Appendix No. 1.5 to the Resolution No. 7/2023

 of the Rector of the University of Rzeszów

**SYLLABUS**

**regarding the qualification cycle FROM 2022TO 2026**

**Academic year 2024/2025**

1. Basic Course/Module Information

|  |  |
| --- | --- |
| Course/Module title | *Food Oxidants and Antioxidants* |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | *College of Natural Sciences* |
| Name of the unit running the course | *Institute of Food Technology and Human Nutrition, Laboratory of Analytical Biochemistry* |
| Field of study | Food technology and human nutrition |
| Qualification level  | I |
| Profile | *General* |
| Study mode | *Stationary* |
| Year and semester of studies | *Year 1, Semester 1* |
| Course type | *Lectures* |
| Language of instruction | English |
| Coordinator | Prof. dr hab. Izabela Sadowska-Bartosz |
| Course instructor | *Prof. dr hab. Izabela Sadowska-Bartosz* |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester(n0.) | Lectures | Classes | Laboratories | Seminars | Practical classes | Internships | others | **ECTS credits**  |
| 1 | 30 |  |  |  |  |  |  | 5 |

1.2. Course delivery methods

X conducted in a traditional way

X involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

* exam

2. Prerequisites

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| *Basic knowledge of food biochemistry, biophysics, food technology* |

3. Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1. Course/Module objectives

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| --- | --- |
| O1 | *The aim of the course is to familiarize doctoral students with the knowledge of oxidation processes in food, in particular free radical processes. Sources of free radicals, both oxygen-centered and non-oxygen centered, will be presented. The mechanisms of action of antioxidants, their chemical structure, occurrence in raw materials and food products, as well as interactions between antioxidants in food will also be presented.* |
| O2 | *The mechanisms of action of antioxidants, their chemical structure, occurrence in raw materials and food products, as well as interactions between antioxidants in food will also be presented.* |
| O3 | *Moreover, the role of natural antioxidants in the prevention of free radical diseases will be discussed. The bioavailability of natural antioxidants and their role in the human body will also be reviewed.* |
| O4 | *Students will learn about the methods of determining the content of antioxidants (sample preparation, extraction, spectroscopic methods, chromatography methods) and methods of analysing the antioxidant capacity.* |

3.2. Course/Module Learning Outcomes (to be completed by the coordinator)

|  |  |  |
| --- | --- | --- |
| Learning Outcome | The description of the learning outcome defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | *Student: knows basic notions and terminology used in redox biology* | K\_W02 |
| LO\_02 | *Applies knowledge of sources of free radicals, both oxygen-centered and non-oxygen centered/ the mechanisms of action of antioxidants, their chemical structure, occurrence in raw materials and food products, as well as interactions between antioxidants in food will also be presented* | K\_W03 |
| LO\_03 | *Performs simple methods of determining the content of antioxidants* | K\_U01, K\_U05 |
| LO\_04 | *Is competent to interpret and draw conclusions from performed experiments* | K\_U08 |
| LO\_05 | *Is aware of limitations of her/his knowledge and feels the need of its broadening* | K\_K01, K\_K04 |

**3.3. Course content (to be completed by the coordinator)**

1. Lectures

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| Content outline |
| *Oxidation processes, especially free radical-mediated, in food and in the human body.* |
| *Antioxidants and their mechanism of action.* |
| *Natural and synthetic antioxidants - presence in food.* |
| *Bioavailability of natural antioxidants, interactions with other food ingredients.*  |
| *Antioxidants in the human body - health benefits.* |
| *Methods of determination of antioxidants. Methods for determination of total antioxidant capacity.* |

1. Classes, laboratories, seminars, practical classes

|  |
| --- |
| Content outline  |
| - |

3.4. Methods of Instruction

Lectures: Presentation, discussion of problems with the students

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

|  |  |  |
| --- | --- | --- |
| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | *WRITTEN EXAM* | *LECTURE* |
| LO-o2 | *WRITTEN EXAM* | *LECTURE* |
| LO-o3 | *WRITTEN EXAM* | *LECTURE* |
| LO-o4 | *WRITTEN EXAM* | *LECTURE* |
| LO-o5 | *WRITTEN EXAM* | *LECTURE* |

4.2 Course assessment criteria

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| *To receive credit, student must achieve a minimum grade of 50 per cent on each test and each exam and must be participate in all lectures/ Weighting: exam 50%, tests 30%, activity during classes 20%. Final thresholds: 50% - grade 3, 60% - grade 3.5, 70% - grade 4, 80% -grade 4.5, 90% - grade 5.* |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

|  |  |
| --- | --- |
| Activity | Number of hours |
| Course hours | 30 |
| Other contact hours involving the teacher (consultation hours, examinations) | 5 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 90 |
| Total number of hours | 125 |
| Total number of ECTS credits | 5 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

|  |  |
| --- | --- |
| Number of hours | *100* |
| Internship regulations and procedures |  |

7. Instructional materials

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| Compulsory literature:1. Bartosz G. Druga twarz tlenu. Wolne rodniki w przyrodzie. PWN, Warszawa, 2003.2. Bartosz G. (ed.), Food Oxidants and Antioxidants: Chemical, Biological, and Functional Properties, CRC Press, 2013.3. Kut K, Cieniek B, Stefaniuk I, Bartosz G, Sadowska-Bartosz I. A Modification of the ABTS• Decolorization Method and an Insight into Its Mechanism. Processes. 2022:10(7):1288. doi:10.3390/pr10071288.4. Sadowska-Bartosz I, Bartosz G. Evaluation of The Antioxidant Capacity of Food Products: Methods, Applications and Limitations. Processes. 2022;10(10):2031. doi:10.3390/pr10102031.5. Sadowska-Bartosz I, Bartosz G. Effect of antioxidants supplementation on aging and longevity. Biomed Res Int. 2014:404680. doi: 10.1155/2014/404680. 6. Grzesik M, Bartosz G, Stefaniuk I, Pichla M, Namieśnik J, Sadowska-Bartosz I.Dietary antioxidants as a source of hydrogen peroxide. Food Chem. 2019 Apr 25;278:692-699. doi: 10.1016/j.foodchem.2018.11.109.  |
| Complementary literature: 1. Sadowska-Bartosz I, Bartosz G. Prevention of protein glycation by natural compounds. Molecules. 2015; 20(2):3309-34. 2. Jan Pokorny, Nedyalka Yanishlieva, Michael Gordon (ed.), Antioxidants in food. Practical applications, CRC Press, Boca Raton, Boston, New York, Washington DC, 2001. |

Approved by the Head of the Department or an authorised person