SCIENCE TEACHING UNDERGRADUATE PROGRAM

1st SEMESTER

	COURSE TITLE	T	P	C
A	General Physics I	4	0	4
A	General Physics Lab I	0	2	1
A	General Chemistry I	4	0	4
A	General Chemistry Lab I	0	2	1
A	General Mathematics I	4	0	4
GK	Atatürk's Principles and Revolutionary History I	2	0	2
GK	Turkish I: Written Expression	2	0	2
MB	Introduction to Education Science	3	0	3
TOTAL		19	4	21

2nd SEMESTER

	COURSE TITLE	T	P	C
A	General Physics II	4	0	4
A	General Physics Lab II	0	2	1
A	General Chemistry II	4	0	4
A	General Chemistry Lab II	0	2	1
A	General Mathematics II	4	0	4
GK	Atatürk's Principles and Revolutionary History II	2	0	2
GK	Turkish II: Oral Expression	2	0	2
MB	Educational Psychology	3	0	3
TOTAL		19	4	21

3rd SEMESTER

	COURSE TITLE	T	P	C
A	General Biology I	4	0	4
A	General Biology Lab I	0	2	1
A	General Physics III	2	0	2
A	General Physics Lab. III	0	2	1
A	General Chemistry III (Analytical Chemistry)	2	2	3
GK	Computer I	2	2	3
GK	Foreign language I	3	0	3
MB	Teaching principles and methods	3	0	3
TOTAL		16	8	20

4th SEMESTER

	COURSE TITLE	T	P	C
A	General Biology II	4	0	4
A	General Biology Lab II	0	2	1
A	Introduction to Modern Physics	2	0	2
A	General Chemistry IV (Organic Chemistry)	2	0	2
GK	Computer II	2	2	3
GK	Foreign language II	3	0	3
GK	Elective I	2	0	2
MB	Science and Technology Program and Planning*	3	0	3
TOTAL		18	4	20

5th SEMESTER

	COURSE TITLE	T	P	C
A	Human Anatomy and Physiology	2	0	2
A	Special Topics in Physics*	2	0	2
A	Special Topics in Chemistry*	2	0	2
A	Statistics	2	0	2
A	Science Education Laboratory Applications I	2	2	3
GK	Turkish Education History*	2	0	2
GK	Scientific Research Methods	2	0	2
MB	Instructional Technologies and Material Design	2	2	3
TOTAL		16	4	18

6th SEMESTER

	COURSE TITLE	T	P	C
A	Genetics and Biotechnology	2	0	2
A	The Nature of Science and the History of Science	3	0	3
A	Environmental Science	3	0	3
A	Earth Science	2	0	2
A	Science Education Laboratory Applications II	2	2	3
GK	Community Service Practice	1	2	2
MB	Special Teaching Methods I	2	2	3
MB	Measurement and Evaluation	3	0	3
TOTAL		18	6	21

7th SEMESTER

	COURSE TITLE	T	P	C
A	Special Topics in Biology*	2	0	2
A	Evolution	2	0	2
A	Special Teaching Methods II	2	2	3
MB	Special Education*	2	0	2
MB	School Experience	1	4	3
MB	Guidance	3	0	3
MB	Classroom Management	2	0	2
TOTAL		14	6	17

8th SEMESTER

	COURSE TITLE	T	P	C
A	Astronomy	2	0	2
A	Elective I	2	0	2
A	Elective II	2	0	2
GK	Elective II	2	0	2
MB	Teaching Practice	2	6	5
MB	Turkish Education System and School Management	2	0	2
TOTAL		12	6	15

GRAND TOTAL	Theoretical	Application	Credit	Hour
	132	42	153	174

A: Field and field education courses, MB: Teaching profession knowledge courses, GK: General culture lessons

1st SEMESTER

General Physics I (4-0-4)
Definition, fields, importance, impact on our lives, and a brief look at the historical development of Physics. Standards, the SI unit system, dimensional analysis, vectors. Kinematics: Definition and variables of motion, examples of motion in one and two-dimensional space, relative velocity. Dynamics: Newton's laws and their applications, universal gravitation, friction force. Energy: Work, Power, types of mechanical energy, energy in conservative and non-conservative force systems. Impulse, Linear Momentum: Center of mass, interaction in one and two-dimensional space. Rotational Motion: Equilibrium in rigid bodies, kinematics, dynamics, energy, and angular momentum of rotational and rolling motion. Mechanical Properties of Matter: Particulate structure and states of matter, longitudinal, shear, and bulk elasticity, pressure, buoyancy, viscosity, and moving fluids, Bernoulli's principle. Oscillatory Motion: Kinematics, dynamics, and energy of simple harmonic motion, damped and forced oscillations, resonance.

General Physics Laboratory I (0-2-1)
Constant Speed Motion, Free Fall, Types of Force and Lami's Theorem, Density Determination and Buoyancy, Friction Force in Solids and Liquids, Equilibrium and Moment, Pulleys, Inclined Plane and Conservation of Work, Conversion of Potential Energy to Kinetic Energy, Calculation of Spring Elastic Constant and Elastic Potential Energy, Conservation of Momentum in Two-Dimensional Space, Solid and Liquid pressure, Simple Pendulum.

General Chemistry I (4-0-4)
Definition, fields, importance, impact on our lives, and a brief look at the historical development of Chemistry. Matter and Properties of Matter, Scientific method, significant figures, properties and classification of matter. Atom and Electronic Structure of the Atom: Atomic nucleus, atomic theories, electronic structure. Chemical Compounds: Introduction to the periodic table, types and formulas of compounds. Chemical Reactions: Chemical equations, acid-base reactions, oxidation-reduction reactions. Gases: Ideal gases, non-ideal gases. Thermochemistry: Enthalpy, internal energy, entropy. Periodic Table: Classification of elements, periodic properties. Chemical Compounds: Formation of compounds (hybridization, formation of hybrid orbitals and molecular geometry), formulas, types, and properties. Chemical Bonds: Basic concepts, bonding theories, and types of bonds.

General Chemistry Laboratory I (0-2-1)
Working techniques in the Chemistry Laboratory, Safety rules, accidents and precautions, safety signs on chemical substance packaging and their meanings, Laboratory materials required in the Chemistry laboratory and their usage, Rules to be observed when working with chemical substances and their importance, Rules to be observed when working with mercury, mercury poisoning and symptoms, closed-ended, open-ended, and/or research-based experiments appropriate to the student level and specific to the subject matter, parallel to the topics of the relevant coursE.

General Mathematics I (4-0-4)
Numbers: number systems and properties, principle of induction, interval, absolute value. Relation: Ordered pairs, Cartesian product, definition of relation, properties of relation, inverse relation, equivalence relation, order relation. Function: Definition of function, properties, types of functions, inverse function, composition of functions, trigonometric functions, exponential functions, logarithmic functions, inverse-trigonometric functions, specially defined functions. Limit: Limit of a variable, limit in functions, limit of trigonometric functions. Continuity: Definition of continuity, continuity from the right and left, properties of continuous functions, types of continuity. Derivative: Definition of derivative, geometric interpretation of derivative, rules of differentiation, higher order derivatives.

Atatürk's Principles and History of the Turkish Revolution I (2-0-2)
Concepts, definitions, course methods and introduction to resources, the Industrial Revolution and the French Revolution, the Dissolution of the Ottoman Empire (XIX. Century), Tanzimat and Islahat Edicts, First and Second Constitutional Eras, Tripoli and Balkan Wars, World War I, Mondros Armistice, Wilson Principles, Paris Conference, M. Kemal's Landing in Samsun and the Situation in Anatolia, Amasya Circular, National Congresses, Opening of the Assembly of Deputies, Establishment of the Turkish Grand National Assembly (TGNA) and Internal Rebellions, Teşkilat-ı Esasi Kanunu (Fundamental Law), Establishment of the Regular Army, First İnönü, Second İnönü, Kütahya-Eskişehir, Sakarya Battle and the Great Offensive, Treaties during the War of Independence, Treaty of Lausanne, Abolition of the Sultanate.

Turkish I: Written Expression (2-0-2)
Basic characteristics of written language and written communication, fundamental differences between written and oral language. Expression: written and oral expression; subjective expression, objective expression; paragraph; paragraph types (introduction-development-conclusion paragraphs). Definition of text and text types (informative texts, literary texts); conditions for being a text (cohesion, coherence, intentionality, acceptability, situationality, informativity, intertextuality). Written expression (written composition: free writing, planned writing); stages of planned writing (topic, narrowing the topic, purpose, point of view, determination of main and supporting ideas; preparing a writing plan, paper layout); theoretical information on informative texts (petition, letter, news, decision, announcement/advertisement, minutes, report, official writings, scientific writings); studies on examples and writing practices; outlining and summarizing a text; correcting language and expression errors in written applications.

Introduction to Educational Science (3-0-3)
Basic concepts of education, the relationship of education with other sciences and its functions (philosophical, social, legal, psychological, economic, political foundations of education), historical development of educational science, trends in educational science in the 21st century, research methods in educational science, structure and characteristics of the Turkish National Education System, the role of the teacher in the education system, characteristics of the teaching profession, applications and developments in the field of teacher training.

2nd SEMESTER

General Physics II (4-0-4)
Electrical Force and Field: Charge and its conservation, electrification, insulators and conductors, Coulomb's law, electric fields of discrete and continuous charges. Gauss's Law. Static Charge Potential Energy: Potential in discrete and continuous charges, potential difference, dielectrics, connection and energy in capacitors. Direct Current: Current, power sources, EMF, resistors, energy and power, DC circuits, structure of measuring instruments, electricity usage and safety. Magnetic Force and Field: Interaction of magnetic field with current-carrying conductors and moving charges, Biot-Savart law, fields created by currents in conductors of different shapes, Hall effect, magnetic properties of matter. Electromagnetic Induction: Faraday's law of induction, Lenz's law, self-induction, magnetic field energy, AC generators, electric motors, transformers.

General Physics Laboratory II (0-2-1)
Electrostatics, OHM's Law, series and parallel connection of resistors, factors affecting the resistance of a conductor, series and parallel connection of capacitors, relationship between series and parallel connection of batteries and bulb brightness, determination of resistance and potential difference with Wheatstone bridge, Kirchhoff circuits, potentiometer, magnetic field created by a current-carrying wire, transformers, generation of alternating current and electromagnetic induction, electric motor, bell and radio.

General Chemistry II (4-0-4)
Chemical Kinetics: Rate laws, rate and measurement of reactions. Chemical Equilibrium: Basic principles, equilibrium constant equation, factors affecting equilibrium. Thermochemistry: Enthalpy, internal energy, entropy. Acids and Bases: Arrhenius concept, Brönsted-Lowry concept, strong and weak acids-bases and acid-base reactions and hydrolysis. Solubility and Complex Ion Equilibria: solubility product constant, precipitation. Main Group Elements I Metals: Alkali metals, alkaline earth metals. Main Group Elements II Nonmetals: Noble gases, halogens, oxygen and nitrogen group, carbon and silicon, boron. Electrochemistry: Electrolysis and Battery.

General Chemistry Laboratory II (0-2-1)
Closed-ended, open-ended, and/or research-based experiments appropriate to the student level and subject matter, parallel to the topics in the Science and Technology Curriculum applied in 4th and 8th grades.

General Mathematics II (4-0-4)
Geometric applications of the derivative: Maximum-minimum problems, indeterminate exponential forms, graphing, differential equations. Indefinite Integral: Definition of indefinite integral, separable variables integral, partial integral, integration by partial fractions, integral of trigonometric functions, integral of irrational functions. Definite Integral: Properties of definite integral, calculation of area and volume, arc length, improper integrals.

Atatürk's Principles and History of the Turkish Revolution II (2-0-2)
Revolutions in the political field, political parties and attempts to transition to multi-party political life, revolutions in the field of law, regulation of social life, innovations in the economic field. Turkish foreign policy during the 1923–1938 period, Turkish foreign policy after Atatürk, Principles of the Turkish Revolution: (Republicanism, Populism, Secularism, Revolutionism, Statism, Nationalism). Complementary principles.

Turkish II: Oral Expression (2-0-2)
Basic characteristics of oral language and oral communication. Oral expression; basic characteristics of speaking skill (using natural language and body language); basic principles of a good speech; basic characteristics of a good speaker (stress, intonation, pause; diction, etc.). Unprepared and prepared speaking; stages of prepared speaking (topic selection and narrowing; determination of purpose, point of view, main and supporting ideas, planning, writing the text; presentation of the speech). Types of speech: (mutual conversations, interview/chat, self-introduction, answering questions, celebrating an important event such as New Year, birth, holiday, etc., giving directions, talking on the phone, applying for a job, meeting/interviewing someone, radio and television speeches, participating as a speaker in various culture and art programs, etc.). Delivering unprepared speeches on various topics, studies on speech examples and oral expression practices, correcting language and expression errors in speeches.

Educational Psychology (3-0-3)
Education-Psychology relationship, definition and functions of educational psychology, basic concepts related to learning and development, developmental characteristics (physical, cognitive, emotional, social, and moral development), factors affecting learning, learning theories, reflections of learning theories on instructional processes, effective learning, factors affecting learning (motivation, individual factors, group dynamics, and the effect of these factors on the classroom instruction process).

3rd SEMESTER

General Biology I (4-0-4)
Definition, fields, importance, impact on our lives, and a brief look at the historical development of Biology. Important branches of Biology. Diversity and classification of living things: Living and non-living structures. Science of living things: Viruses, Bacteria (Archae and true bacteria), Eukaryotes (Protists, Fungi, Plants, Animals). Species Concept and Taxonomic Structures. Viruses. Monerans. Protists. Fungi. Structure and characteristics of Plants. Basic Unit of Life: Cell, structure and function of the cell. Cell membrane, cytoplasm, and organelles. Nucleus. Cell Division; Mitosis, Meiosis, and uncontrolled cell division. Tissues: Plant tissues; Meristematic tissue, permanent tissue. Plant Organs and Structures: Vegetative organs, Generative organs. Reproduction, fertilization, and development in non-flowering and flowering plants. Classification of animals: Classification of animals according to their similarities and differences, lifestyles resulting from these characteristics (their nutrition, place in nature, etc.).

General Biology Lab I (0-2-1)
Basic laboratory usage techniques. Laboratory safety precautions. Introduction to the microscope, its use, examination of cell structure. Observation of osmosis, diffusion events, examination and comparison of plant and animal cells. Examination of cell division and its phases. Examination of animal and plant tissues. Examination of the developmental stages of the plant. Examination of the parts of flowering plants.

General Physics III (2-0-2)
Thermodynamics: Heat and temperature, thermal properties of matter (specific heat, thermal conductivity, thermal expansion), laws of thermodynamics, reversible and irreversible processes, efficiency and entropy. Geometric Optics: Nature, speed, and sources of light, reflection and mirrors, refraction and lenses. Wave Optics: Interference, thin films, diffraction, resolution, polarization. Optical Instruments: Magnifying glass, glasses, microscope, overhead projector, projection, binoculars, telescope, camera, prism spectrometer. Wave Motion: Kinematics, dynamics, energy, reflection, refraction, and interference, sound waves, standing waves, resonance, sound intensity, Doppler effect. AC Circuits: Resistance, current, phase difference, resonance state in RL, RC, and RLC circuits, radio transmitter and receiver. Electromagnetic Waves: Oscillation of electric and magnetic fields, e.m. waves formed in a dipole antenna, spectrum, energy, and momentum of e.m. waves. Nuclear Physics: Binding energy, natural and artificial radioactivity, nuclear reactions (fission, fusion) and energy, reactors.

General Physics Laboratory III (0-2-1)
Mechanical equivalent of calorie, determination of coefficient of linear expansion and thermal conductivity of solids, laws of reflection and characteristics of the image in a plane mirror, ray diagrams and image characteristics in concave and convex mirrors, ray diagrams and image formation in thin and thick lenses, paths followed by light when changing medium and light prism, double-slit interference, resonance, interference of water waves and Doppler effect, propagation of sound, formation and propagation of sound waves, absorption of sound, reflection of sound and formation of echo.Enrichment of these topics with examples from daily life and their correlation with the Science and Technology Curriculum applied in 4th – 8th grades.

General Chemistry III (Analytical Chemistry) (2-2-3)
Definition and purpose of analytical chemistry, introduction to qualitative and quantitative analysis methods, solutions, solvents, solutes, solubility, solution concentrations, chemical reactions important for analytical chemistry: precipitation, neutralization, complexation, redox. Chemical equilibrium, homogeneous and heterogeneous equilibrium reactions, Acids-bases: weak acid-weak base, strong acid-strong base, monoacid-monobase, polyprotic acids, pH and pOH, acid-base equilibria, buffer solutions. Quantitative analysis: gravimetric analysis, titrimetric analysis, non-aqueous titrations, complexometric analysis, errors in chemical analysis, instrumental analysis methods.

Computer I (2-2-3)
Fundamental concepts related to information technologies, software, and hardware, operating systems in general, word processing programs, electronic spreadsheet programs, data presentation, the use of the Internet in education, the impact of information technologies on the social structure and their place in education, information systems security and related ethical concepts.

Foreign Language I (3-0-3)
This course is designed to enable university students to use reading, speaking, listening, and writing skills in a certain efficiency in all kinds of academic activities they conduct in their fields. In this course, linguistic and communicative competencies of students will be developed and their foreign language proficiency will be increased by creating engaging contexts, providing exercises that enhance language fluency, and demonstrating the use of language in real communication skills.

Principles and Methods of Instruction (3-0-3)
Fundamental concepts related to instruction, principles of learning and instruction, the importance and benefits of planned work in instruction, instructional planning (unitized annual plan, daily plan, and activity examples), learning and instruction strategies, instructional methods and techniques, their relation to practice, instructional tools and materials, the duties and responsibilities of the teacher in increasing the quality of instruction service, teacher competencies.

4th SEMESTER

General Biology II (4-0-4)
Energy flow in living things – in nature, energy flow in other living systems: Investigation and examination of how cell respiration occurs and where the energy obtained from respiration is used. Comparison with photosynthesis in plants and respiration in animals. Tissues and characteristics in animals: Tissue types, functions, and working characteristics. Reproduction, fertilization, and development in animals: Importance of reproduction, types of fertilization, stages of embryological development, developmental processes in different animal species. Nutrition and digestion in animals: Classification of animals according to their feeding types and examination of their habitats, differences in the digestive system according to feeding types. Respiration in animals: Types of respiration, comparison of animals according to their respiratory characteristics and examination of their habitat characteristics. Excretory system in animals: Examination of the developmental stages of excretory organs, differences between them, and comparison of excretory products. Circulatory system in animals: Examination of the structures of the heart, vessels, and blood, comparison of animals with open and closed circulatory systems. Nervous system in animals: Examination of the structures that form the nervous system, comparison of differences between animal classes. Homeostasis (Internal balance): Physiological and morphological examination of the structures responsible for the body's adaptation to the external environment and the maintenance of internal balance against various external stimuli.

General Biology Lab II (0-2-1)
Examination of the photosynthesis event in plants, factors affecting photosynthesis, single-celled organisms and tissues, comparison of different tissue samples. Cultivation of living things in laboratory environment, examination of embryonic developmental stages of living things (frog, chick). Observation of respiration event in living things, examination of blood cells, determination of blood groups. Determination of carbohydrates, fats, and proteins in food.

Introduction to Modern Physics (2-0-2)
Structure of the Atom: Atomic models, energy levels, atomic and molecular spectra. Relativity: Relativity in time, dimension, and mass. Photons: Concept of quantum, black-body radiation, photoelectric and Compton effect. Quantum Mechanics: Wave-particle duality, De Broglie waves, Uncertainty principle, Schrödinger wave.

General Chemistry IV (Organic Chemistry) (2-0-2)
Introduction to organic chemistry: Atomic orbitals, chemical bonds, bond energies, bond lengths, electronegativity, and dipoles. Basic concepts in organic chemistry: molecular formula, structural formula, isomerism, and the radical concept. Organic molecules: writing and determination of molecular formulas. The course examines the molecular structures, nomenclature, properties, and reactions of Alkanes, Alkenes-Alkynes, Aromatic compounds, Aldehydes and Ketones, Carboxylic acids, and Amines. Final topics include fats, proteins, DNA structure, and polymers.

Computer II (2-2-3)
Basic concepts related to computer-assisted education, its elements, theoretical foundations, benefits and limitations, application methods, common formats used in computer-assisted instruction, evaluation and selection of course software, distance education applications, database applications, and the negative effects of computers and the internet on children/youth and their prevention.

Foreign Language II (3-0-3)
This course is designed to enable university students to use reading, speaking, listening, and writing skills at a certain level of proficiency in all kinds of academic activities they conduct in their fields. The aim is to raise the knowledge and skills students gained in the "Foreign Language I" course to a higher level. This should be achieved by creating engaging contexts, providing exercises that increase language fluency, demonstrating the use of language in real communication skills, and thereby enhancing students' linguistic and communicative competence and foreign language proficiency.

Science-Technology Curriculum and Planning* (3-0-3)
Definition of curriculum, principles of curriculum development, basic approaches in curriculum development, curriculum development process, the difference between curriculum development and program arrangement, development and components of the elementary school Science and Technology curriculum, planning in science instruction, course program, planning instructional activities; examination and preparation of lesson, daily, and unitized annual plans, general instructional principles, methods, and techniques. These topics will be enriched with examples from daily life and linked to the Science and Technology Curriculum applied in 4th – 8th grades.

5th SEMESTER

Human Anatomy and Physiology (2-0-2)
Definition of anatomy and physiology, anatomical planes and axes of the body, Organ systems: nutrition and metabolism, digestive system, circulatory system, excretory system, respiratory system, female reproductive system and menstrual cycle, male reproductive system, fertilization and embryo development process, locomotor system (skeleton and muscles), endocrine system, nervous system, and sensory organs.

Special Topics in Physics* (2-0-2)
Semiconductors: Diode, transistor, solar cells, and their usage areas, lasers. Superconductors and their usage areas. X-Rays: Structure, use in chemical analysis and quality control. Communication Technology Tools: Computers and their elements, integrated circuits, fiber optics, various physical sensors (optical, thermal, pressure-based, electrical, magnetic-based), Integrated circuits, Digital systems, Nanotechnology. Imaging Techniques and Tools: Ultrasound, NMR, Tomography, Scintillation, Electron and scanning microscopes.

Special Topics in Chemistry* (2-0-2)
Air pollution (Acid rain, smog pollution, and prevention). A chemical look at our health and foods. Enthalpy sources of our world. Greenhouse gases and their importance. From river water to drinking water. Glasses and ceramics. Relationship between visual arts and chemistry. Photochemistry. Corrosion chemistry and its importance. Biological processes and equilibrium. Drug therapy and chemistry (Blood chemistry). Chemical cleaning materials and their correct use. Carbon-based materials. Chemistry in the life process, environment, and environmental problems in the light of chemistry, chemical pollution, Nuclear Energy.

Statistics (2-0-2)
Introduction to statistics and basic concepts in statistics; descriptive statistics (measures of central tendency and dispersion), estimation of population parameters (standard error and confidence intervals); concept of correlation and alternative correlation techniques; hypothesis testing, decision making; difference tests; chi-square analysis; scale development process; standardization and adaptation procedures; data analysis with statistical software packages and alternative programs.

Science Instruction Lab Applications I (2-2-3)
The importance and purpose of the laboratory in science education: History of laboratory instruction, the place of laboratory work in the Science and Technology curriculum. Scientific method and scientific process skills: types of experiments, designing and developing experiments, scientific process skills, and how they are acquired. Measurement and error: reliability, validity, sources of error, error calculations. Experiment worksheets and experiment report: types of worksheets, preparation of worksheets, designing and developing experiments. Measurement and evaluation in the laboratory: evaluation methods and tools. Various experiments ranging from closed-ended to open-ended in physics, chemistry, and biology subjects within the scope of the Science and Technology Curriculum.

Turkish Education History* (2-0-2)
The importance of Turkish education history from the perspective of the education phenomenon. The state of education and teacher training institutions before the Republic. Turkish Education Revolution 1: Historical background, philosophical, intellectual, and political foundations of the Revolution. Turkish Education Revolution 2: The Tevhid-i Tedrisat Law (Law of Unification of Education): its historical foundations, scope, implementation, and importance; secularization in the Turkish education system. Turkish Education Revolution 3: Coeducation and the education of girls, the Script Revolution, People's Schools, People's Houses. The fundamental principles underlying the education system of the Republic of Turkey. Village Institutes, Education Institutes, and Higher Teacher Training Colleges. Universities and teacher training. Recent developments in the Turkish education field.

Scientific Research Methods (2-0-2)
Science and basic concepts (fact, knowledge, absolute, true, false, universal knowledge, etc.), basic information about the history of science, the structure of scientific research, scientific methods and different views on these methods, problem, research model, population and sample, data collection and data collection methods (quantitative and qualitative data collection techniques), recording, analysis, interpretation, and reporting of data.

Instructional Technologies and Material Design (2-2-3)
Concepts related to Instructional Technology, characteristics of various instructional technologies, the place and use of instructional technologies in the teaching process, determining the technology needs of the school or classroom, planning and implementing appropriate technology, developing two- and three-dimensional materials through instructional technologies, developing instructional materials (worksheets, activity design, overhead transparencies, slides, visual media (VCD, DVD) materials, computer-based materials), examining educational software, evaluating instructional materials of various qualities, Internet and distance education, visual design principles, research on the effectiveness of instructional materials, and the current status of instructional technology use in Turkey and the world.

6th SEMESTER

Genetics and Biotechnology (2-0-2)
Definition, fields, importance, impact on our lives, and a brief look at the historical development of genetic biotechnology. The Birth of Modern Genetic Science: Mendel's theories, cross-breeding, deviations from Mendel's theory. Cytoplasmic inheritance. Natural selection, adaptation, mutations. Molecular Biology. Gene Technology: Molecular genetics. Human genetics and genetic diseases. Opportunities provided by genetic engineering to society, science, and technology. Basic Principles of Biotechnology: Microorganism metabolism, plant-animal cell cultures, fermentation and fermentation technology, basic processes in biotechnology. Biotechnological Applications: Microbial biomass production (baker's yeast, single-cell protein), production of primary metabolites (citric acid, fumaric acid, acetic acid, amino acid, vitamin), fermentations (alcohol fermentation, lactic acid production, butyric acid, butanol, acetone), production of secondary metabolites (antibiotics), enzyme production, gene biotechnology, environmental biotechnology.

Nature of Science and History of Science (3-0-3)
Definition of Science: its aims, characteristics, development, and stages. History of Science: philosophy of science, philosophical movements, and their effect on the development of science, history of inventions. Epistemology, ontology: the nature of scientific concepts, how knowledge is reached, scientific knowledge and its characteristics. Concept of existence . Scientific method: scientific thinking, scientific inquiry. Science and society: sociology and anthropology of science, science ethics.

Environmental Science (3-0-3)
Concept of environment: Historical development of environmental science. Humans and the Environment, population and the environment, Regional and Local Environmental Problems: Water, Soil, Air, Radioactive pollution, and other sources of pollution. Biological diversity and the situation in Turkey: Flora and Fauna. Endemic animal and plant species in Turkey, endangered species. Environmental organizations and their activities, environmental education, sustainable development.

Earth Science (2-0-2)
Definition and subject of Geology. General information about the Earth: shape and dimensions of the globe, movements of the globe, geospheres of the earth, internal heat, gravity and isostasy, age of the globe. Materials forming the Earth's crust: Minerals, definition and characteristics. Important rock-forming minerals: Rocks, definition and general information, igneous rocks, metamorphism and metamorphic rocks, sedimentary rocks, weathering and soil, types of weathering, conditions and types of soil formation. Tectonic movements: Orogenic movements, epeirogenic movements, faults, volcanism, earthquakes. Stratigraphy: general principles, geological ages.

Science Instruction Lab Applications II (2-2-3)
Experiments conducted with simple and inexpensive materials: examples of simple physics, chemistry, and biology materials. Computer-assisted laboratory work: the place of the computer in the laboratory and how it is used. Safety in the science laboratory: safety in physics, chemistry, and biology experiments. Group work: designing and presenting experiments in class using the science and technology curriculum.

Community Service Practices (1-2-2)
The importance of community service practices; preparing projects aimed at identifying and finding solutions to current community problems; participating as an audience member, speaker, or organizer in scientific events such as panels, conferences, congresses, and symposiums; volunteering in various projects within the framework of social responsibility; and acquiring basic knowledge and skills for the implementation of community service activities in schools.

Special Teaching Methods I (2-2-3)
Science instruction, its fundamental aims, science literacy, concept instruction (misconceptions, concept maps, conceptual cartoons, V diagrams, etc.), methods and materials used in science instruction, examination and evaluation of the Science and Technology Curriculum applied in 4th – 8th grades (themes, learning outcomes, learning situations, assessment techniques, etc.). Examination and evaluation of examples of the course textbook, teacher's book, and student workbook.

Measurement and Evaluation (3-0-3)
The place and importance of measurement and evaluation in education, basic concepts related to the topic, and the desirable qualities of measurement tools (reliability, validity, usability/practicality). It examines measurement tools used in education and their characteristics, including tools based on traditional approaches (written exams, short-answer tests, true-false tests, multiple-choice tests, matching tests, oral exams, assignments) and tools aimed at comprehensively knowing the student (observation, interview, performance assessment, student product portfolio, research papers, research projects, peer assessment, self-assessment, attitude scales). The curriculum also includes basic statistical operations performed on measurement results, evaluating learning outcomes, grading, and developing a measurement tool related to one's own field.

7th SEMESTER

Special Topics in Biology* (2-0-2)
Genetically modified organisms (GMO). Stem cell technology. Organ transplants and the importance of organ donation. The importance of biology for society, science, and technology. Development processes of drugs and cosmetic products and their effects on nature. The use of microorganisms in eliminating environmental pollutants. Ready-made foods, their preparation processes, and dangers. Chemical substances (drugs, dyes, detergents) and their biological effects. Organisms in our immediate environment (single-celled organisms, house dust mites, insects) and their effects on health. Biological sensors. Genetic cloning. The use of nanotechnology in biology. Bioinformatics.

Evolution (2-0-2)
Definition of Evolution: Development of the concept of evolution. Evidence supporting evolution. Darwin's Theory of Evolution and the Neo-Synthesis Theory. Inorganic evolution. Evolution of plants and animals: Adaptation, Variation, sources of variation: Mutation, Recombination, Migration. Detection of genetic variation: Cross-breeding experiments, Artificial selection, Natural selection. Isolation Mechanisms: Habitat, Seasonal-Ethological-Mechanical-Physiological Isolation (Gametic Mortality). Postzygotic Isolation Mechanisms: Zygotic Mortality, Hybrid Inviability, Hybrid Sterility, F Inviability and Sterility. Ways of Speciation: Phyletic Evolution, Secondary Speciation, Primary Speciation. Ways of Primary Speciation. Allopatric Speciation, Sympatric Speciation, Parapatric Speciation. Human evolution. These topics will be enriched with examples from daily life and linked to the Science and Technology Curriculum applied in 4th – 8th grades.

Special Teaching Methods II (2-2-3)
Micro-Teaching applications (Students prepare plans, arrange the environment, tools-equipment, and materials, and present lessons on topics selected from the 4th – 8th grade Science and Technology Curriculum, and their presentations are evaluated in terms of teaching knowledge and skills).

Special Education* (2-0-2)
Definition of special education, basic principles related to special education, causes of disability, importance of early diagnosis and treatment, historical approach to disability, characteristics and education of children with intellectual, hearing, visual, or physical disabilities, language and communication disorders, chronic illnesses, specific learning difficulties, attention deficit and hyperactivity disorder, autism, and giftedness. Education of differently developing children through play, observed reactions in the families of children with special needs, the status of special education in our country, and institutions and organizations established for this purpose.

School Experience (1-4-3)
Observing a day in the life of a teacher and a student at school; observing how the teacher organizes a lesson, divides the lesson into stages, implements instructional methods and techniques, utilizes various activities, manages the class and controls the classroom, concludes the lesson, and evaluates student work. Examining the organizational structure of the school, how the school principal performs their duties, and the school's relationship with the community. Preparing a portfolio that reflects school experience work.

Guidance (3-0-3)
Basic concepts, student personality services, the place of psychological counseling and guidance within these services, principles and development of guidance, types of psychological counseling and guidance, services, techniques, organization and personnel, new developments in the field, techniques for getting to know the student, counselor-teacher cooperation, and the guidance duties to be performed by the teacher.

Classroom Management (2-0-2)
Basic concepts related to classroom management; classroom communication and interaction; the definition of classroom management; the differences and characteristics of the classroom management concept compared to ensuring discipline in the classroom; in-class and out-of-class factors affecting the classroom environment; classroom management models; developing and implementing rules in the classroom; physically organizing the classroom; managing undesirable behaviors in the classroom; time management in the classroom; classroom organization; and creating a positive classroom environment suitable for learning (with examples and suggestions).

8th SEMESTER

Astronomy (2-0-2)
Kepler's Laws and the structure of the Solar System: Planets and their characteristics, satellites. General Structure of the Universe: Galaxies, formation of stars, red giants, neutron stars, white dwarfs, black holes.

Teaching Practice (2-6-5)
Preparing a daily plan every week; implementing the prepared plan; evaluation of the implementation by the school teacher, the faculty member, and the practice student; making corrections in line with the evaluations and re-applying the plan; and preparing a portfolio.

Turkish Education System and School Management (2-0-2)
The aims and fundamental principles of the Turkish education system, legal regulations related to education, the structure of the Turkish education system, management theories and processes, and school organization and management. It details matters related to personnel, students, instruction, and operations in school management, and the concept of social participation in school.