3.	1.5 Course description	
	3.1.5.1 Courses that are course codes of the curriculum	
02027111	Basic Farm Workshop Using and maintaining welding equipment, carpentry tools, and basic construction tools; reading and interpreting blueprints; and fabricating assigned specimens.	1(0-3-2)
02027112	Laboratory of Basic Drawing Laboratory practice in selecting and using drawing instruments and lettering, applied geometry, orthographic drawing, pictorial representation, dimensioning and notation, and technical sketching.	1(0-3-2)
02027211	Agricultural Surveying Theory and practice of agricultural surveying, including measurement techniques, boundary surveying, leveling, and farm mapping.	2(1-3-4)
02027212	Agricultural Machinery Drawing Prerequisites: 02027112 Computer applications for agricultural machinery drawing and sketching, including creating two-dimensional and three-dimensional drawings, assembling three-dimensional models, producing presentations, and generating two-dimensional drawings from three-dimensional models.	2(1-3-4)
02027213	Materials and Elementary Mechanics of Materials Prerequisites: 01420119 Study of materials and their essential properties in agricultural settings; principles of force and force systems, moments of force, equilibrium, stress, strain, and deformation; torsion, shear forces, and bending moments; connections including screws, rivets, and welded joints; and analysis of structural elements such as beams, shafts, and columns.	3(3-0-6)
02027221	Farm Engines Study of engine components and their functions, including gasoline and diesel engines, along with practical training in the operation and maintenance of farm engines.	3(2-3-6)
02027231	Principles of Farmstead Irrigation Study of the importance of water in agriculture, including agricultural water sources, the water cycle, and the relationships among soil, water, plants, and climate. Covers water requirements and factors influencing water management, irrigation scheduling, surface irrigation, pipe irrigation, pump and pump system design, irrigation efficiency, rainwater management and utilization, crop yield responses to water availability, water drainage and design, and the application of computer technology in farm water management.	3(2-3-6)
02027261	Electric and Electronics for Agriculture Study of the fundamental principles of electricity and power systems, including basic electrical circuit analysis, design and control of	3(2-3-6)

02027362	Computer Programming for Agriculture II Prerequisites: 02027262	2(1-3-4)
02027361	Computer Programming for Agriculture I Study of network programs and computer network systems, computer programming and applications in agricultural planning and management, information management for agriculture, and the development and implementation of computer software for solving agricultural problems.	3(2-3-6)
02027333	Sprinkler and Drip Irrigation System Study of factors influencing plant water consumption, relationships among water in soil, plants, and air, methods for determining plant water consumption rates, and computerized design and economic analysis of sprinkler and drip irrigation systems.	3(2-3-6)
02027324**	Agricultural Power Transmission Prerequisites: 02027213 Study of the fundamentals of power transmission, measurement, and utilization in agricultural applications.	3(2-3-6)
02027323	Principles of Farm Machinery III Prerequisites: 02027322 Study of the principles of operation, repair, maintenance, and practical application of agricultural machinery used for harvesting, threshing, decorticating, milling, and cleaning.	3(2-3-6)
02027322	Principles of Farm Machinery II Prerequisites: 02027321 Study of the principles of operation, repair, maintenance, and practical application of farm machinery used for tillage, planting, weed control, fertilizing, and agricultural spraying.	3(2-3-6)
02027321	Principles of Farm Machinery I Prerequisites: 02027221 Study of the principles of power sources, power transmission, electrical systems, braking, and hydraulic systems of farm tractors. Includes practical operation and use of farm tractors and the application of pneumatic systems in agriculture.	3(2-3-6)
02027262**	Fundamental Agricultural Control System Study of sensors and transducers, signal measurement and conditioning, signal conditioning circuits, actuator equipment and control systems, functions and programming of programmable controllers, and the application of programmable controllers in agricultural mechatronics.	3(2-3-6)
	electrical equipment used in agriculture, electronics circuit analysis, basic power electronics, digital principles and circuit design, and the application of electrical and electronic equipment in agricultural settings.	

	Study of the principles of computer programming, including program structure and algorithm flowcharts, variable types and data management, database structure analysis using high-level languages, and microcontroller architecture. Covers registers, special registers, data memory, program memory, input/output ports, timer and counter circuits, the microcontroller instruction set, and programming and applications of microcontrollers in agricultural mechatronics using high-level languages.	
02027399	Basic Specific Practicum in Agricultural Machinery and Mechatronics Basic specific practicum in agricultural machinery and mechatronics.	1(0-10-5)
02027423	Testing and Evaluation of Agricultural Machinery and Equipment Prerequisites: 02027321 Study of the meaning of testing and evaluation, basic measurement techniques, the relationship between the human body and machines, economic assessment, standards and testing procedures, and the evaluation of agricultural machinery and equipment.	3(2-3-6)
02027425	Agricultural Machinery and Resources Management Study of agricultural system management, including the management of machinery, energy, soil, water, fertilizers, and pests, aimed at increasing the value of agricultural products while conserving energy, soil, water, and other agricultural resources.	3(3-0-6)
02027441**	Agricultural Production Technology in Environmental Control System Study of the principles of agricultural production in controlled environments, including types and selection of equipment for plant and livestock housing, the relationship between plants, animals, and their environment, and environmental control technologies used in greenhouses. Covers automatic control systems for greenhouses, design, planning, and construction techniques, assembly and installation of measuring equipment, environmental control systems, water systems, lighting systems, and more. Also includes monitoring, analysis, and evaluation of greenhouse performance.	3(2-3-6)
02027442**	Planning and Layout for Modern Farm Study of principles for planning and layout of modern farms, covering components and factors related to farm building layout, utilities, renewable energy sources, water sources, irrigation and drainage systems, and farm waste management. Includes farm standards, regulations, and laws, as well as the application of information technology for farm planning and management. Students will also engage in creating project case studies, including cost estimation and feasibility analysis.	3(2-3-6)

02027443 Agricultural Building Planning

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3(2-3-6)

	Study of principles of planning and zoning management for farmsteads, feasibility studies and cost estimates for agricultural projects, and the fundamental elements of agricultural building planning, including infrastructure considerations, standards, regulations, and legislation.	
02027451**	Post-harvest Mechanization and Agricultural Production Storage Prerequisites: 02027221 Study of the characteristics of agricultural products and the machinery used in postharvest operations, including drying, milling, cleaning, and sorting. Covers basic principles of thermodynamics and heat transfer, as well as methods of drying, cooling, storage, packaging, and handling of agricultural products.	3(2-3-6)
02027452	Drying and Storage Technology for Agricultural Commodities Prerequisites: 02027451 Study of the basic principles of thermodynamics and heat transfer, properties of moist air, physical and biochemical properties of agricultural commodities, postharvest losses, and quality control. Covers theories and methods of drying and storage, as well as performance testing of agricultural crop dryers and storage systems.	3(3-0-6)
02027453	Non-Destructive Testing of Agricultural Material Study of the principles of non-destructive testing for agricultural materials, including techniques such as chlorophyll fluorescence, near- infrared spectroscopy (NIR), and other specific testing methods. Covers comparative analysis and applications of these techniques in agriculture.	3(2-2-5)
02027455	Agricultural and Food Products Processing Operations Study of the principles and technologies of agricultural products, with a focus on food product processing operations and management. Covers the characteristics and properties of food products, storage techniques, and equipment used in food processing.	3(3-0-6)
02027461	Agricultural Mechatronics I Prerequisites: 02027262 Study of embedded system architecture, including the instruments and tools used for developing embedded systems. Covers fundamental principles for embedded system development and the application of embedded systems in agricultural mechatronics.	3(2-3-6)
02027462	Agricultural Mechatronics II Prerequisites: 02027461 Study of advanced principles in the development of embedded systems, focusing on communication and applications between embedded systems and equipment used in agricultural machinery and mechatronics.	3(2-3-6)
02027463	Automatic Control System for Agricultural Mechatronics Prerequisites: 02027262	3(3-0-6)

	Study of automatic control systems, including transfer functions, linearization, dynamic system behavior, response of linear dynamic systems, system analysis, frequency response, and compensation techniques. Covers fundamentals of digital control systems, modern control theory, and applications of automatic control systems in agricultural mechatronics.	
02027491	Research Techniques in Agricultural Machinery and Mechatronics Study of the principles and methods of research in agricultural machinery and mechatronics, including identifying research problems, formulating research objectives and hypotheses, data collection, analysis and interpretation, application of statistical methods and software for research, and report writing and presentation.	1(0-3-2)
02027496	Selected Topics in Agricultural Machinery and Mechatronics Study of selected topics in agricultural machinery and mechatronics at the bachelor's degree level, with topics varying by semester.	1-3
02027497	Seminar Presentation and discussion of selected topics of interest in agricultural machinery and mechatronics at the bachelor's degree level.	1
02027498	Special Problems	3
	Special problems in agricultural machinery and mechatronics at the bachelor's degree level and compile into a written report.	
02027499	Specific Practicum in Agricultural Machinery and Mechatronics Prerequisites: 02027399 Specific practicum in agricultural machinery and mechatronics	1(0-10-5)
Extracurric	ular service course	
02027201*	Agricultural Innovation for Modern Farm) Study of the concept and meaning of innovation, its importance, key elements, and approaches to development. Covers the creation of innovations, trends in population, society, environment, and food demand, as well as modern farming practices. Focuses on innovations and trends in agricultural innovation for plant and animal production, agricultural machinery and mechatronics for modern farming, information technology applications for modern farms, unmanned aircraft systems in agriculture, and management of agricultural innovations for modern farms.	3(3-0-6)
3.	.1.5.2 Courses that are extracurricular course codes	
01403111	General Chemistry) Study of atoms and atomic structures, the periodic table, chemical bonding, chemical reactions, states of matter (gases, liquids, solids), solutions, thermodynamics, chemical kinetics, chemical equilibria, electrolytes and	4(4-0-8)

their ionization, acids and bases, ionic equilibria, and electrochemistry.

01403112	Laboratory in General Chemistry Prerequisites or study together: 01403111 Laboratory work for General Chemistry.	1(0-3-2)
01417111	Calculus I Limits and continuity, derivatives and applications, differentials and applications, integration and applications.	3(3-0-6)
01420115	Laboratory in Abridged Physics Prerequisites or study together: 01420119 Laboratory for Abridged Physics.	1(0-3-2)
01420119	Abridged Physics Study of mechanics, thermodynamics, waves, sound, static electricity, electric current, magnetism, electromagnetic waves, light, and an introduction to modern physics.	3(3-0-6)
01422111	Principles of Statistics) Study of atoms and atomic structures, periodic systems, chemical bonding, chemical reactions, states of matter (gases, liquids, solids), solutions, thermodynamics, chemical kinetics, chemical equilibria, electrolytes and their ionization, acids and bases, ionic equilibria, and electrochemistry.	3(3-0-6)
01424111	Principles of Biology Study of biomolecules in organisms, cellular structure and metabolism, genetics and evolution, species diversity, structure and function of animals and plants, and the principles of ecology and behavior.	3(3-0-6)
02028321	Fertilizers and Manures Prerequisites: 02036261 Study of the types and important properties of organic and inorganic fertilizers, preparation of organic fertilizers, principles of fertilizer application, and the appropriate use of fertilizers for key economic crops across various soil types. Includes a required field trip.	3(3-0-6)
2036211	Agricultural Extension and Technology Transfer Study of the concept, meaning, philosophy, and principles of agricultural extension. Covers learning and communication processes for technology transfer, program planning and evaluation for sustainable agricultural extension, comparative extension methods, agricultural information and technology, innovation and adoption processes for target audiences, and media communication for technology transfer.	3(3-0-6)
02036221	Animal Science and Technology Study of the importance of animal production and its relationships with other agricultural production sectors. Covers the role of science and	3(3-0-6)

	technology in animal production, farm management and environmental considerations, primary and processed animal products, livestock marketing, and future trends in animal production.	
02036231	Crop Science and Technology Study of the significance of field crops to the global ecosystem, including their classification and centers of origin. Covers production physiology, crop improvement, cultural practices, production ecology, cropping systems and management, and seed science and technology of key economic crops.	2(2-0-4)
02036261	Soil Science Prerequisites: 01403111 Study of soil genesis, survey, and classification, along with the physical, chemical, and microbiological properties of soil. Covers plant nutrients, fertilizer use, and soil organic matter management. Includes topics on soil degradation, soil and water conservation, and the use of soil information for agricultural and environmental purposes.	3(2-3-6)
02036271	Horticultural Science and Technology Study of the socio-economic and environmental significance of horticulture. Covers the science and technology of production, propagation, harvesting, storage, processing, marketing, and transportation of fruit, flower, ornamental, vegetable, spice, herb, and other horticultural crops.	2(2-0-4)
02036299	General Practicum Study and practice of farm operations in agronomy, horticulture, forage crops, pest management, soil and fertilizer application, animal husbandry, and the use of farm machinery.	2(0-10-5)
02036371	Fundamental Agricultural Pest Management Study of the importance and types of insects, plant diseases, and weeds as agricultural pests. Covers pest survey techniques, decision-making in pest management, control methods to reduce pest-related damage, and key factors for the application of pest control tools and instruments.	3(2-2-5)
02036390	Cooperative Education Preparation Study of the principles, concepts, processes, and steps of cooperative education, including related rules and regulations. Covers basic knowledge and techniques for job applications, workplace practices, communication, and human relations. Includes training in personality development, quality management systems in the workplace, project presentation techniques, and report writing.	1(1-0-2)

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On the job training as a temporary employee according to the assigned project including report writing and presentation.

4. Field Experience Components (Internship and Cooperative Education)

The curriculum requires internship as a required special subject for both cooperative education and non-cooperative education programs. Cooperative education is an elective special subject.

4.1 Field Experience Learning Outcome Standards

4.1.1 Internship consists of:

1. Basic Internship (02036299):

A general agricultural training program covering field crops, horticulture, animal feed plants, pest management, soil and fertilizer, animal husbandry, and agricultural mechanics. Students are required to complete training across all designated areas.

2. Basic Agricultural Machinery and Mechatronics Internship (02027399):

A 150-hour internship where students develop personal and group responsibility in the use, maintenance, and selection of agricultural machinery and various agricultural technologies. The internship focuses on enhancing practical skills through training in departmental laboratories and student-managed plots.

3. Agricultural Machinery and Mechatronics Specialized Internship (02027499):

A 150-hour internship where students gain field experience at various establishments, such as sugar mills, agricultural machinery manufacturing companies, irrigation system firms, seed production companies, agricultural export businesses, and plant farms. Students engage in training on production processes, repair and maintenance of agricultural machinery, quality control, and safety. Opportunities also include internships at government agencies such as agricultural machinery and technology promotion agencies, the Royal Project, and agencies overseeing agricultural production standards. The internship is conducted under the supervision of a designated internship advisor and a representative from the host organization, focusing on the site's mission and addressing specific problems through project-based learning.

4.1.2 Cooperative Education

This educational system emphasizes hands-on experience in a professional setting, where students work systematically in a business or organization that employs graduates prior to graduation. Students are required to engage in full-time work at the host organization for 16 weeks (equivalent to one semester or four full months of actual work-learning). Unlike traditional internships, students are treated as temporary employees, working as part of the organization's workforce.

Field Experience Learning Outcome Standards:

- 1. **Discipline**: Ability to adhere to the rules and regulations of the internship site.
- 2. **Integrity**: Demonstrates honesty, punctuality, and responsibility in carrying out assigned tasks.
- 3. **Practical Skills**: Knowledge and competence in using tools, equipment, and techniques relevant to the work at the internship site.

- 4. **Problem Solving**: Ability to apply knowledge and suggest solutions to real-world situations.
- 5. Teamwork: Capable of collaborating effectively with others.
- 6. Communication Skills: Proficient in speaking, writing, and analytical thinking.

4.2 Time period

According to the study plan

4.3 Time management and teaching schedule

4.3.1 Internship

The internship duration is determined by the working hours of the host organization, with a minimum total internship time of 300 hours. For the course 02036299, students are required to complete training across all designated bases.

4.3.2 Cooperative Education

- The internship period follows the working hours of the employer or organization that employs graduates, spanning 16 weeks or one semester.