



Food chemistry  
Educational subject description sheet

**Basic information**

|   |  |   |  |
|---|--|---|--|
| <b>Field of study</b><br>Biotechnology                                      |  | <b>Education cycle</b><br>2022/23                               |  |
| <b>Speciality</b><br>-  |  | <b>Subject code</b><br>ND000000NBTS.18.0725.22                  |  |
| <b>Organizational unit</b><br>The Faculty of Biotechnology and Food Science |  | <b>Lecture languages</b><br>english                             |  |
| <b>Study level</b><br>First-cycle (engineer) programme                      |  | <b>Mandatory</b><br>optional                                    |  |
| <b>Study form</b><br>Full-time  |  | <b>Block</b><br>major subjects (conducted) in foreign languages |  |
| <b>Education profile</b><br>General academic                                |  | <b>Disciplines</b><br>Food technology and nutrition             |  |
|   |  | <b>Subject related to scientific research</b><br>Yes            |  |
|   |  | <b>Subject shaping practical skills</b><br>Nie                  |  |
| <b>Teacher responsible for the subject</b>                                  | Anna Gliszczyńska  |   |  |
| <b>Other teachers conducting classes</b>                                    | Anna Gliszczyńska  |   |  |
| <b>Period</b><br>Semester 4   | <b>Examination</b><br>exam   | <b>Number of ECTS points</b><br>4.0                             |  |
|   | <b>Activities and hours</b><br>lecture: 15<br>laboratory classes: 30 |   |  |

## Goals

|    |  |
|----|--|
| C1 | The aim of the course is to familiarize students with the chemical, physical and sensory properties of the main food ingredients: carbohydrates, lipids, proteins, colorants, polyphenols, non-proteinaceous nitrogen compounds, fragrances and others. The program of the course also consists issues related to the understanding of functional properties of food ingredients, the interactions between them and their conversions during technological processes. Also impact of all these compounds on human health and presentation of selected food additives. As a part of laboratory classes, the student uses the knowledge from the area of methods of isolation and purification of organic compounds to extract selected food components from plant / animal biological raw material or food product. |
|----|--|

## Subject's learning outcomes

| Code  | Outcomes in terms of   | Effects                                     | Examination methods                                |
|---|--|---|--|
| <b>Knowledge - Student knows and understands:</b> |  |   |  |
| W1  | chemical composition of food products, main food ingredients, their chemical, physical, technological and biological properties at an advanced level   | NB_P6S_WG01                                 | written exam, oral credit, report                  |
| W2  | interactions between food components, their functional properties and the degree of their impact on the health of the body and identify hazards  | NB_P6S_WG03,<br>NB_P6S_WG09                 | written exam, oral credit, report                  |
| W3  | in an advanced stage, chemical, physicochemical and instrumental methods of isolation of selected food ingredients from food products / raw materials  | NB_P6S_WG04                                 | written exam, oral credit, report                  |
| <b>Skills - Student can:</b>                      |  |   |  |
| U1  | perform procedures of isolation of specific food components using chemical and physical methods and techniques from the field of general chemistry using appropriate equipment and paying attention on the principles of health and safety | NB_P6S_UO12,<br>NB_P6S_UW03                 | oral credit, observation of student's work, report |
| U2  | confirm by means of chromatographic /spectroscopic/physicochemical/chemical techniques that isolated the main component from the raw material or food product and prepare a report from laboratory work and obtained results               | NB_P6S_UO12,<br>NB_P6S_UW05,<br>NB_P6S_UW07 | oral credit, observation of student's work, report |
| U3  | properly use terminology in the field of general and organic chemistry   | NB_P6S_UK09                                 | oral credit, observation of student's work, report |
| U4  | understand the need to broaden the knowledge in the field of food chemistry and methods of analysis of food ingredients  | NB_P6S_UU13                                 | oral credit, observation of student's work, report |
| U5  | the student is able to use professional terminology in a foreign language  | NB_P6S_UK09,<br>NB_P6S_UK11                 | written exam, oral credit, report                  |
| <b>Social competences - Student is ready to:</b>  |  |   |  |
| K1  | critical assessment of own knowledge and skills in food chemistry  | NB_P6S_KK01                                 | observation of student's work                      |
| K2  | keep the safety rules and be aware of the rules of work in a chemical laboratory and the risks arising from the presence in chemical laboratory  | NB_P6S_KK02,<br>NB_P6S_KO03                 | observation of student's work                      |

## Balance of ECTS points

| Activity form                     | Activity hours*     |                    |
|-----------------------------------|---------------------|--------------------|
| lecture                           | 15                  |                    |
| laboratory classes                | 30                  |                    |
| presentation/report preparation   | 6                   |                    |
| project preparation               | 12                  |                    |
| consultations                     | 4                   |                    |
| exam participation                | 2                   |                    |
| exam / credit preparation         | 49                  |                    |
| <b>Student workload</b>           | <b>Hours</b><br>118 | <b>ECTS</b><br>4.0 |
| <b>Workload involving teacher</b> | <b>Hours</b><br>47  | <b>ECTS</b><br>1.8 |
| <b>Practical workload</b>         | <b>Hours</b><br>30  | <b>ECTS</b><br>1.0 |

\* hour means 45 minutes

## Study content

| No. | Course content   | Activities         |
|-----|--|--------------------|
| 1.  | 1. Scope of food chemistry. The chemical composition of food products. 2. Water as a food component. 3. Structure, occurrence and properties of mono- and disaccharides in food. 4. Non-enzymatic browning of food - Maillard reactions and their importance in forming the traitssensory food products. 5. Polysaccharides and their occurrence in food. 6. Structure, occurrence and properties of fatty acids. 7. Structure, occurrence and properties of TAG. 8. Structure and the role of phospholipids in food. 9. Proteins in food products. 10. Non-protein nitrogen compounds. 11. Occurrence, structure and properties of polyphenols. 12. Colorants in food. 13. Fragrances in food part 1 14. Fragrances in food part 2 15. Allergens, mutagens, carcinogens and anticarcinogens, contamination of food. | lecture            |
| 2.  | 1. Equipment of the food chemistry laboratory, health and safety rules and description of method how to use equipment available in the laboratory 2. Isolation of trimyristin from nutmeg 3. Isolation and identification of the volatile compounds of spices 4. Isolation of curcumin from curcuma 5. Properties of reducing sugars occurring in food 6. Isolation of piperine from black pepper 7. Isolation of phospholipids from egg yolk 8. Isolation of caffeine from tea leaves 9. Separation of pigments from plant material 10. Isolation of theobromine from cacao<br>each student performs 5 out of 9 exercises mentioned above (marked with numbers 2-10)  | laboratory classes |

## Course advanced

### Teaching methods:

case analysis, text analysis, brainstorming, teamwork, discussion, participation in research, lecture, classes

| Activities         | Examination methods  | Percentage in subject assessment |
|--------------------|--|----------------------------------|
| lecture            | written exam   | 50%                              |
| laboratory classes | written exam, oral credit, observation of student's work, report | 50%                              |

### Entry requirements

general chemistry, organic and inorganic chemistry

### Literature

#### Obligatory

1. Food Chemistry, H.-D.Belitz, W.Grosch, Springer-Verlag, 2004.
2. Chemical and Functional Properties of Food Components, ed. by Z.Sikorski, Taylor and Francis Group, 2007.

#### Optional

1. Food Chemistry, R. Fennema, Marcel Dekker, Inc. 1996.

## Kierunkowe efekty uczenia się

| Kod         | Treść  |
|-------------|--|
| NB_P6S_KK01 | The graduate is ready to critical assessment of own knowledge and skills and seeking experts' opinions   |
| NB_P6S_KK02 | The graduate is ready to use the knowledge in the field of biotechnology and food sciences to solve professional problems  |
| NB_P6S_KO03 | The graduate is ready to take responsibility for high quality and safety of biotechnological products  |
| NB_P6S_UK09 | The graduate can communicate with specialists in the field of biotechnology and food technology using specialized terminology  |
| NB_P6S_UK11 | The graduate can use foreign language at B2 level of the European Language Description System  |
| NB_P6S_UO12 | The graduate can collaborate and work in a group, taking various roles, being responsible for the safety of own and other work   |
| NB_P6S_UU13 | The graduate can plan the path of own scientific and professional development, understand the need for lifelong learning and the graduate can updating knowledge related to the profession             |
| NB_P6S_UW03 | The graduate can perform analyzes using chemical, biological and physical methods and techniques from biotechnology and food technology using appropriate equipment                                    |
| NB_P6S_UW05 | The graduate can identify and evaluate the quality of biotechnological and food products, and their impact on human and animal health as well as natural environment                                   |
| NB_P6S_UW07 | The graduate can search for and use information from various fields of science for critical analysis of the functioning of existing technical and technological solutions                              |
| NB_P6S_WG01 | The graduate knows and understands at an advanced level facts and concepts in chemistry, mathematics, physics, biochemistry, microbiology, cell biology and molecular biology adapted to Biotechnology |
| NB_P6S_WG03 | The graduate knows and understands relationships between selected natural phenomena appropriate for biotechnology studies  |
| NB_P6S_WG04 | The graduate knows and understands in an advanced level, chemical, biological and instrumental methods used in biotechnology and food analysis   |
| NB_P6S_WG09 | Issues in the field of quality of plant and animal raw materials, their processing technologies and microbiological hazards in food production   |