WARSAW UNIVERSITY OF LIFE SCIENCES

INTERNATIONAL ACADEMIC MOBILITY PROGRAMME

"SMART AGRICULTURAL FUTURE: ACADEMIC MOBILITY IN THE FIELDS OF DIGITAL CROP PRODUCTION, MODERN LIVESTOCK FARMING AND AGRICULTURAL ENGINEERING"

The Programme is implemented within the framework of the Memorandum of Understanding between Polissia National University and the Warsaw University of Life Sciences (SGGW).

Period: 01/06/2026–10/07/2026

Duration: 18 weeks.

The Programme includes: a weekly structure; thematic modules; lectures; practical assignments and seminars; familiarisation with modern digital technologies; educational and research activities; intercultural exchange; and presentation of the results of the international internship.

MODULE 1: DIGITAL AGRICULTURE AND AGRICULTURE 4.0

(Weeks 2–5)

1. The Concept of Agriculture 4.0 and the Digital Transformation of the Agricultural Sector

Evolution of agriculture: from Agriculture 1.0 to Agriculture 4.0. Key stages in the development of agricultural production. Digitalisation and automation of agriculture. The Internet of Things (IoT) in modern agricultural production. Use of big data and digital analytics. Artificial intelligence in agricultural production management systems. Digital twins of agricultural systems. The role of innovative technologies in improving the productivity and sustainability of the agricultural sector.

2. The Internet of Things, Sensor Technologies and Big Data in Agricultural Production

Application of IoT technologies in crop and livestock production. Sensors for monitoring moisture, temperature and soil conditions. Microclimate monitoring systems. Automated collection of agricultural data. Use of digital platforms for data storage and analysis. Big data as a basis for forecasting and managerial decision-making. Integration of digital systems into production processes.

3. Artificial Intelligence and Machine Learning in Agriculture

Key areas of application of artificial intelligence in the agricultural sector. Machine learning for yield forecasting. Identification of plant diseases and pests. Analysis of satellite and aerial imagery. Decision-support systems. Risk forecasting and optimisation of production processes. Use of computer vision in crop and livestock production. Ethical and safety aspects of using artificial intelligence.

4. Robotics and Automation of Agricultural Production

Modern agricultural robots. Autonomous agricultural machinery. Robotic systems for crop care. Automated monitoring and control systems. Machine vision in agricultural production. Advantages and limitations of robotics. The impact of automation on labour productivity and production efficiency.

MODULE 2: DIGITAL CROP PRODUCTION AND PRECISION AGRICULTURE

(Weeks 6–9)

5. Fundamentals of Precision Agriculture

The concept and principles of precision agriculture. Spatial variability of agricultural land. A differentiated approach to crop management. Digital field mapping. Collection and analysis of agronomic data. Optimisation of the use of seeds, fertilisers and plant protection products. Increased yields and reduced production costs.

6. GPS Navigation and Satellite Technologies in Crop Production

Global navigation satellite systems. GPS navigation of agricultural machinery. Automatic and parallel guidance. Satellite monitoring of agricultural land. Remote sensing of the Earth's surface. Creation of electronic field maps. Use of satellite data to assess crop conditions.

7. Unmanned Aerial Vehicles and Digital Crop Monitoring

Use of drones in modern crop production. Aerial imaging of agricultural land. Monitoring plant development. Identification of areas with insufficient moisture and nutrient availability. Monitoring the spread of diseases and pests. Analysis of vegetation indices. Use of drones for the precise application of plant protection products.

8. Digital Soil Fertility Management

Modern methods of digital soil analysis. Sensor-based monitoring of moisture and temperature. Creation of soil fertility maps. Variable-rate fertiliser application. Optimisation of nutrient use. Conservation of soil resources. Digital technologies for improving the environmental safety of crop production.

MODULE 3: MODERN LIVESTOCK FARMING AND DIGITAL TECHNOLOGIES

(Weeks 10–13)

9. Precision Livestock Farming: Digital Livestock Production

The concept of precision livestock farming. Digital technologies for managing livestock enterprises. Automated animal record-keeping. Monitoring physiological condition and behaviour. Productivity monitoring systems. Use of sensors and electronic identification devices. Digital tools for improving production efficiency.

10. Intelligent Systems for Monitoring Animal Health and Welfare

Automated health monitoring. Activity sensors. Body temperature monitoring. Detection of changes in animal behaviour. Early disease detection. Digital systems for monitoring animal welfare. Use of artificial intelligence for data analysis.

11. Automated Technologies for Animal Feeding and Housing

Robotic feeding systems. Automated feed distribution. Digital monitoring of feed intake. Microclimate management systems. Automated cleaning and maintenance of facilities. Optimisation of production processes. Improved efficiency and resource conservation.

12. Robotic Systems in Modern Dairy Farming

Automated milking systems. Robotic milking complexes. Digital monitoring of milk quality. Monitoring animal productivity. Automated collection of production data. Analysis of health and productivity indicators. Innovative models for the development of dairy cattle farming.

MODULE 4: AGRICULTURAL ENGINEERING AND INTELLIGENT TECHNOLOGIES

(Weeks 14–17)

13. Modern Agricultural Machinery and Automatic Control Systems

Intelligent agricultural machinery. Automated machinery control. Precision positioning systems. Autonomous tractors and robotic implements. Digital monitoring of technological operations. Monitoring the technical condition of machinery. Optimisation of fuel and energy use.

14. Digital Twins and Engineering Modelling in the Agricultural Sector

The concept of a digital twin. Modelling agricultural production systems. Digital representation of technological processes. Forecasting production outcomes. Use of digital models to optimise management. Integration of data from sensors and production systems. Prospects for the development of digital twins in agricultural engineering.

15. Innovative Technologies for Sustainable and Resource-Efficient Agriculture

Rational use of land resources. Digital monitoring of water resources. Reduction of losses in agricultural production. Energy-efficient technologies. Reduction of negative environmental impacts. Climate-smart agriculture. Innovative solutions for achieving the Sustainable Development Goals.

16. European Experience in the Development of Digital Agriculture

Modern approaches to the digitalisation of the agricultural sector in European Union countries. Innovative agricultural centres and research laboratories. Cooperation among universities, research institutions and agricultural businesses. European educational and research projects. International academic cooperation. Exchange of experience between students and academic staff of Polissia National University and the Warsaw University of Life Sciences. Opportunities for further development of international cooperation.

BLOCK 5: FINAL WEEK

(Week 18)

Presentation of the results of academic mobility. Final presentations by Programme participants. Presentation of individual and team projects. Discussion of prospects for applying digital technologies in Ukrainian agriculture. Exchange of professional and intercultural experience. Summary of the international academic mobility programme. Evaluation of participation outcomes.

Awarding of certificates.