The offer for Erasmus+ Training mobility under in 2027

Proposed Research Plans for International Students

Stays starting from 15.02 (min.16 weeks – according to sending university rules)

Under ongoing research projects

Research program and student requirements

Students participating in the research program are expected to:

- work in the laboratory min. 6 hours per day on working days;
- participate regularly in individual meetings with the academic supervisor;
- prepare an experimental plan and maintain detailed laboratory documentation;
- independently analyze and interpret obtained results under the supervisor's guidance;
- participate in research seminars and present preliminary and final results;
- participate, where possible, in scientific conferences and departmental research events;
- prepare a scientific poster or oral presentation based on research;
- contribute to the preparation of a scientific publication based on the results obtained;
- follow laboratory safety procedures and good laboratory practice;
- actively participate in the research team's activities.

The exact scope of laboratory work and analytical methods will be adjusted to the student's academic background, previous laboratory experience and duration of the stay.

What we offer – academic and student benefits

Students participating in the research program will be integrated into the university's internal academic system and will receive access to a range of facilities and services supporting both their research and everyday student life.

Academic and research facilities:

- integration into the university's **internal student and academic system**;
- a university **student ID card** (available for a small administrative fee, approximately PLN 20 (around 5 euro) – the exact fee should be confirmed);
- an individual **university e-mail address**;
- access to the university's **cloud storage and digital services**;
- access to **scientific databases, journals and electronic research resources** available through the university;
- access to **well-equipped food science and food analysis laboratories**;
- individual supervision and regular meetings with an academic mentor;
- the opportunity to work as a member of a **young and supportive research team**;
- participation in research seminars, scientific meetings and conferences;
- the possibility of contributing to a **scientific publication**.

Student life and accommodation:

- possibility of accommodation in a **university student residence**, subject to availability;
- accommodation in **single or double rooms**;
- rooms equipped with a **private bathroom and kitchenette**, providing students with greater independence and comfort;
- access to a wide range of **student discounts and benefits available in Wrocław with a valid university student ID**;
- student discounts may cover cultural activities, sports and recreation, transport, restaurants, entertainment and other services.

Life in Wrocław:

- the university is located in **Wrocław, one of Poland's major academic and cultural centres**;
- students can enjoy a beautiful university campus and access to the historic city centre;
- Wrocław offers a vibrant international student environment, numerous cultural and recreational opportunities and extensive public transport connections;
- the city provides **many discounts and special offers for students**, making everyday life and leisure more affordable.

FERBION PROJECT

Mentor to contact - Dr inż. Agata Wojciechowicz (agata.wojciechowicz@ue.wroc.pl)

Research area: *Innovative processing and fermentation of pseudocereals for the development of high-quality and health-promoting cereal products*
The research projects combine laboratory experiments, food analysis and product development. Students may choose one research topic or combine several areas depending on the duration of their stay and their previous laboratory experience.

1. Micronization of pseudocereals and its effect on flour quality

Aim: To investigate how micronization of selected pseudocereals (e.g. buckwheat, quinoa, amaranth) affects their technological and functional properties.
Research activities:

- preparation and micronization of pseudocereal raw materials,
- determination of particle size distribution,
- evaluation of water absorption and hydration properties,
- analysis of flour colour and selected physicochemical properties,
- evaluation of rheological properties,
- comparison of untreated and micronized flours,
- application of the flours in selected food matrices.

Possible products: doughs, bread, pancakes, biscuits, wafers or other cereal-based products.

2. Pseudocereal sourdoughs – development and characterization

Aim: To develop sourdoughs based on selected pseudocereals and evaluate their fermentation characteristics and quality.
Research activities:

- preparation and propagation of pseudocereal sourdoughs,
- monitoring of pH and titratable acidity,
- evaluation of fermentation dynamics,
- assessment of selected physicochemical properties,
- comparison of different pseudocereal substrates,
- evaluation of the effect of fermentation on flour functionality.

The project may include the comparison of different fermentation conditions or starter cultures.

3. Effect of malt addition on pseudocereal sourdoughs

Aim: To investigate whether the addition of selected malts can modify fermentation and technological properties of pseudocereal sourdoughs.
Research activities:

- preparation of sourdoughs with different malt additions,
- comparison of different malt types or addition levels,

- monitoring of pH and acidity,
- evaluation of dough rheology and fermentation behaviour,
- analysis of selected physicochemical properties,
- assessment of the technological potential of malt-enriched sourdoughs.

This project could be particularly interesting for students interested in fermentation technology, cereal science and functional food development.

4. Influence of pseudocereal sourdoughs on bread quality

Aim: To evaluate the influence of pseudocereal sourdough addition on the quality and technological properties of bread.

Research activities:

- development of bread formulations containing pseudocereal sourdough,
- optimization of sourdough addition,
- evaluation of dough properties,
- assessment of bread volume, texture and colour,
- determination of moisture and selected chemical parameters,
- sensory evaluation,
- comparison with a control wheat bread.

The project may focus on improving nutritional value while maintaining acceptable technological and sensory quality.

5. Pseudocereal sourdoughs in alternative food matrices

Aim: To investigate the possibility of applying pseudocereal sourdoughs in products other than traditional bread.

Potential matrices:

- wafers,
- biscuits,
- crackers,
- pancakes,
- cakes,
- gluten-free products,
- high-protein or high-fibre cereal products.

Students would investigate how sourdough fermentation influences texture, colour, moisture, rheology, sensory characteristics and overall product quality.

CARBOFINE PROJECT

Mentor to contact - Dr inż. Ewa Pejcz (ewa.pejcz@ue.wroc.pl)

Research area:
Carbohydrate functionality and modification in cereal foods
Possible product applications
- baked cereal products,
- pasta and other flour-based staple foods,
- fermented cereal products,
- other cereal- and plant-based foods relevant to the selected research topic.

Possible analyses (depending on the research topic):
- techno-functional properties, including water absorption, water holding capacity, swelling and solubility,
- rheological and textural properties (RVA, Mixolab, oscillatory rheology, TPA),
- food product quality analysis,
- colour measurements,
- selected sugars and fructans,
- starch and amylose/amylopectin,
- selected dietary fibre fractions,
- total phenolic content and selected antioxidant assays.

Proposed research topics
1. Modification of fermentable carbohydrates during cereal processing
2. Use of fibre-rich plant ingredients in cereal products
3. Designing cereal products through plant enrichment and processing

TOMATOX PROJECT

Mentor to contact - Dr inż. Remigiusz Olędzki (remigiusz.oledzki@ue.wroc.pl)
Research Area: **Bioactive properties of processed and unprocessed plant-based raw materials**.

Research projects within the aforementioned area will include laboratory research and analyses in order to find the most antioxidant-rich plant raw materials for nutritional use. The research will also focus on searching the most beneficial culinary processing methods to maintain the high antioxidant and health-promoting properties of the raw materials tested.

Proposed research topic:
1. Thermal processing and its effect on the antioxidant and bioactive properties of various tomato varieties.
Research objective: Determination of the effect of thermal processing of selected tomato varieties (e.g. cherry tomatoes, red tomatoes, raspberry tomatoes, etc.)) on their antioxidant and bioactive properties.
Research activities:
• preparation of raw materials for processing,
• homogenization of raw materials and preparation of homogenate for extraction,
• selection of the appropriate extraction method and extractant,
• preparation of extract for analysis,
• analysis of antioxidant properties using spectrophotometric methods (e.g., ABTS, DPPH, FRAP),
• assessment of total polyphenolic content (including anthocyanins and flavonoids),
• assessment of total carotenoid content (xanthophylls and carotenes),
• assessment of total reducing sugar content.
Possible products based on processed and unprocessed plant raw materials: plant freeze-dried products with high antioxidant and

SONOGEL PROJECT

Mentor to contact - Dr inż. Szymon Juchniewicz (szymon.juchniewicz@ue.wroc.pl)
Research area: *Design and characterization of structured food systems, protein functionality and physical modification of biopolymers for food applications*

The research projects combine laboratory experiments, food structure analysis and product development. Students may choose one research topic or combine several areas depending on the duration of their stay and their previous laboratory experience.

1. Functional properties of proteins following physical treatment

Aim: To investigate how physical treatments, particularly ultrasound, modify the structural and functional properties of selected plant and animal proteins.

Research activities:

- preparation of protein dispersions and application of ultrasound under controlled conditions,
- investigation of the effects of treatment duration, intensity and temperature,
- determination of protein solubility and water- and oil-holding capacity,
- evaluation of emulsifying and foaming properties,
- assessment of gel-forming ability, texture and rheological properties,
- analysis of structural changes using spectroscopic and microscopic methods,
- comparison of untreated and physically treated proteins in model food systems.

Possible applications: protein-based emulsifiers, foaming agents, gelling ingredients and texture modifiers.

2. Plant-based emulgels for the simultaneous delivery of vitamins

Aim: To investigate whether plant-based emulgels can incorporate and stabilize both a water-soluble vitamin and a fat-soluble vitamin within a single food matrix.

Research activities:

- preparation of oil-in-water emulgels based on hemp protein and psyllium husk,
- incorporation of vitamin into the aqueous phase and other vitamin into the lipid phase,
- comparison of formulations with different vitamin concentrations and oil types,
- measurement of pH, texture and rheological properties,
- evaluation of physical stability and microstructure,
- assessment of lipid oxidation and vitamin retention during storage,
- identification of formulation factors associated with improved stability.

Possible products: functional gels, fortified spreads and gel-based food ingredients.

3. Protein–polysaccharide interactions in food hydrogels

Aim: To investigate how protein type, polysaccharide addition and processing conditions influence gel formation, mechanical properties and water retention.

Research activities:

- preparation of model hydrogels using selected plant or animal proteins,
- comparison of gels with different protein and polysaccharide concentrations,
- investigation of the effects of heating and selected physical treatments,
- evaluation of gel strength and texture,
- analysis of viscoelastic properties and temperature-dependent behaviour,
- determination of water-holding capacity and storage stability,
- examination of microstructure and relationships between composition and functionality.

Possible applications: texture modification, water retention and the development of structured food matrices.

INKREDIBLE PROJECT

Mentor to contact - Mgr inż. Alona Tiupova (alona.tiupova@ue.wroc.pl)
Research area: Development of edible inks from plant-based raw materials and food processing by-products for extrusion-based 3D food printing.

The projects connect food formulation, material characterisation and additive manufacturing. They contribute to Alona Tiupova's doctoral research on the utilisation of vegetable processing by-products as raw materials for edible inks for 3D food printing. Student work will provide a defined experimental dataset on formulation properties, printing performance or post-processing stability, supporting the assessment of relationships between composition and product quality.
Students may select one of the topics below or combine related activities within an agreed experimental plan. For a five- to six-month stay, the first month will focus on training, a targeted literature review and preliminary trials; months two to four on the main experiments; and the final one to two months on verification, data analysis and reporting. Shorter stays may focus on a smaller set of formulations or a specific printing test.

Recommended background: Master's-level studies in food science, food technology, biotechnology, chemistry or a related field; basic laboratory experience; familiarity with data processing and elementary statistics; and sufficient English for laboratory communication and scientific reading. Previous experience with rheology or 3D printing is welcome but is not required, as project-specific training will be provided.

1. Development and characterisation of edible inks
Aim: To develop edible formulations incorporating plant-based powders or vegetable processing by-products and assess their suitability for extrusion-based 3D printing.
Research activities:

- prepare raw materials through selected drying, milling and sieving procedures;
- formulate inks using cereal flours, vegetable powders and, where appropriate, food-grade structuring agents;
- determine particle size distribution, colour and selected physicochemical properties;
- evaluate water absorption, water-holding capacity and hydration behaviour;
- characterise viscosity, viscoelastic properties and response to shear;
- compare formulations and identify candidates for printing trials.

Possible products: Cereal–vegetable edible inks, formulations enriched with vegetable processing by-products and prototype inks for printed snacks.

2. Printing performance and structural stability

Aim: To investigate how ink properties and printing settings influence extrusion continuity, dimensional accuracy and the ability to build stable multilayer structures.
Research activities:

- prepare selected inks using standardised mixing and hydration procedures;
- design or select model geometries and prepare them for printing;
- evaluate the effects of extrusion pressure, nozzle diameter, printing speed and layer height within the available equipment's operating range;
- assess filament continuity, layer deposition and adhesion between layers;
- measure the dimensions of printed objects and compare them with the digital designs;
- evaluate shape fidelity and buildability using solid and hollow structures;
- relate printing outcomes to ink composition and measured rheological properties.

Possible products: Printed discs, squares, triangles, hollow cylinders and other model structures, as well as customised food prototypes with controlled geometry.
3. Post processing and quality of 3D printed foods
Aim: To assess how selected post-printing treatments affect the physical quality and, where feasible, selected bioactive properties of printed foods.
Research activities:

- produce printed samples using selected formulations and standardised printing conditions;
- apply suitable post-printing treatments, such as baking or drying;
- measure changes in dimensions, mass, colour and structural stability;
- evaluate texture and selected physicochemical characteristics using available methods;
- where feasible, assess selected bioactive compounds or antioxidant activity before and after processing;
- compare formulations and treatments to identify conditions that support product quality and shape retention;
- analyse the results and prepare figures and tables for a scientific presentation or manuscript.

Possible products: Baked or dried 3D-printed snacks, cereal–vegetable products and prototype foods incorporating vegetable processing by-products.
Expected outcomes of the research stay
Expected outputs include a focused literature review, an agreed experimental plan, a complete laboratory record and an organised dataset with formulation details, measurement results and printing conditions. The student will prepare an analysed set of results with figures and tables, a final research report and a scientific poster or oral presentation. Where the findings support publication, the student may contribute to a manuscript, with authorship based on the contribution made. The project will also develop practical skills in edible ink formulation, food analysis, 3D printing and interpretation of experimental data.

FUNCTIFREE PROJECT

Mentor to contact - Mgr inż. Rafał Wiśniewski (rafal.wisniewski@ue.wroc.pl)

1. Functional Properties and Bioactive Potential of Plant-Based Food Ingredients

Research Aim

To investigate the physicochemical, functional, and bioactive properties of selected plant-based ingredients and their potential applications in functional food development.

Research Activities

- Characterization of chemical composition and functional properties of plant materials.
- Determination of total phenolic content and antioxidant capacity using DPPH, ABTS, FRAP, and ORAC assays.
- Assessment of the effects of processing and drying techniques on ingredient properties.
- Statistical analysis and interpretation of experimental results.

Expected Outcomes

Development of practical skills in food analysis and evaluation of plant-based ingredients for functional food applications.

2. Development and Characterization of Functional Gluten-Free Food Products

Research Aim

To develop innovative gluten-free food products enriched with plant-based ingredients and evaluate their nutritional and technological properties.

Research Activities

- Development of experimental gluten-free formulations.
- Evaluation of rheological, textural, and physicochemical properties.
- Assessment of selected nutritional and functional characteristics.
- Analysis of relationships between formulation composition and product quality.

Expected Outcomes

Practical experience in food formulation, instrumental analysis, and optimization of gluten-free products.

3. Advanced Chromatographic Techniques for Food Composition and Bioactive Compound Analysis

Research Aim

To apply chromatographic techniques for the identification and quantification of selected food

constituents and bioactive compounds.

Research Activities

- Extraction and preparation of food samples for chromatographic analysis.
- Application of HPLC-UV/Vis-RI and LC-MS techniques for qualitative and quantitative analysis of selected food constituents.
- Determination of selected phenolic compounds, amino acids, sugars, and other food constituents.
- Optimization of chromatographic conditions and interpretation of analytical results.

Expected Outcomes

Development of practical skills in chromatographic analysis, sample preparation, method optimization, and interpretation of analytical data.

EMULVEG PROJEKT

Mentor to contact - Mgr inż. Oliwia Paroń (oliwia.paron@ue.wroc.pl)

Research area: *Development, characterization, and application of plant-based emulgels as innovative structured lipid systems in food products.*

The research projects focus on the development of plant-based emulgels using natural polysaccharides, vegetable oils, and plant proteins, as well as their potential application as alternative fat systems in food products. The activities combine laboratory experiments, physicochemical characterization, formulation optimization, and food product development.
Students may choose one research topic or combine both areas depending on the duration of their stay, research interests, and previous laboratory experience.

1. Development and characterization of plant-based emulgels

Aim 1: To investigate the influence of formulation parameters, including oil type, oil concentration, and plant protein content, on the physicochemical, structural, and functional properties of polysaccharide-based emulgels.
Research activities:

- preparation of emulgels using selected vegetable oils and natural polysaccharides,
- incorporation of plant proteins as emulsion stabilizers,
- optimization of emulgel formulations and preparation conditions,
- evaluation of rheological properties, including flow behavior and oscillatory measurements,
- determination of textural properties using texture profile analysis (TPA),
- evaluation of oil binding capacity (OBC) and physical stability,
- analysis of colour and appearance,
- microscopic characterization of emulgel microstructure,
- evaluation of changes in selected properties during storage,

- comparison of formulations with different oil and protein concentrations.

2. Application of plant-based emulgels in selected food products

Aim: To investigate the potential of plant-based emulgels as partial or complete replacements for conventional fats in selected food products and evaluate their influence on technological, physicochemical, and textural properties.

Research activities:

- selection and preparation of emulgel formulations for specific food applications,
- incorporation of emulgels into selected food matrices as partial or complete replacements for conventional fats,
- development and optimization of food product formulations,
- evaluation of the influence of emulgel incorporation on product texture and structure,
- determination of textural properties using texture profile analysis (TPA),
- analysis of colour and selected physicochemical properties,
- evaluation of product quality and stability during storage,
- comparison of products containing emulgels with conventional formulations.

Possible products: Shortbread cookies, muffins, and plant-based meat alternatives.

PHENOLEX PROJECT

Mentor to contact - Mgr inż. Patryk Słota (patryk.slota@ue.wroc.pl)

Research area: *Sustainable extraction and characterization of polyphenolic compounds from plant-based materials and agro-food by-products*

The research projects combine laboratory experiments, optimization of extraction processes, and characterization of bioactive compounds recovered from natural materials. Students may investigate different plant-based raw materials and extraction techniques depending on the duration of their stay, laboratory facilities, and previous research experience.

1. Extraction of polyphenolic compounds from plant-based materials and agro-food by-products
Aim: To investigate the influence of extraction techniques and process parameters on the recovery, composition, and functional properties of polyphenolic compounds from selected plant-based materials and agro-food by-products.

Research activities:

- preparation and pretreatment of plant-based raw materials,
- selection of extraction solvents and their compositions,
- application of conventional and advanced extraction techniques,
- evaluation of the effects of temperature, extraction time, and solvent composition on extraction efficiency,
- optimization of extraction conditions,
- determination of polyphenolic compound content in the obtained extracts,
- evaluation of antioxidant activity and selected functional properties,
- comparison of extraction efficiency and extract characteristics under different processing conditions,
- assessment of the potential applications of the obtained extracts.

Possible products: Polyphenol-rich extracts, natural antioxidant preparations, and functional ingredients for food, cosmetic, or biodegradable packaging applications.

TROPISTRUCT PROJECT

Mentor to contact - Mgr inż. Philippine Geollot

Research area: Functional valorization of underutilized plant resources for the development and characterization of innovative structured food systems

The proposed research projects focus on the physicochemical and functional characterization of plant-derived ingredients, their interactions within complex food matrices, and their potential applications in innovative food structuring technologies.

Particular attention will be given to underutilized tropical plant resources, including *Moringa oleifera*, *Canna edulis/indica* and, depending on availability, *Terminalia catappa*. Other plant-based ingredients may also be considered according to their functional properties and availability.

Students may select one research topic or combine related activities depending on their academic background, previous laboratory experience, available equipment and duration of their Erasmus+ research stay.

1. Physicochemical and Functional Characterization of Underutilized Plant-Based Ingredients

Aim: To investigate the physicochemical composition and functional properties of selected plant-derived ingredients and assess their potential for incorporation into structured food systems.

Research activities:

- Preparation and pretreatment of selected plant raw materials, including drying, milling and sieving.
- Determination of selected physicochemical properties, such as moisture content, colour and particle size distribution.
- Evaluation of hydration properties, including water absorption, swelling capacity and water-holding capacity.
- Investigation of oil-holding capacity, solubility and selected emulsifying properties, where relevant.
- Characterization of selected functional groups and potential molecular interactions using FTIR spectroscopy.
- Comparison of ingredients according to their functional characteristics.
- Statistical analysis and interpretation of experimental results.

Expected outcomes: Identification of promising plant-derived ingredients for food structuring applications and development of a dataset linking physicochemical characteristics to functional properties.

2. Protein–Polysaccharide Interactions in Plant-Based Structured Food Systems

Aim: To investigate how interactions between plant proteins and polysaccharides influence the

formation, rheological behaviour and stability of model structured food systems.
Research activities:

- Preparation of model formulations containing selected plant protein and polysaccharide fractions.
- Investigation of the effects of ingredient ratios, concentrations and hydration conditions.
- Evaluation of gel formation and selected structural properties.
- Measurement of viscosity and viscoelastic behaviour.
- Determination of texture, water-holding capacity and physical stability.
- Investigation of potential molecular interactions using FTIR spectroscopy.
- Analysis of relationships between formulation composition, molecular characteristics and technological functionality.

Possible applications: Plant-based hydrogels, texture-modifying ingredients and structured food matrices.

3. Development and Characterization of Plant-Based Emulgels and Structured Emulsions

Aim: To investigate the influence of plant-derived ingredients and formulation parameters on the physicochemical, rheological and structural properties of emulgels and structured emulsion systems.
Research activities:

- Preparation of model oil-in-water emulsions and emulgels using selected plant-based ingredients.
- Investigation of the effects of oil concentration, protein–polysaccharide ratios and processing conditions.
- Evaluation of emulsion formation and physical stability.
- Measurement of viscosity, viscoelastic properties and texture.
- Characterization of selected microstructural properties using available analytical methods.
- Assessment of changes in formulation properties during storage.
- Comparison of formulations to identify relationships between composition, structure and functionality.

Possible applications: Plant-based spreads, structured lipid-containing food ingredients and alternative food matrices.