



NEAR EAST UNIVERSITY

DEPARTMENT OF Food Engineering

Course Structure Diagram with Course Credits

2021-2022

COURSE OBJECTIVES AND CONTENTS:

ECC107- Biology (2-0)2

An introduction to life earth, characteristics of living things, importance of water in life, inorganic materials, biological molecules, hormones, vitamins, enzymes, features of prokaryotic and eukaryotic cells, physical and chemical properties of cell, cell membrane structure and function, transports across cell membranes, organelles, aerobic, anaerobic respiration and fermentation, photosynthesis and chemosynthesis, ribosomes and protein synthesis, centrioles, DNA replication and repair, cellular reproduction.

CHM104-General Chem. for Biolog. Sci. & Eng. (3-2)4

A basic course with emphasizing the metric system. Introduction to atomic theory, stoichiometry. The structural and physical properties of matter. Periodic relationship among elements and periodic table. Gaseous state. Thermochemistry. Energy and enthalpy. Electronic structure of atoms. Chemical bonding.

ENG101- English I (3-0)3

Within a thematic approach, reading, writing, speaking, and listening skills will be developed. In speaking and writing, students will be encouraged to use language forms that they learn through reading and listening. Under broad themes (or threads), the students will be exposed to extensive reading both in and outside the classroom. They'll be encouraged to read a variety of texts such as short stories, academic articles, research reports, reviews and journalistic texts as well as chapters from textbooks.

FDE101- Introduction to Food Engineering (1-0)1

Definition and importance of food engineering, relationship of food engineering with other disciplines, main characteristics and functions of foods, food processing methods, food preservation techniques.

MTH 101- Calculus 1 (4-0)4

Functions, limits and continuity. Derivatives. Average value theorem. Graph plotting. Integrals. Logarithmic, trigonometric and reverse trigonometric functions and their derivatives. L'Hospital's rules. Integral methods, applications of integrals and irregular integrals.

PHY101- General Physics I (3-2)4

Measurement, vectors, kinematics, force, mass. Newton's laws, applications of Newton's laws. Work and kinetic energy. Conservation of linear momentum. Impulse, collisions, rotation, moments of inertia. Torque, angular momentum, conservation of angular momentum, static equilibrium.

FDE205- Biochemistry (3-2)3

Cell structure and material transport from cell membrane, introduction to metabolism, carbohydrate metabolism, biological oxidation, photosynthesis, lipid metabolism, amino acid metabolism, definition and biosynthesis of nucleic acid, biosynthesis of nucleotides, biosynthesis of proteins, enzymes, co-enzymes.

Prerequisite: CHM104

ECC016- Introduction to Com. & Prog. (3-0)3

Construction and abstraction of computer program. Structure of a Pascal program, data types, constants, input and output of integer numbers, real numbers. Arithmetic expressions. Control structures, Procedures. Enumerated types, array records and subscripted variables. Arrays. Files, pointers, linked-lists, queues.

ENG102- English II (3-0)3

This course will be a continuation of ENG 101, with greater emphasis on

student autonomy, research skills and synthesizing ability. In Eng-102, the ability to evaluate, analyze and synthesize information in written discourse will be highlighted. Documentation in writing will be introduced at the beginning of the course, in order to solidly establish the skill by the end. Students will learn the discourse patterns and structures to be used in different essay types.

Prerequisite:ENG101

MTH102-Calculus II (4-0)4

Plane and polar co-ordinates, area in polar co-ordinates, arc length of curves. Limit continuity and differentiability of function of several variables, extreme values, and method of Lagrange multipliers. Double integral, triple integral with applications. Line integrals, Green's theorem. Sequences, infinite series, power series, Taylor's series. Complex numbers.

Prerequisite: MTH 101

TD102- Technical Drawing (3-0)3

Fundamentals of engineering drawing, introductory materials, use of instruments, lettering, constructional geometry, orthographic drawing, sectioning, dimensioning, pictorial drawing and sketching, isometric projection, assembly drawing, assembly elements.

PHY102- General Physics II (3-2)4

Electrical charges. Coulomb's law. Electrical fields. Gauss's law. Electrical potential. Capacitance and dielectrics. Current and resistance. Direct current circuits. Magnetic fields. Sources of the magnetic field. Faraday's law of induction. Inductance and inductors.

Prerequisite: PHY 101

ECC217 Microbiology (3-2)3

General properties of microorganisms, prokaryotic and eukaryotic cells, microbial taxonomy and nomenclature, microbial growth, different mediums for growth, sterilization methods, bacteria, yeasts, moulds, algae, protozoa and viruses, microbial metabolisms, microbial genetics, microbial communications and relations.

Prerequisite: ECC107

CHM122- Organic Chemistry (2-2)3

Structures of organic compounds and nomenclature, hydrocarbons (alkanes, alkenes, alkynes, aromatic hydrocarbons), organic halogen compounds, alcohols, ethers, aldehydes and ketones, carboxylic acids, acyl compounds (acid halides, acid anhydrides, esters, amides, nitriles), amines, stereochemistry.

Prerequisite: CHM104

ENG201- Writing Techniques in Academic English (3-0)3

The main goal of ENG 210 is to enhance the students' competence and willingness to express themselves in an organized manner in academic and professional contexts, and to interact with others confidently. ENG 210 will be inter-active; students will be encouraged to listen actively, respond to presentations, and participate in discussions. Speaking activities and academic presentations will ensue from reading and listening activities. Each theme will lead to the production of an oral and/or written activity. Students will enable to distinguish between oral and written discourse, and emphasize the requirements of oral discourse.

Prerequisite: ENG102

FDE201- Mass and Energy Balances (3-0)3

Systems of units and dimensions. Dimensional equations and consistency. Concentration, force, weight, pressure and temperature. Definition of types of process, operation and system. Block diagram representation of a process. Material balances for steady-state open systems and for steady-state open systems with recycle, by-pass and purge. Material balances for processes

with and without chemical reaction. Gases and vapors, saturation and humidity. General terms of energy balances. Energy balances for both reactional and non- reactional systems. Physical and chemical heat effects, use of steam tables. Simultaneous material and energy balances. Humidification and use of psychometric chart.

Prerequisite: CHM104

MTH201- Differential Equations (4-0)4

Differential equations and their solutions: Classification of Differential equations; their origin and solutions, Initial value and Boundary value problems and existence of solutions. First order equations: separable equations and equations reducible this form. Linear equations and Bernoulli equations. Exact differential equations and integrating factors. Higher order linear differential equations: Basic Theory of Linear Differential Equations, The Homogeneous Linear Equation with constant coefficients. The method of undetermined Coefficients, The Cauchy –Euler equation, Variation of Parameters. Series solutions of linear differential equations. Laplace transform: Definition, existence and basic properties, the inverse transform and the convolution, Laplace Transform solution of linear differential equations with constant coefficients, Laplace transform solution of linear differential equations with discontinuous nonhomogeneous terms.

Prerequisite: MTH102

CHM212- Analytical Chemistry (3-2)3

Laboratory safety, basic concepts in analytical chemistry, gravimetric and titrimetric analysis methods, aqueous-solution chemistry, chemical equilibria and theory and applications of neutralization titrations, precipitation titrimetry, complex formation, oxidation/reduction titrations.

Prerequisite: CHM104

FDE202- Thermodynamics (4-0)4

Basic principles in thermodynamic, chemical equilibrium concept, temperature

and irreversibility, the first law, work and heat concepts, the second law and entropy, state equations and thermodynamic properties of pure substances, design and analysis of open and closed systems, power generators and thermodynamic analysis of cyclic cooling processes, thermodynamic applications in food engineering.

Prerequisite:FDE201

FDE206 –Food Microbiology (4-1)4

Importance of microorganisms in foods (contamination sources, food borne bacteria, yeasts, fungi, viruses and parasites), intrinsic and extrinsic factors in foods affected microbial growth, indicator microorganisms, contamination and spoilage of different kinds of foods, chemical changes in foods caused by microorganisms, microbial counts and its importance, microbial analyses of foods.

Prerequisite:ECC217

FDE212 – Food Engineering Unit Operations I (4-2)4

Dimensional analysis, transport phenomena and fluid mechanics, properties of fluids, viscosity, density, surface tension, Newton's law, fluid statics, static balance, manometers, flow of fluids, mass balances, characteristics of flow, laminar flow boundary layer theory, momentum balance, velocity profiles, overall energy balance and friction, flow around submerged objects, measurement of fluid flow, agitation of liquids.

Prerequisite:MTH201

MTH251- Probability and Statistics (3-0)3

Definition of probability.Sample space and events.Permutations and combinations.Conditional probability and Bayer's theorem.Random variables.Discrete and continuous distributions.Moment generating function.Expectation, variance, covariance and correlation.Condition densities and regression and transformation of variables.Descriptive statistics.

Prerequisite: MTH 101

FDE214 –Engineering Materials (3-0)3

Properties of materials, atomic structure, bonding, crystal structure, crystal defects, solid solutions, mechanical properties of materials, elastic and plastic deformation, hardness of materials and its measurement, phase diagrams, metals, production of iron and stainless steel, heat treatment of steels, nonferrous metals, production and their alloys, corrosion, testing of materials, inorganic, organic and composite materials and their properties.

Prerequisite: CHM104

FDE300-Summer Practice I-NC

Twenty working days of practical training in a plant designated or approved by the Department. A final report is required at the end of the training period. Material and energy balances will be performed by the students and also information about plant will be provided in practice report.

FDE301 –Instrumental Analysis (3-2)3

Basic principles of spectroscopy, ultra violet and visible region spectroscopy, UV-VIS spectrophotometers, analytical applications, fluorescence and phosphorescence spectroscopy, refractometric and polarimetric methods and measurements, atomic absorption and flame emission spectroscopy, chromatography: principles and analytical applications, paper chromatography, liquid and gas chromatography, HPLC and GC applications.

Prerequisite: CHM212

FDE303 –Food Chemistry I (3-0)3

Chemical composition of foods, function of water in foods (properties of water, moisture sorption isotherms and water activity), carbohydrates, proteins, lipids, enzymes (main types of enzymes and enzymatic reactions in foods), phenolic compounds and pigments.

Prerequisite: CHM122

FDE311 –Food Engineering Unit Operations II (4-0)4

Fundamentals of heat transfer, principles of conduction, convection and radiation. Empirical models for the evaluation of heat transfer coefficients. Heat transfer operations in food engineering with emphasis on heat exchange in non-Newtonian flow, boiling and condensation, evaporation and concentration, pasteurization and sterilization, cooking and cooling, freezing.

Prerequisite:FDE212

FDE302 –Food Analysis (3-2)3

Sampling, sample preparation, evaluation of analytical data, moisture and total solid analyses, mineral and ash analyses, pH and titratable acidity, crude fat, crude protein, carbohydrate and fiber analyses, enzyme assay, vitamin analyses, analyses of pesticide and mycotoxin in foods, rheologic analyses, color analyses, sensory evaluation.

Prerequisite:FDE301

FDE304 –Food Chemistry II (3-0)3

Vitamins (classification, water-soluble vitamins, fat-soluble vitamins), minerals (nutritional aspects of minerals, mineral composition of foods, toxic elements), food additives (definition and function of food additives, toxicological concepts, preservatives, colorants, antioxidants, sweeteners, emulsifiers), residue and contaminants (toxicological evaluation, metallic contaminants, radionucleides, pesticides, hormones, antibiotics mycotoxins, polycyclic aromatic hydrocarbons), toxic compounds naturally found in foods.

Prerequisite: FDE303

FDE306 –Reaction Kinetics (3-0)3

Reaction rates, theories about reaction rates, factors affecting reaction rates in foods, calculation of kinetic parameters for reactions in foods (reaction rate constants and half- lives), effects of temperature on reaction rates in foods

(activation energies and Q10 values). Kinetics of biological reactions. Kinetics of biomass production, substrate utilization and product formation in cell cultures. Kinetics of microbial death and enzyme inactivation.

Prerequisite: FDE303

FDE312 – Food Engineering Unit Operations III (4-0)4

Fundamentals of mass transfer, principles of diffusion and diffusivity, molecular and convective mass transfer, phase equilibria, equilibrium processes, absorption, membrane separation processes, leaching, distillation, drying and crystallization, extraction, evaporation.

Prerequisite: FDE311

FDE320 – Industrial Microbiology (2-0)2

General characteristics of industrial microorganisms, industrial applications of some microorganisms, stoichiometry of microbial growth and product formation, application principles of free and immobilized cultures, selection, scale up, operation and control of bioreactors, recovery and purification of products, utilization of genetically modified organisms in processing.

FDE321 – Food Biotechnology (2-0)2

Definition of biotechnology, fundamentals of genetic engineering and recombinant DNA technology, mutagenesis, enzyme technology, biosensors, techniques of product recovery, factors affecting the fermentation and their controls, fermenter design and its control, biotechnological applications in food industry.

FDE322 – Principles of Nutrition (2-0)2

Nutrition and health, nutrients and their properties, usage of nutrients in body, composition of foods, their physical and chemical properties, diet-planning for people of different age, sex and work group.

FDE323- Physical Properties of Foods (2-0)2

Principles involved in physical properties of foods, density and specific gravity, textural and rheological properties, surface properties including emulsion, foaming, gelation, adhesion, cohesion, solubility and wettability, thermal properties of foods, thermal conductivity of foods, dielectric properties of foods.

FDE400-Summer Practice II-NC

Twenty working days of practical training in a plant designated or approved by the Department. A final report is required at the end of the training period. Process flow chart, properties of each unit, material and energy calculations of each unit, raw materials, products and their properties, distribution, management and quality control in the trained plant should be reported.

FDE401- Food Engineering Design I (3-0)3

During one semester, students choose a design based topic in Food Engineering and conduct research about this topic using sources such as libraries, computer and laboratory facilities and prepare a trial plan. A final report in a scientific manuscript format and an oral presentation is prepared. Design and optimization of equipment used in food industry through case studies. Optimization of operational conditions. The principles of engineering operations are extensively utilized in a design report for each case (pumps and compressors, centrifugation, heat exchangers, pasteurization, distillation, packaging, drying, evaporation, crystallization, fermentors) including a technical specification sheet.

Prerequisite:FDE312

FDE403- Process Control (3-0)3

Importance of process control in the food industry, introduction to process control principles, definition of control objectives, disturbances, manipulated variables, basics of mathematical modeling, process control elements, definition of open and closed loop systems, transfer functions and block diagrams, types and selection of controllers, types and selection of control schemes. Process control of selected food engineering operations (bioreactors, blanching,

pasteurization and sterilization, drying, freezing, evaporation and concentration, baking and extrusion).

Prerequisite:FDE312

FDE407- Food Packaging (2-0)2

Functions of packages and importance of food packaging, food packaging material, structures and properties of paper, metal, glass and plastic packaging materials, properties of multi-layer combinations, packaging systems, aseptic packaging, vacuum packaging, modified atmosphere packaging, packaging of fresh and processed foods, shelf life of packaged foods, package-product interactions, package control, safety and legislative aspects of packaging.

FDE411- Food Technology (3-0)3

Raw material handling, processing, packaging, storage and distribution of food products are covered for each food group. Certain topics are assigned to students as term projects.

FDE402 – Food Engineering Design II (3-0)3

It is prerequisite course of FDE401. Design and optimization of equipment used in food industry through case studies. Optimization of operational conditions. The principles of engineering operations are extensively utilized in a design report for each case including a technical specification sheet.

Prerequisite:FDE401

FDE404- Quality Control in Food Engineering (3-0)3

Quality concept and quality criteria in foods, basic concepts of quality assurance and related definitions (ISO, GMP, HACCP, GAP), quality assurance organization and its function, quality control cards and their interpretation, color, textural and rheological properties of foods, sensorial properties of foods and evaluation techniques, national and international standards and legislation concerning food quality, quality changes in foods, defect types and their determination in foods.

Prerequisite:FDE302

FDE412 – Food Engineering Unit Operation Laboratories (3-2)3

Experiments on a variety of food engineering operations (drying, extraction, pasteurization, filtration, size reduction, centrifugation, fluid flow, fermentation). Experimental design, analysis and interpretation of data in the form of written reports.

Prerequisite:FDE312

FDE421 – Cereal Technology (3-0)3

Physical and chemical properties of cereal, cereal quality criteria, storage of cereal, milling of cereal, flour quality criteria, rheology and chemistry of dough, bread making technology, macaroni production technology, biscuit production technology, bulgur production technology, breakfast cereals and snack food technology, quality control analyses in cereals and cereal products.

FDE422 – Fermentation Technology (3-0)3

Definition of fermentation, microorganisms of fermentation, fermentation kinetics, alcoholic fermentation and other fermentations, wine technology, brewing technology, vinegar technology, lactic acid fermentations and technologies, quality control analyses in fermented products.

FDE423 – Fruit and Vegetable Technology (3-0)3

Physical, chemical and biological properties of fruits and vegetables, pre-treatments used for preservation of fruits and vegetables, freezing of fruits and vegetables, production technology of canned foods, tomato paste production technology, jam-marmalade production technology, drying technology, fruit juice processing technology, high pressure (HP) processing of fruits and vegetables, quality control analyses in fruits, vegetables and their products.

FDE424 – Seafood Products Technology (3-0)3

Classification, anatomy and physiology of seafoods, composition of seafoods and its importance for nutrition, postmortem alteration in seafoods and its effect on rigor mortis and quality of fish meat, freshness parameters in seafoods, chilling and freezing, canning production technology, technology of curing, smoking, drying and alternative seafoods production and quality control in seafoods.

FDE425 – Fats and Oils Technology (3-0)3

Oil chemistry, fatty acids, glycerides, phosphatides, sterols, color and odor substances, waxes, hydrocarbons, natural antioxidants, deterioration reactions in oils, oil raw materials, storage and cleaning of raw materials, size reduction, roasting, pressing, extraction and pre-pressing-extraction, degumming, removal of free fatty acids, decolorization, deodorization, vintarization, production of modified fats, fractional crystallization, hydrogenation, interesterification, margarine production, quality control analyses in fats and oils.

FDE426 – Dairy Technology (3-0)3

Milk composition, dairy chemistry and physics, dairy microbiology, milk grading, dairy processing technology; clarification, separation, standardization, pasteurization, UHT treatment, homogenization, dairy products technology; fluid milk products, concentrated and dried milk products, cultured dairy products technology (cheese, yogurt and fermented beverages), butter, ice cream, quality control analyses in milk and dairy products.

FDE427 – Meat Technology (3-0)3

Physical, chemical, microbiological and histological characteristics of meat, conversion of muscle to meat, preservation methods; meat refrigeration and freezing technologies, meat processing technologies; curing, smoking, emulsification, fermentation, canning, restructured meat products, meat packaging technology, quality control analyses in meat and meat products.

FDE430 – Plant Sanitation (3-0)3

Hygiene and sanitation concepts and importance in food industry, sources of food contamination and its prevention, sanitation and cleaning practices in food plants, personal hygiene, training and education, cleaning agents, sanitizers, pest control, properties and disinfection of water used in food plants.

FDE431 – Food Economy and Management (3-0)3

Integration models at agriculture and food system, food production and demand, food marketing and actors, food distribution system and organization, food policy components, food security and reliability, sub food sector-actual analysis and evaluation, food enterprises, alternative establishment place, production-cost and capacity analysis, investment strategy, economic and financial analysis.

FDE432 – Food Legislation (3-0)3

The history of food control in Turkey, the law (5179) and its consequences, Turkish food codex announcements, Food control regulations and control systems, ISO 17020 and food auditing, food control labs, EU food legislation and food control, TSE food standards, ISO and CAC food standards, and the control of HACCP applications.