FIZ183 PHYSICS** **(3-0-3) 4 ECTS**

Physics and Measurement; Vectors; Motion in One and Two Dimensions; Newton's Laws of Motion; Circular Motion and Other Application of Newton's Laws; Work and Kinetic Energy; Potential Energy and Conservation of Energy; Linear Momentum and Collisions; Rotation of a Rigid Object About Fixed Axis; Torque and Angular Momentum; Static Balance and its Properties.

**FIZ191 PHYSICS I LABORATORY** **(0-3-1) 1 ECTS**

Measurement, vector addition of forces, motion in an inclined plane, collision in two-dimensional space, helical spring and potential energy change in helical spring, center of mass and physical balance of bodies, simple pendulum, angular acceleration, angular velocity and torque, moment of inertia.

**KIM193 CHEMISTRY** **(3-0-3) 4 ECTS**

Introduction, matter and measurement, atomic structure, chemical bonds and molecular geometry, chemical equations and quantitative relations, gases, solutions, chemical kinetics and chemical equilibrium, chemical thermodynamics, electrochemistry.

**KIM191 CHEMISTRY LABORATORY** **(0-2-1) 1 ECTS**

Getting started in the laboratory, basic laboratory procedures, identification of a substance with its chemical properties, the law of conservation of mass, density of solids and liquids,

precipitation and leaching, crystallization, stoichiometry, acid-base titrations, diffusion, interaction of some inorganic salts with acid.

### **MAT181 MATHEMATICS I**

**(4-0-4) 6 ECTS**

Numbers, Lines, Circles and Parabolas, Functions and their Graphics, Trigonometric Functions, Limit and Limit Rules, Continuity, Derivative and Rules of Differentiation, Chain Rule and Parametric Equations, Derivative of Trigonometric Functions, Inverse Functions and their Derivatives, Derivative of Logarithmic and Exponential Functions, Implicit Differentiation, Monotone functions and First Derivative Test, Extreme Values of Functions, Theorems Related with Differentiable Functions, Concavity, Sketching the Graph of a Function, Indeterminant Forms and L'Hopital Rule, Differentials.

### **GDM101 INTRODUCTION TO FOOD ENGINEERING**

**(2-0-2) 4 ECTS**

Definition of food engineering, information about food engineering department, history, interest and scope, content of food engineering, general basic information, food science and food technology, food safety methods, food quality control, food process and technologies, Turkish Food Industry.

### **GDM105 ENGINEERING ETHICS**

**(2-0-2) 2 ECTS**

Introduction. The concept of ethics and the historical development of ethics. Ethical behavior criteria. Ethical behavior social codes. Professional ethics, purpose and importance. Ethical principles, ethical and unethical behaviors in professional life. The engineering profession and the professional, socio-economic and environmental ethical responsibilities of the engineer. TMMOB engineering and architectural professional code of conduct. Ethical case examples related to engineering ethics; "Case I: The Space Shuttle Challenger Crash." Solving ethical problems. Profession-work ethic. "Case II: Ford Pinto accidents." academic ethics. "Case III: Kansas City, Hyatt Regency Hotel disaster." Ethics in scientific research and publications. Addressing ethical issues. "Case IV: Examples from Turkey." Environmental ethics.

**GDM107 INFORMATION TECHNOLOGIES****(1-2-2) 4 ECTS**

Introduction to computer (definition, historical development, computer types), Computer hardware and environment units, Software (operating systems, application software, programming language), Operating systems, Office programs and applications (word processor, data and graphics processor, electronic presentation softwares), Computer network and internet.

**TUR181 TURKISH LANGUAGE I****(2-0-2) 2 ECTS**

Students will be taught how to use the written communication tools accurately and efficiently in this course. Various types of written statements will be examined through a critical point of view by doing exercises on understanding, telling, reading, and writing. Punctuation and spelling rules, which are basis of written statement, will be taught and accurate usage of these rules for efficient and strong expression will be provided.

**YDL185 FOREIGN LANGUAGE I****(2-0-2) 2 ECTS**

Present tense and past tense, auxiliary verbs, transitive and intransitive verbs, singular and plural structures, active and passive sentences, adjective clauses, noun clauses, structures connecting sentences, conditional sentences.

**2<sup>nd</sup> ACADEMIC SESSION****FIZ182 PHYSICS II****(3-0-3) 4 ECTS**

Electric fields, Gauss law, electrical potential, capacitance and dielectrics, current and resistance, direct current circuits, magnetic fields, sources of magnetic fields, Faraday's law, inductance, alternating current circuits, electromagnetic waves.

**FIZ192 PHYSICS II LABORATORY****(0-3-1) 1 ECTS**

Ohm's law and resistance measurement with Ohm's law, Kirchhoff's laws, equipotential and electric field lines, electrolysis, current and voltage measurement, resistance measurement methods and wheatstone bridge, resistance capacitance (RC) circuits, alternating current and series RLC circuit, magnetic field.

**MAT182 MATHEMATICS II****(4-0-4) 6 ECTS**

Definite Integral, Fundamental Theorem of Calculus, Indefinite integral, Basic Integration Formulas, Integration Techniques, trigonometric Integrals, Improper Integrals, Application of definite Integrals: Area, volume, surface area, length of a curve, Center of Mass, Sequence and Series, Convergence of Sequences and Series, Convergence Tests for Series, Power Series and Radius of Convergence, Taylor Formula, Parametric Curves and Polar coordinates, Area and Length in Polar Coordinates.

**GDM102 ANALYTICAL CHEMISTRY****(2-0-2) 3 ECTS**

Errors in chemical analysis, statistical organization and evaluation of data, gravimetric methods, volumetric methods, aqueous-solution chemistry, ionic equilibrium, equilibrium calculations in complex systems, theory of neutralization titrations, titration curves of complex acids/bases, precipitation titrations.

**GDM104 ORGANIC CHEMISTRY****(2-0-2) 3 ECTS**

Alkanes, alkenes, aromatic hydrocarbons, alcohols, ethers, aldehydes and ketones, carboxylic acids, stereoisomers, carbohydrates, amino acids, proteins.

**GDM112 COMPUTER AIDED TECHNICAL DRAWINGS****(2-2-3) 4 ECTS**

Introduction and use of technical drawing tools and equipment, paper forms, line types, writing norms, scales, legend notation, geometric drawings, projections, axenometric drawings, perspective views, dimensioning and scanning, section drawings, plans, detail drawings, professional practices.

**GDM114 INTRODUCTION TO PROGRAMMING****(2-2-3) 3 ECTS**

Introduction to programming, Programming languages, Arithmetic and logical expressions, Algorithms, Drawing flow charts, Basic programming principles, Data types, variables, matrix and array operations, Control statements, loops, functions, File operations, graphics operations, Making applications in Engineering field with sample programming language.

**GDM116 STATICS****(3-0-3) 2 ECTS**

Mechanics: Basic concepts and principles. The statics of particles “Forces in the plane, forces in the space.” Rigid bodies: Equivalent force systems, Equilibrium of rigid bodies “Two dimensional balance, Three dimensional balance.” Geometric center and center of gravity. Structural analysis “Cages, Frames and machines.” Forces in the beams “General equations, shear force and bending moment diagrams.” Moment of inertia “ Moments of inertia of area, Moments of inertia of mass.” Virtual work “Mechanisms, Mechanical efficiency.”

**TUR182 TURKISH LANGUAGE II****(2-0-2) 2 ECTS**

Turkish affixes and their application, General information about composition, Word types, sentence elements, sentence analysis application, Expression and sentence disorders and their correction, Petitions, minutes, letters and types, Principles to be followed in the preparation of scientific articles.

**YDL186 YABANCI DİL II****(2-0-2) 2 ECTS**

Recent and future tenses, their similarities and differences with other tenses, the expression of actions that require skill, the use of ordinal and counting numbers, the ability to talk about dates, the future plans and travel and shopping information, the careers, interests and habits of individuals, giving intent, warning, advice, and direction.

**FREE ELECTIVE COURSE****KRY900 CAREER PLANNING****(1-0-1) 0 ECTS****3<sup>rd</sup> ACADEMIC SESSION****GDM201 FOOD CHEMISTRY****(2-0-2) 4 ECTS**

Water-Ice, description of acid-base, buffer systems, carbohydrates, lipids, proteins, enzymes, vitamins and minerals, natural toxic compounds and contaminants, phenolic compounds, natural color compounds and flavour compounds, alcohols, glycosides, alkaloids.

**GDM203 GENERAL MICROBIOLOGY****(2-2-3) 4 ECTS**

History and development of Microbiology, definition and scope of microbiology, cell chemistry, prokaryotic protists (monera), morphological characteristics and anatomical structure of bacteria, reproduction in bacteria, classification and nomenclature of microorganisms, general characteristics and growth of molds, yeasts and general characteristics, algae and general characteristics, protozoa and general characteristics, the general properties of viruses and virus reproduction, feeding of microorganisms, microbiological media, practise.

**GDM207 PHYSICAL CHEMISTRY****(2-0-2) 3 ECTS**

Basic concepts in physical chemistry, ideal gas and ideal gas mixtures, kinematic gas theory, distribution of molecular velocity, real gases and van der Waals equations, first law of thermodynamic, internal energy and enthalpy functions, isothermal and adiabatic processes, the second and third laws of thermodynamics, entropy, free energy, thermochemical reactions, chemical equilibrium, chemical kinetics, reaction rate, order and molecularity, measurement methods of reaction rate, relationship of rate constant and temperature.

**GDM209 ENGINEERING MATHEMATICS****(3-0-3) 4 ECTS**

Fundamentals of vector analysis. Vector algebra. Line, surface and volume integrals. Green's theorem on surfaces. Stokes and Gauss theorems. Matrices. Determinants. Linear systems of equations. Algebraic eigenvalues and vectors of matrices. Complex numbers. Complex analytical functions. Apps.

**GDM211 FOOD BIOLOGY****(2-0-2) 2 ECTS**

Creatures, formation of life, importance of water in life, inorganic matters, biological molecules, hormones, vitamins, enzymes, properties of prokaryotic and eukaryotic cells, physical and chemical properties of cell, cell membrane structure and function, cell membrane transport, organelles, aerobic and anaerobic respiration and fermentation, photosynthesis, chemosynthesis, ribosomes and protein synthesis, DNA replication and repair.

**GDM215 FLUID MECHANICS****(3-0-3) 4 ECTS**

Definition of fluid, Properties and units of fluid, Fluid statics, Pressure and pressure variation, Manometers, Pressure force on plane and curved surfaces, Flotation and lifting. Relative balance. Dimensionless numbers and dynamic similarity, Fluid flow concepts and basic equations of flow (Continuity-Euler-Bernoulli-Energy Equation). Fluid resistance and boundary layer concepts.

**GDM217 MATERIAL SCIENCE****(3-0-3) 2 ECTS**

General introduction to material science and introduction of today's Engineering materials and classification of materials. Atomic structure-sequencing motion-bond structure. Crystal-amorphous structure. Diffusion in materials. Mechanical properties of materials and control of microstructure. Strengthening treatments in materials. Materials production methods and today's engineering materials. Law of phases (single, double and triple phase diagrams). Introduction of engineering materials, material selection, iron alloys. Non-ferrous alloys. Corrosion.

**GDM287 VOCATIONAL FOREIGN LANGUAGE I****(3-0-3) 2 ECTS**

What is engineering? Engineering disciplines (Computer Engineering, Biomedical Engineering, Environmental Engineering, Electrical and Electronics Engineering, Food Engineering, Civil Engineering, Geology Engineering, Mining Engineering, Mechanical Engineering, Metallurgical and Materials Engineering). Shapes. Materials. Tools. Energy. Simple Machines. Working with numbers. Types of measurement. The scientific method. Safety precautions.

**AIT281 PRINCIPLES OF ATATURK AND HISTORY  
OF TURKISH REVOLUTION II****(2-0-2) 2 ECTS**

The meaning of the history of the revolution - the importance of the Turkish revolution, a general view of the causes that led to the Turkish revolution, the First World War, the disintegration of the Ottoman Empire, the state of the country against the occupations, the attitude of Mustafa Kemal Pasha, the first step to liberation, organization through congresses, societies , Kuvayi Milliye, Misak-ı Milliye, opening of the Turkish Grand National Assembly, establishment of the National Army, Two important events: Peace of Sevres and

Gyumri, War of Independence until the Battle of Sakarya, Battle of Sakarya, Great Offensive, From Mudanya to Lausanne , the transition to the period of the first revolution in the political field "Takrir-i Sukun".

## **FREE ELECTIVE COURSES**

### **GDM901 ETHICS IN FOOD ENGINEERING (2-0-2) 3 ECTS**

Historical process in food-human relationship, historical process in food engineering education, professional laws/drafts, professional organizations (chamber, association, foundation, etc.) and relations with them, professional responsibilities, relations between colleagues, professional abuses, relations with other professions, food engineer - employer relations, food engineer-employee relations, expertise and expertise responsibilities, social responsibility of food engineer, general food legislation.

### **GDM905 MAIN ISSUES WONDERED ABOUT FOODS (2-0-2) 3 ECTS**

Basic chemical components of foods; What is functional food? Antioxidant, prebiotic, probiotic, synbiotic, dietary fiber, Omega 3-Omega 6 fatty acids, gluten, phytic acid, cholesterol, mycotoxin, nitrosamine etc. why? What are their relations with health?; UHT milk, pasteurized milk, street milk; margarine and butter; Natural toxins found in foods; Food infections and food poisoning; Food allergies.

### **GDM907 TRADITIONAL FOODS (2-0-2) 3 ECTS**

Definition, importance, regional distribution and other basic concepts of traditional foods; Turkish nutrition culture; geo-marking; traditional dairy products; traditional cereal products; traditional meat products; traditional fruit and vegetable products; traditional drinks; traditional confectionery products; traditional fermented foods; physical, chemical and biological risks in traditional foods; production techniques of traditional foods; nutritional value of traditional foods.



**GDM202 FOOD MICROBIOLOGY**

**(3-0-3) 5 ECTS**

Microorganisms and foods, food contamination sources, factors affecting the growth of microorganisms in foods (internal factors, external factors), food preservation methods (prevention of contamination, removal of contaminants from food, prevention of microbial growth, inactivation of microorganisms found in food, food-borne diseases, epidemiology and controlling of food borne pathogens.

**GDM204 FOOD MICROBIOLOGY LABORATORY**

**(0-3-2) ECTS**

Basic techniques on laboratory studies with microorganisms, obtaining pure colonies with case studies, determining number of colony, finding colony and control of microorganisms, determination of quality with microbiological analysis.

**GDM206 MASS AND ENERGY BALANCES**

**(2-1-3) 4 ECTS**

Dimensions and units, unit systems, basic concepts such as pressure, temperature, concentration, composition, mass balances for open systems, mass balances for transactions involving chemical reaction and free, gas-vapor relations, the phase diagram of water, balance, vapor pressure, the partial pressure, saturation, partial saturation and humidity concepts, the establishment of the overall energy balance, enthalpy changes without phase change, enthalpy changes in the phase change, the establishment of the overall energy equation in chemical reaction and without the system.

**GDM210 FOOD BIOCHEMISTRY**

**(2-0-2) 2 ECTS**

Vivo characteristics, cell structure, carbohydrates, proteins, lipids and metabolisms, biochemical reactions that occur during food processing, non-enzymatic browning reactions (caramelization, ascorbic acid oxidation and Maillard reactions), the bioactive proteins and peptides, enzymes-coenzymes, enzymes in the food industry.

**GDM216 THERMODYNAMICS****(3-0-3) 4 ECTS**

Basic concepts and definitions. Properties of pure substances. System balance. Work and heat. The first law of thermodynamics. Internal energy and enthalpy. The second law of thermodynamics. Carnot cycles. Entropy.

**GDM218 PROBABILITY AND STATISTICS****(3-0-3) 4 ECTS**

Basic concepts. Classification and presentation of data. Measures of central tendency. Distribution (variability) measures. The concept of variables and random variables. Probability and probability distributions. Permutation and combination. Tests of hypothesis. Correlation and regression. Linear, multiple linear and nonlinear relationships.

**GDM220 ENGINEERING ECONOMY****(2-0-2) 2 ECTS**

The nature of engineering economics and basic concepts. Cost calculation and analysis. Revenue calculation and analysis. Profit maximization and breakeven analysis. The concept and calculations of amortization and depreciation amortization. Cash flow calculation. Time value of money, simple and compound interest calculations. Evaluation of investment projects, profitability rate, payback period, net present value analysis, internal rate of return, cost-benefit analysis. Purchase-lease analysis.

**GDM288 MESLEKİ YABANCI DİL II****(3-0-3) 2 ECTS**

Professional technical writing and reading, foreign language for speaking and business life.

**AIT282 PRINCIPLES OF ATATÜRK AND HISTORY OF  
TURKISH REVOLUTION II****(2-0-2) 2 ECTS**

The characteristics of the execution of the Turkish Revolution, the establishment of the legal system, the establishment of the education system, the efforts made in the field of economy and finance, other innovations regulating social life, the domestic politics of the Republic of Turkey during the Atatürk period, the foreign policy of the Republic of Turkey during the Atatürk era, Unit supplement: Atatürk's his death, the domestic and foreign policy of the Republic of Turkey after the Atatürk period (1938-1983 summary), Atatürk's principles in general, Atatürk's Principles; Republicanism, Nationalism (Nationalism), Populism, Statism, Secularism and Revolutionism, general evaluation.

## **FREE ELECTIVE COURSES**

### **GDM904 CURRENT ISSUES ABOUT FOODS**

**(2-0-2) 3 ECTS**

Functional foods and the problems encountered in the sector, Current technological and basic processes, Active and smart packaging systems, Green and clean label concepts, evaluation of food-agricultural industrial wastes, different nutrition systems, food allergy and intolerance, artificial food technologies, latest developments in edible resources, current studies in different food components, different food systems and auxiliary elements following the current literature.

### **GDM906 FOOD HYGIENE**

**(2-0-2) 3 ECTS**

Definition and importance of hygiene and sanitation; causes of food spoilage (physical, chemical, microbiological factors); food-microorganism relationship; foodborne infections and poisonings; personnel and equipment hygiene; cleaning and disinfection; pest control; hygiene in the purchase, storage, preparation and presentation of food

### **GDM908 FOOD PROCESSING METHODS**

**(2-0-2) 3 ECTS**

Drying, cooling, extraction, evaporation, filtration, distillation.

### **GDM910 FOOD TECHNOLOGIES**

**(2-0-2) 3 ECTS**

Production technologies of proteins, carbohydrates, fats, various foods.

## **5. YARIYIL**

### **GDM301 FOOD HYGIENE AND SANITATION**

**(2-0-2) 2 ECTS**

The concepts and the importance of hygiene and sanitation in food industry, sources of contamination in foods and prevention, cleaning and sanitation practices in food plants, the introduction to HACCP, personal hygiene and education, detergents and disinfectants, insect control, properties and disinfection of the water used in the food industry, waste product operations.

**GDM303 FERMANTATION TECHNOLOGY****(2-0-2) 3 ECTS**

The role and importance of fermentation technology in food industry, definition of fermentation, types of fermentation, alcohol fermentation, lactic acid fermentation, acetic acid fermentation, citric acid fermentation, raw materials for fermentation, fermentation microorganisms, yeast and bacterial cell structures, replication and growth conditions, pickle production technology, olive production technology, vinegar production technology, wine production technology, beer production technology, distilled spirits technology, boza production technology.

**GDM305 REACTION KINETICS****(2-0-2) 2 ECTS**

The reaction rate, the reaction rate theory, factors affecting the rate of reaction in food, calculation of kinetic parameters for the reactions in food (reaction rate constants and half-lives), the effect of temperature on reaction rates in foods (activation energy and Q<sub>10</sub> values). Kinetics of biological reactions. Kinetics of microbial death and enzyme inactivation.

**GDM307 FOOD ANALYSIS****(2-2-3) 4 ECTS**

Sampling, sample preparation for analysis of, evaluation of the results, pH and titratable acidity, total dry matter and moisture analysis, mineral and ash analysis, fat, protein, sugar analysis, vitamin analysis, density determination, determination of enzyme activity, rheological analysis, color analysis sensory evaluation.

**GDM309 HEAT AND MASS TRANSFER****(2-2-3) 4 ECTS**

The basic principles of heat transfer, Fick's law, heat transmission coefficients, steady-state heat transfer, film coefficients, general coefficient concept in natural and forced convection, heat loss and insulation, heat exchangers, heating and cooling of solids, radiation, unsteady state heat conduction. The principles of mass transfer, phase equilibrium and related diagrams, basic principles of steady and unsteady state molecular diffusion, the models used for mass transfer coefficient, correlations for convective mass transfer coefficients, analogies between the heat, mass and momentum transfer.

**GDM311 OCCUPATIONAL HEALTH AND SAFETY (2-0-2) 2 ECTS**

Occupational health and safety legislation and application principles that employees should know within the scope of the Occupational Health and Safety Law No. 6331. General occupational health and safety information needed by employees in the formation of a safety culture. Hazards, risks, emergencies, collective protection measures, use of personal protective equipment and changing employee behavior in the workplace. Prevention of work accidents and occupational diseases.

**GDM313 UNIT OPERATIONS IN FOOD ENGINEERING I (3-0-3) 4 ECTS**

Cleaning, sorting and classification systems in food industry, the equipment used for milling process, sieving, grinding, mixing and homogenisation, emulsification, filtration, membrane separation systems and equipment used for general principles, applications in the food industry.

**VOCATIONAL ELECTIVE COURSES**

**GDM315 LABORATORY TECHNICS (3-0-3) 6 ECTS**

Laboratory rules and safety, laboratory equipment, basic laboratory procedures, sample preparation for analysis, solution preparation and instrumental analysis based on different principles.

**GDM317 REFRIGERATION TECHNOLOGY (3-0-3) 6 ECTS**

Getting cold and some definitions, cooling agents and their properties, steam cycles, cooling systems, main parts of compression refrigeration system, planning of cold storages and critical factors in construction, food freezing methods and freezers, food storage in cold conditions without freezing, frozen storage, chemical changes in stored frozen vegetable foods, frozen storage of dairy products and eggs, frozen storage of meat and seafood products, physical and chemical changes in frozen meat, thawing of frozen foods.

**GDM319 PRINCIPLES OF NUTRITION****(3-0-3) 6 ECTS**

Food and nutrition, nutrition-health relations. Nutrients and their importance in nutrition  
Digestion and absorption. Energy metabolism. Nutrition programs in special cases, menu  
planning. Exercise and nutrition.

**FREE ELECTIVE COURSES****GDM909 GENERAL Nutrition****(2-0-2) 3 ECTS**

Adequate and balanced nutrition; Nutrition-health relationship; Nutrients and their  
importance in nutrition; Chemical structure of carbohydrates, importance in nutrition;  
Chemical structure of lipids, importance in nutrition; Chemical structure of proteins,  
importance in nutrition; vitamins; water and minerals; Digestion and absorption; Energy  
metabolism; Exercise and nutrition; Nutrition programs in special cases; Principles of food  
purchasing, storage, preparation and cooking; General evaluation

**GDM911 FOOD PRESERVATION METHODS****(2-0-2) 3 ECTS**

Causes of spoilage of foods, heat treatment, cold application, drying, concentration,  
fermentation, preservative addition, smoking, storage in different gas atmosphere,  
irradiation.

**GDM913 POLYMER PROCESSING AND PACKAGING****(2-0-2) 3 ECTS**

Polymer raw materials, additives; extrusion; inflation; injection molding; thermoforming.

**6. YARIYIL****GDM302 DAIRY TECHNOLOGY****(2-0-2) 3 ECTS**

The importance of milk, transport and cold storage, technological processes applying to milk,  
milk cleaning (clarification), standardization of milk fat and separators, homogenization of  
milk and homogenizers, deaeration, heat treatment applied to milk, heaters, pasteurization  
and sterilization, sanitation in dairy plants, drinking milk, yoghurt, cheese, butter, ice-cream,  
milk powder, condensed milk products technology, non-thermal processing methods to

extend the shelf life of milk (microfiltration, pulsed electrical fields, high hydrostatic pressure, ultrasound, microwave, UV and related applications)

**GDM304 MEAT TECHNOLOGY (2-0-2) 3 ECTS**

Physical, chemical, microbiological and histological properties of meat, The biochemical reactions that occur in the after cutting period, The factors that determine meat quality, Meat preservation methods, Meat refrigeration and freezing technology, Processing technology of meat products, Curing technology, Smoking technology, Emulsification technology, Fermentation technology, Canned meat technology, Quality control analyzes in meat and meat products.

**GDM306 UNIT OPERATIONS IN FOOD ENGINEERING II (3-0-3) 4 ECTS**

Heat and mass transfer operations; distillation and applications, freezing, solid-liquid extraction and applications, evaporation and evaporators, crystallization and crystallizers, humidification and humidity removal, drying methods and dryers.

**GDM308 UNIT OPERATIONS LABORATORY IN FOOD ENGINEERING (0-2-1) 1 ECTS**

Fluidized bed, plate heat exchangers, double tube heat exchangers, agitated boiler, thermal conductivity measurement, rising film evaporator, unsteady state heat transfer, freezing of food, solid-liquid extraction, tray dryer, hammer mill and solids processing systems, coefficient measurement of diffusion of gases and liquids

**GDM310 INSTRUMENTAL ANALYSIS (2-1-3) 3 ECTS**

Analysis methods using modern equipment, chromatographic analysis (paper, column, thin-layer, gas and liquid chromatography), spectroscopic analysis (UV-visible spectroscopy, fluorescence, infrared and atomic absorption spectroscopy), electrophoresis and potentiometry.

**GDM312 FRUIT AND VEGETABLE TECHNOLOGY (2-0-2) 3 ECTS**

Physical, chemical and biological properties of fruits and vegetables, pre-treatment applied in the preservation of fruits and vegetables, freezing storage of fruits and vegetables, canned production technology, tomato paste production technology, jam-marmalade production technology, drying technology, fruit juice production technology, quality analysis of fruit and vegetables products.

**GDM314 PRACTICLE TRAINING (0-0-0) 4 ECTS**

This is carried out in accordance with the internship instructions of the Food Engineering Department with the aim to improve knowledge and professional etiquette learned during academic year in various private or public institutions / organizations operating in food area.

**VOCATIONAL ELECTIVE COURSES**

**GDM316 FOOD ADDITIVES (3-0-3) 6 ECTS**

Definitions of additives, the purpose of use of additives in foods, the use of which additives in which foods and in what proportions, national and international legal regulations on additives.

**GDM318 ENZYME SCIENCE (3-0-3) 6 ECTS**

Historical development of enzymes, importance of enzymes, basic structure of enzymes, naming and classification of enzymes, enzyme kinetics, deterioration caused by enzymes in foods, important enzymes for the food industry, commercial enzyme production and purification of enzymes, properties and important functions of enzymes used in food technology.

**GDM320 PROJECT PREPARATION TECHNIQUES (3-0-3) 6 ECTS**

Project concepts, food projects and their features, determination of the project subject and project decision, justification of the project and market study, project scale and site selection, technical aspect of the project, project expenses and incomes, technical evaluation of the projects, financial evaluation of the projects, economic evaluation of the projects , EU project cycle management.



## **FREE ELECTIVE COURSES**

### **SSP900 SOCIAL RESPONSIBILITY PROJECT (1-2-2) 3 ECTS**

To acquire the necessary knowledge and skills to realize social responsibility projects, to work with different social circles.

### **GNC900 VOLUNTEERING STUDIES (1-2-2) 3 ECTS**

## **7. YARIYIL**

### **GDM401 FOOD TECHNOLOGY LABORATORY I (0-3-2) 2 ECTS**

Fruit and vegetable technology applications, dairy technology applications, fermentation technology applications.

### **GDM403 FAT AND OIL TECHNOLOGY (2-0-2) 3 ECTS**

Fat and oil chemistry, fatty acid, glycerides, phosphatides, sterols, colorants, flavors and odour, waxes, hydrocarbons, natural antioxidants, basic deterioration reactions in fats, fatty raw materials, storage and cleaning of raw materials, size reduction, roasting, pressing, extraction and pre-pression-extraction, taking the adhesive materials, decreasing acidity, bleaching, deodorization, winterization, production of modified fats, fractional crystallization, hydrogenation, interesterification, margarine production, oil production technology, quality control of oil.

### **GDM405 CEREAL TECHNOLOGY (2-0-2) 3 ECTS**

Physical and chemical properties of cereal, cereal quality criteria, storage, milling, flour quality criteria, dough chemistry and rheology, bread production technology, pasta production technology, biscuit production technology, bulgur production technology, breakfast cereals and snack foods production technology, quality control of cereals.

**GDM407 PROCESS DESIGN AND CONTROL****(1-2-2) 2 ECTS**

Project research and development activities in the food plants, costs and calculation methods, interest, depreciation, evaluation of investment options, feasibility studies, optimization, basic fluid mechanics theories, basic heat transfer theories, optimization, basic production systems and waste management in food factories. Importance of process control in the food industry, general control systems, temperature and flow control systems, level, pressure, humidity and rheology measurement, mathematical modeling. Presentation and discussion of the feasibility report prepared by the students.

**GDM409 FOOD QUALITY CONTROL****(2-0-2) 2 ECTS**

The concept of quality and food quality criterion, the history of food control in Turkey, the basic concepts of quality assurance and related definitions (ISO, GMP, HACCP, GAP), quality assurance organization and tasks, quality control cards and comments, color, texture and rheological properties in foods, sensory properties of foods and sensory analysis methods, national and international standards about food quality, introduction to Turkish legislation, Turkish Standards, Food Legislation and preparation reasons, Turkish Food Law, the Turkish Food Codex Regulation, Regulation of Food Production-Consumption and Control, Food legislation and food control in EU.

**GDM499 PRACTICAL TRAINING****(0-0-0) 4 ECTS**

It is carried out in accordance with the internship directive of the Food Engineering Department in order to reinforce the knowledge and professional experience learned during the education period in various private or public institutions / organizations operating in the field of food.

**GDM497 DIPLOMA PROJECT****(0-2-1) 4 ECTS**

Diploma project is a theoretical, applied or experimental research, examination or project work, mainly on design, in which the senior students of the food engineering department will use the knowledge and skills they have taken during their education period. Students; They are obliged to prepare a diploma work in accordance with the rules in the diploma work writing guide, using office programs (word processor, spreadsheet, presentation, etc.) and necessary design software.

## **VOCATIONAL ELECTIVE COURSES**

### **GDM411 INDUSTRIAL MICROBIOLOGY**

**(3-0-3) 6 ECTS**

General characteristics of industrial microorganisms, industrial applications of some microorganisms, microbial growth and stoichiometry of the product formation, principles of free and immobilized culture applications, bioreactor selection, scale-up, operation and control, recycling of industrial microbiology products and purification, usage of genetically modified organisms.

### **GDM413 FOOD RHEOLOGY**

**(3-0-3) 6 ECTS**

Definition and history of rheology, cutting and force definitions, rheological behavior models, calculation of flow parameters, dealing of parameters that affect the rheological properties, comparison and rheological characterization of various foods.

### **GDM415 FOOD CATERING TECHNOLOGY**

**(3-0-3) 6 ECTS**

Historical development and classification, catering systems and management, pretreatments in the production of canned foods, raw materials used in canned foods, additives, packaging, thermal processing technique, various prepared food formulations and processing, applications in production canned foods, quality control, storage and transport, quality assurance systems in catering industry.

### **GDM417 FOOD MARKETING**

**(3-0-3) 6 ECTS**

Definition, content, development of marketing and new trends, basic marketing techniques and food marketing, strategic planning and the role of marketing, market types, estimation of market demand, target market selection, product, price and distribution strategies, finance, personnel and public relations, agricultural factors affecting food marketing (cobweb ve king laws), impact of food supply on the marketing, marketing research and information system, consumer markets and consumer behavior, industrial markets and international markets, market segmentation, targeting, positioning and sales forecasts, product, price, marketing communication, personal selling and sales promotion, advertising and public relations, the definition, types and importance of advertising, stages of the sales process, distribution channels, physical distribution, brokers and franchise system, brand concept, branding

process, brand and customer loyalty, the definition, types and importance of advertising, assessment of cases and overall evaluation.

**GDM419 SENSORY ANALYSIS IN FOOD**

**(3-0-3) 6 ECTS**

Principles of sensory analysis, structure of sensory organs and their role in perception, sensory qualities of foods, introduction of sensory testing methods of foodstuffs (descriptive, distinguishing, preference tests), factors affecting sensory measurements, preparation and control of samples and test rooms for sensory analysis, sensory Selection and training of panelists to be used for analysis, determination of threshold value, applications of sensory test methods in the laboratory and points to be considered in practice.

**GDM421 FERMENTED DAIRY PRODUCTS**

**(3-0-3) 6 ECTS**

Starter cultures used in the production of fermented dairy products, yoghurt, cheese, butter, ayran, fruit yoghurt, kumiss, kefir production technology. packaging and storage of fermented milk products, general quality controls in fermented milk products.

**GDM423 SEAFOOD PROCESS TECHNOLOGY**

**(3-0-3) 6 ECTS**

Classification of fisheries, anatomy and physiology, fisheries product composition and importance of nutrition products, postmortem changes in fisheries, rigor mortis, and impact on fish meat quality, freshness parameters seafood, cold and frozen storage of seafood, canned production technology, cured, smoked, dried and alternative aquaculture production technologies and quality control of fishery products.

**GDM425 EVALUATION OF FOOD INDUSTRY WASTES**

**(3-0-3) 6 ECTS**

Important food industry wastes, evaluation of milk processing wastes, seafood processing wastes, meat processing wastes, oil processing waste, potato processing waste, carbonated beverage processing wastes, baked goods processing waste, examples of current waste assessment, recycling of waste, composting process and biogas production.

**GDM427 WATER TECHNOLOGY****(3-0-3) 6 ECTS**

Existence of water in nature, chemistry and properties of water, properties sought in drinking, domestic and industrial waters, properties of water used in the food industry, the substances contained in water and the events caused by them, processes applied in water purification.

**8. YARIYIL****GDM400 DIPLOMA PROJECT****(0-2-1) 4 ECTS**

Diploma Project is a design-oriented theoretical, practical or experimental project study in which the senior food engineering students use and apply their knowledge and abilities they have acquired from the course they have taken during their studies. The students have to prepare a report according to the guidelines in the Diploma Project Writing Guide by using office programs (word processors, spreadsheets, presentation software etc.) and necessary design software.

**GDM402 FOOD TECHNOLOGY LABORATORY II****(0-3-2) 2 ECTS**

Cereal technology applications, fat and oil technology applications, meat technology applications.

**GDM404 ENTREPRENEURSHIP AND LEADERSHIP****(2-2-3) 4 ECTS**

Basic concepts of entrepreneurship, importance of entrepreneurship and development, entrepreneurial types, entrepreneurial characteristics and entrepreneurial test applications, creativity and business idea development, issues to be considered in the preparation of the business plan concept and business plan, business plan concept and elements, business plan sections: Market research and marketing plan,, preparing an example marketing plan, production plan and preparation of a sample production plan, management plan and sample preparation of a management plan, financial plan and preparation of a sample financial plan, writing a business plan and the issues to be considered in the presentations.

**GDM406 DESIGN OPERATIONS IN FOOD ENGINEERING****(1-1-2) 2 ECTS**

Exploration of design-based subject in food engineering, presentation and discussion of the report.

## **VOCATIONAL ELECTIVE COURSES**

### **GDM408 LABOUR LAW**

**(3-0-3) 6 ECTS**

Law, rule of law, right to work, labor organization, employment contracts and debts arising from this contract, termination of contract,, work and rest periods, permission and holidays, occupational health and safety.

### **GDM410 NEW TECHNICS IN FOOD TECHNOLOGY**

**(3-0-3) 6 ECTS**

Basic principles of modern methods applied in food preservation and processing. High pressure reverse osmosis, pulsed electric field, ultrasound, pulsed light, ohmic heating, infrared heating, supercritical solvent applications and other modern food preservation methods.

### **GDM412 CHEESE TECHNOLOGY**

**(3-0-3) 6 ECTS**

The nutritional value of cheese, classification of cheese, raw material of cheese, additives used in cheese making and ingredients, preparation of milk for cheese production, coagulation and curd processing, starter cultures, cheese ripening, packaging of cheese, the technology of domestic and foreign types of cheese, cheese defects and precautions, evaluation of whey.

### **GDM414 TRADITIONAL FOODS**

**(3-0-3) 6 ECTS**

The definition of traditional foods, importance, the regional distribution and other main concepts, Turkish food culture, geographical indication, traditional dairy products, traditional cereal products, traditional meat products, traditional fruit and vegetable products, traditional drinks, traditional sugar products, traditional fermented foods, physical, chemical and biological risks in traditional foods, traditional food production techniques and industrial applicability, the nutritional value of traditional foods, ISO 9001, ISO 22000 and HACCP practices in the production of traditional foods, the use of hurdle technology for traditional foods.

**GDM416 FOOD PACKAGING AND STORAGE****(3-0-3) 6 ECTS**

Food spoilage and preservation, preservation methods, package and packaging, packaging materials and containers, glass-based packaging, rigid, semi-rigid and flexible packaging materials, wood packaging materials, aluminum and tin packaging materials, methods of tinning and lacquering, corrosion, sulphur browning and oxidation, lacquering, multi-layer packaging materials, printed packaging materials, film and foil based packages and packaging, preservation of foods with protective gases (controlled and modified atmosphere), barcode system, intelligent packaging technology, innovations in packaging, edible packaging.

**GDM418 DEVELOPMENT METHODS FOR NEW PRODUCT****(3-0-3) 6 ECTS**

New food product development strategies with the potential to produce in the food industry and consumer trends, evaluation of new product ideas, panel tests, product features, sensory evaluation techniques, evaluation the results of new product concepts studies and documentation, determination of prototype product and design, determination of product specifications, formulation, ingredients and functional properties, recipe optimization, improvement of existing products in terms of cost and content, consumer acceptance testing, determination the shelf life and safety of the final product, selection of package and label design, market presentation and distribution, enrichment activities in various ways to be able to make products functional.

**GDM420 SPECIAL FOOD TECHNOLOGY****(3-0-3) 6 ECTS**

Tea production technology, tea quality criteria, coffee, cocoa, cocoa powder and oil, cocoa products technology, chocolate and chocolate production stages, sugar production, confectionery technology, raw materials used in confectionery, production of hard and soft sugar, Turkish delight, regret, molasses, tahini and tahini halva production, fermented products, production of various traditional foods.

**GDM422 FUNCTIONAL FOODS****(3-0-3) 6 ECTS**

Definition of functional foods, their effects on health, functional ingredients (dietary fiber, phenolic compounds, oligosaccharides, sugar alcohols, peptides and proteins, glycosides,

minerals, fatty acids, prebiotics and probiotics, phytochemicals), functional foods of plant and animal origin, functional food production and legal regulations on consumption.

#### **GDM424 FOOD SAFETY**

**(3-0-3) 6 ECTS**

Microbiological, physical and chemical hazards in foods, food quality approaches. ISO 9000 and other ISO standards. HACCP, basic concepts, preparation stages, preliminary operations. Hazard analysis. Application of HACCP. rules of keeping registrations. HACCP practices. Risk analysis. Good Agricultural Techniques; GAP. Good Manufacturing Practise, GMP, cGMP. Basic issues of food security threatens the health of consumers; pesticides, mycotoxins, heavy metals, veterinary drug residues, additives, dioxins, natural toxic ingredients, allergens, GMO and etc.

#### **GDM426 FOOD CONSERVATION TECHNICIS**

**(3-0-3) 6 ECTS**

Physical, chemical and microbiological spoilage in food, basic principle used for food preservations, methods of food preservation, prevention of contamination, removal of microorganisms, preservation of foods with chemical preservatives, refrigeration and freezing techniques, decreasing of water activity, controlled and modified atmosphere packaging, heat treatment in food processing and preservation, electricity, high pressure, irradiation, microwave examples of new applications.

#### **GDM428 COLOR IN FOODS**

**(3-0-3) 6 ECTS**

The importance of color in foods, its effect on flavor and other characteristics, regulations associated with colorants, artificial colorants used in foods, natural colorants used in foods, analysis of some colorants.