NAVOI STATE UNIVERSITY

OX1406 FOOD SAFETY — COURSE SYLLABUS

Faculty of Natural Sciences & Medicine | Department of Biology | Program: 60520200 Ecology & Environmental Protection

COURSE PASSPORT & ACADEMIC METADATA

Course Title: Food Safety

Course Code: OX1406

Course Type: Mandatory

Field of Study: 500000 Natural Sciences

Field: 520000 Environment

Program: 60520200 Ecology & Environmental Protection

Academic Year: 2026–2027

Form of Education: Full-time

Language: Uzbek

Total Workload Allocation: 90 Hours Contact (Lectures, Practical) + Self-Study / Independent Work | **Credits:** ECTS Compliant

Aligned UN SDGs: SDG 2 (Zero Hunger), SDG 3 (Good Health & Well-being), SDG 12 (Responsible Consumption)



1. Course Description & Medical-Toxicological Framework

The Food Safety course provides a comprehensive scientific framework for inspecting raw food materials, semi-finished goods, and chemical additives. Students explore temperature-induced, chemical, and biological degradation processes, medical-toxicological standards, HACCP/ISO 22000 management systems, traceability ('Farm to Fork'), GMO risk evaluation, mycotoxins, and synthetic packaging hazard mitigation.

In alignment with UN SDGs 2, 3, and 12, the curriculum equips students with hands-on skills in food quality control, pesticide residue analysis, microbiological auditing, and digital traceability systems.

2. Course Aims & Technical Competencies

Course Aim: To cultivate expert technical competence in food inspection, medical-toxicological safety evaluation, industrial sanitation, and international food safety management systems.

- Toxicological & Microbiological Auditing: Identify anthropogenic toxic elements, mycotoxins, pesticide residues, and microbial contamination across supply chains.
- Standards & Regulatory Mastery: Implement HACCP 7 principles, Critical Control Points (CCP), ISO 22000 standards, and national SanPiN regulations.
- Traceability & Digital Innovation: Master 'Farm to Fork' monitoring using QR codes, RFID tags, AI-based quality sensors, and Product Recall protocols.
- Food Authenticity & Adulteration Detection: Distinguish genuine food products from adulterated goods (milk, honey, meat, oils) via laboratory assay techniques.

3. Prerequisites

Prerequisites: General Chemistry (UK 1106), Soil and Agroecology (TAY 11210).

4. Course Structure & Workload Allocation

Activity Type	Curriculum & Diagnostic Focus	Workload Allocation
Lectures	Medical-Toxicological Theory, HACCP & Standards	45 Contact Hours
Practical / Laboratory	Physico-Chemical, Microbiological & Safety Assays	45 Contact Hours
Independent Study	Technology Planning, Hazard Analysis & Cases	Self-Directed Work
Total Workload	Comprehensive Food Safety Module	90 Hours Contact + Self-Study

5. Detailed Course Curriculum Outline

5.1 Lecture Syllabus Outline

• **L1: Introduction & Raw Material Chemical Composition:** Chemical components, sources in raw materials, and food quality nomenclature.

• **L2: Classification of Toxic Contaminants & Pathways:** Harmful foreign substances, environmental entry routes, and toxicity metrics.

• **L3: Anthropogenic Toxins, Heavy Metals & Radiation Safety:** Radionuclides, toxic element accumulation, and agrochemical contamination in plants.

• **L4: Safety Assessment & Control of Food Additives:** Evaluating food additives, colorants, preservatives, and regulatory thresholds.

• **L5: Microbiological Safety & Mycotoxin Control:** Microbiological indicators, natural toxins, mycotoxins (aflatoxin, patulin), and detection assays.

• **L6: Agricultural Raw Material Storage & Primary Processing:** Theoretical foundations of storage, primary processing, and deep processing safety.

• **L7: Food Production Technologies & Emission Reduction:** Oils, margarines, canned foods, meat-dairy, wine, and grain processing residue reduction.

• **L8: GMO Safety Criteria & Risk Assessment:** Genetically Modified Organisms classification, potential hazards, and bio-safety criteria.

• **L9: Safe Inhibitors, Vitamins & Flavoring Technologies:** Theoretical bases of safe inhibitors, synthetic/natural vitamins, sugar substitutes, and flavorings.

• **L10: Finished Product Nutritional Value & Eco-Packaging:** Storage, transport, secondary raw material utilization, and packaging material safety.

• **L11: Synthetic Food Hazards & Packaging Safety:** Mitigating hazards from synthetic foods, plasticizers, and polymer packaging contact.

• **L12: International Food Safety Systems: HACCP & ISO 22000:** HACCP 7 core principles, Critical Control Points (CCP), and ISO 22000 implementation.

• **L13: Food Labeling, Packaging Sanitation & Consumer Information:** Product labels, E-number codes, allergen disclosures, and consumer rights protection.

• **L14: Traceability & Supply Chain Monitoring ('Farm to Fork'):** Documenting supply chains, digital tracking (QR, RFID), and Product Recall mechanisms.

• **L15: Industrial Sanitation, Hygiene & Bio-Safety:** CIP cleaning systems, personal hygiene, medical exams, and pest control (disinfection/deratization).

• **L16: Hormones, Antibiotics & Veterinary Residues:** Growth stimulators, antibiotic resistance hazards in meat/milk/eggs, and detection methods.

• **L17: Food Adulteration & Authenticity Testing:** Identifying assortment, quantitative, and info fraud in milk, honey, oil, juice, and meat.

• **L18: Express Methods & Advanced Preservation Technologies:** Cryo-technologies, MAP packaging, UV/Radiation sterilization, and UHF processing.

• **L19: Eco-Friendly & Organic Food Certification:** Bio/Organic farming standards, chemical-free processing, and export certification.

• **L20: National Legislation, Expertise & State Control:** Uzbekistan Food Safety Law, SanPiN norms, SES, and Technical Regulation Agency roles.

• **L21: Crisis Management & Global Food Security Threats:** Biological epidemics, mass poisoning responses, climate change impacts, and risk mapping.

• **L22: Digital Innovations, AI & Emerging Biotechnologies:** AI, IoT, Blockchain, smart packaging indicators, and alternative protein safety (lab-grown meat).

5.2 Practical & Seminar Discussion Outline

- Determining safety indicators in canned meat products according to state standards.
- Assessing safety and quality metrics in sausage and processed meat products.
- Evaluating chemical safety indicators in vegetable oils and fats.
- Standardized safety testing of margarine and spread products.
- Analyzing safety, acidity, and heavy metal limits in bakery and bread products.
- Microbiological and physico-chemical safety testing of dairy products.
- Detecting microbial contamination levels and bacterial counts in raw milk.
- Medical-toxicological analysis of bread and cereal goods.
- Toxicological evaluation of alcoholic and non-alcoholic beverages.
- Hygienic evaluation of raw plant product quality and chemical safety.
- Sanitary-bacteriological examination of meat, sausages, and poultry.
- Sanitary-bacteriological and toxicological inspection of eggs and egg products.
- Freshness and safety testing of fish, seafood, and aquaculture items.
- Determining nitrate and nitrite concentrations in fresh/processed fruits, vegetables, and juices.
- Assaying pesticide residues in agricultural raw materials and hygienic risk scoring.
- Analyzing mycotoxin contamination (Aflatoxins, Ochratoxin, Patulin) in grains and flour.
- Authenticity testing and adulteration detection in honey and bee products.
- Sanitary-hygienic safety inspection of infant food and dietary products.
- Detecting residual antibiotics and hormonal preparations in meat and milk.
- Quantitative analysis and safety scoring of food additives (dyes, preservatives, antioxidants).
- Determining radiological safety indicators (radionuclides: Cesium, Strontium) in food.
- Hygienic safety testing of food-contact packaging polymers (plastics, paper, metals).
- Microbiological surface and air contamination swabs (CIP validation) in food processing plants.

5.4 Independent Study & Analytical Projects

- Microbiological and biochemical principles of modern food preservation technologies.
- Thermoradiative and dielectric properties of food raw materials.
- Theoretical foundations of oil extraction from oilseeds and solvent selection.
- Scientific criteria for selecting eco-friendly extraction solvents.
- Unwanted accompanying compounds in vegetable oils and refining methods.
- Catalytic hydrogenation theories in margarine and fat processing.
- Designing safe technological workflows in butter manufacturing.
- Planning hazard-controlled processing parameters for smoked and semi-smoked sausages.
- Safety planning and critical control point design in condensed milk production.

6. Recommended Literature & Information Sources

- Doyle M.P., Diez-Gonzalez F. Food Microbiology: Fundamentals and Frontiers (5th Ed.). ASM Press / Purdue University, 2020.
- State Standards Portal: https://www.standart.uz

- Sanitary-Epidemiological Service: https://www.sanepid.uz