



SZKOŁA GŁÓWNA  
GOSPODARSTWA  
WIEJSKIEGO

## Drying

### Educational subject description sheet

#### Basic information

|  |  |
|--|--|
| <b>Field of study</b><br>Food Science - Technology and Nutrition | <b>Didactic cycle</b><br>2023/24                                       |
| <b>Speciality</b><br>-   | <b>Subject code</b><br>NoZTNS_D.120.04046.23                           |
| <b>Organizational unit</b><br>Faculty of Food Technology         | <b>Lecture languages</b><br>english                                    |
| <b>Study level</b><br>first cycle (bachelor's degree)            | <b>Mandatory</b><br>Elective subjects                                  |
| <b>Study form</b><br>full-time studies                           | <b>Block</b><br>Major subjects   |
| <b>Education profile</b><br>General academic                     | <b>Disciplines</b><br>Food technology and nutrition                    |
| <b>Coordinator</b>   | Katarzyna Samborska  |
| <b>Teacher</b>   | Katarzyna Samborska  |
| <b>Period</b><br>Semester 6                                      | <b>Examination</b><br>Pass with grade                                  |
|  | <b>Activities and hours</b><br>Lecture: 30<br>Laboratory exercises: 15 |
|  | <b>Number of ECTS points</b><br>3                                      |

#### Goals

| Code | Goal  |
|------|---|
| C1   | The aim of the course is to familiarize students with information on: the role of drying in the food industry, forms and properties of water in food, properties of dried food products, the influence of phase changes on the properties of dried food, kinetics and methods of drying, methods of pre-treatment before drying, microencapsulation by drying |

## Entry requirements

Food raw materials, Introduction into food processing, Food production equipment, Basics of food engineering

## Subject's learning outcomes

| Code  | Outcomes in terms of  | Effects   | Examination methods              |
|---|---|---|----------------------------------|
| <b>Knowledge - Student knows and understands:</b> |   |   |                                  |
| W1  | the role of drying in the food industry, water properties in food, the influence of phase changes on food properties, the kinetics of food drying, factors influencing the drying process, methods of food drying, methods of pre-treatment before drying, microencapsulation by drying | TN_K1_W01, TN_K1_W04, TN_K1_W05, TN_K1_W06, TN_K1_W11 | Test (written or computer based) |
| <b>Skills - Student can:</b>                      |   |   |                                  |
| U1  | conduct an experiment of drying selected raw materials with selected methods, assess the influence of various parameters/factors on the course of the process and properties of the obtained products   | TN_K1_U01, TN_K1_U03, TN_K1_U07, TN_K1_U09            | Report, Presentation             |

## Study content

| No. | Course content  | Subject's learning outcomes | Activities           |
|-----|---|-----------------------------|----------------------|
| 1.  | During the lectures, students will be introduced to: - general characteristics of the drying process, including its energy consumption, - the properties of water in food, - influence of phase changes on the properties of dried food, - kinetics of food drying, factors influencing the drying process, - food drying methods, - methods of pre-treatment before drying, including PEF, US treatment, - microencapsulation of food ingredients by drying. | W1                          | Lecture              |
| 2.  | During the laboratory classes, students will be acquainted with selected methods of preliminary operations before drying and with selected drying methods.  | U1                          | Laboratory exercises |

## Course advanced

| Activities           | Methods of conducting classes  |
|----------------------|--|
| Lecture              | Lecture, E-learning - lecture part   |
| Laboratory exercises | E-learning - exercises part, Laboratory (experiment), learning by experiment |

| Activities           | Examination method               | Percentage |
|----------------------|----------------------------------|------------|
| Lecture              | Test (written or computer based) | 50%        |
| Laboratory exercises | Report                           | 25%        |
| Laboratory exercises | Presentation                     | 25%        |

| Activities           | Credit conditions                                 |
|----------------------|---|
| Lecture              | Test - 50% points                                 |
| Laboratory exercises | Laboratories (report + presentation) - 50% points |

## Literature

### Obligatory

1. Jangam, S.V., Law, C.L. Mujumdar A.S. 2010. Drying of Foods, Vegetables and Fruits - Volume 1-3
2. Sablani, S.S., and M.S.Rahman. 2007. Fundamentals of food dehydration. In Food drying science and technology: Microbiology, chemistry, applications, ed. Y.H.Hui, C.Clary, M.M.Farid, O.O.Fasina, A.Noormhorm, and J.Welti-Chenis, 1-42. Lancaster, PA: DESTech Publications
3. Patel, R. P., Patel, M. P., & Suthar, A. M. (2009). Spray drying technology: an overview. Indian Journal of Science and Technology, 2(10), 44-47.

### Optional

1. Sobulska, M., & Zbicinski, I. (2020). Advances in spray drying of sugar-rich products. Drying Technology, 1-26.
2. Llavata, B., García-Pérez, J. V., Simal, S.,(2020). Innovative pre-treatments to enhance food drying: a current review. Current Opinion in Food Science, 35, 20-26.2.
3. Samborska, K., Poozesh, S., Barańska, A., Sobulska, M., Jedlińska, A., Arpagaus, C., ... & Jafari, S. M. (2022). Innovations in spray drying process for food and pharma industries. Journal of Food Engineering, 110960.
4. Jafari, S. M., Arpagaus, C., Cerqueira, M. A., & Samborska, K. (2021). Nano spray drying of food ingredients; materials, processing and applications. Trends in Food Science & Technology, 109, 632-646.
5. Other suggested by teacher

## Calculation of ECTS points

| Activity form                            | Activity hours*    |
|--|--------------------|
| Lecture                                  | 30                 |
| Laboratory exercises                     | 15                 |
| Preparing a report                       | 10                 |
| Preparation for the test                 | 10                 |
| Preparation of a multimedia presentation | 10                 |
| <b>Student workload</b>                  | <b>Hours</b><br>75 |
| <b>Number of ECTS points</b>             | <b>ECTS</b><br>3   |

\* hour means 45 minutes

## Effects

| Code      | Content   |
|-----------|---|
| TN_K1_U01 | The graduate can conduct experiments and solve practical issues in the field of basic sciences, and then implement them in activities carried out under directional issues in the field of food processing and human nutrition  |
| TN_K1_U03 | The graduate can select methods and tools to make observations, measurements, and calculations in the field of phenomena occurring during processing, storage, research of food, human nutrition and consumer behaviour on the food market, and critically analyze and interpret the obtained data, assess the credibility of own actions   |
| TN_K1_U07 | The graduate can communicate with the surrounding using specialist terminology appropriate for the field of study, including taking part in a discussion on professional issues, also using a foreign language in the field relevant to the field of study, in accordance with the requirements set out for B2 level of the European System for the Description of Education Linguistic |
| TN_K1_U09 | The graduate can update knowledge and deepen practical skills in the field of study, taking into account the progress in the development of science and technology, and the need for specific competences in the food production and human nutrition sector   |
| TN_K1_W01 | The graduate knows and understands theoretical issues in the field of biological, chemical, mathematical, and related sciences, which are the basis for the description of phenomena occurring in food and the human being body, used for its description   |
| TN_K1_W04 | The graduate knows and understands the theoretical basis of phenomenon and changes occurring in raw materials, semi-finished products, and food products in a natural way, and under the influence of technological processes, food storage and testing   |
| TN_K1_W05 | The graduate knows and understands basics of construction and operation of machines, devices, and instruments used for food processing and testing  |
| TN_K1_W06 | The graduate knows and understands methods and techniques used for food processing, preservation, storage, and testing  |
| TN_K1_W11 | The graduate knows and understands economic, social, environmental, ethical, and legal conditions of food production and the principles of development of new products, distribution, and offering food to consumers, including basic concepts and principles in the field of protection of industrial property and copyright   |