

**A COURSE SYLLABUS – DOCTORAL SCHOOL  
REGARDING THE QUALIFICATION CYCLE FROM 2021 TO 2025**

| <b>GENERAL INFORMATION ABOUT COURSE</b>  |  |  |   |   |
|--|--|--|---|---|
| Course title   | <b>Bioavailability of nutrients</b>  |  |   |   |
| Name of the unit running the course  | Doctoral School at the University of Rzeszów   |  |   |   |
| Type of course ( <i>obligatory, optional</i> )   | Optional elective  |  |   |   |
| Year and semester of studies   | III/6  |  |   |   |
| Discipline   | Food and Nutrition Technology  |  |   |   |
| Language of Course   | Polish   |  |   |   |
| Name of Course coordinator   | Agata Znamiorska-Piotrowska, Associate professor   |  |   |   |
| Name of Course lecturer  | Agata Znamiorska-Piotrowska, Associate professor   |  |   |   |
| Prerequisites  | Chemistry, Microbiology  |  |   |   |
| <b>BRIEF DESCRIPTION OF COURSE<br/>(100-200 words)</b>   |  |  |   |   |
| The aim of the course is to familiarise students with the factors affecting the bioavailability of nutrients and/or the survival of probiotic bacteria in the human gastrointestinal tract. Therefore, the lectures begin by reminding students of the physiology of the gastrointestinal tract, and this content continues with the determination of the bioavailability of a selected component in food or the survival of bacteria by simulated in vitro digestion. |  |  |   |   |
| <b>COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES</b>  |  |  |   |   |
| Learning outcome   | The description of the learning outcome defined for the course   | Relation to the degree programme outcomes (symbol)       | Learning Format (Lectures, classes,...) | Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...) |
| <b>Knowledge (no.)</b>   | <b>(Knows and understands)</b>   |  |   |   |
| 1.   | global developments and trends in nutrient bioavailability and/or survival of probiotic bacteria in the human gastrointestinal tract                         | P8S_WG/1<br>P8S_WG/2                                     | Lectures                                | paper   |
| 2  | test methods for nutrient bioavailability and/or survival of probiotic bacteria  | P8S_WG/3   | Lectures<br>Laboratory                  | paper and laboratory report   |
| <b>Skills (no.)</b>  | <b>(Able to)</b>   |  |   |   |
| 1  | uses knowledge to complete a research task (determination of nutrient bioavailability and/or bacterial survival) and to improve research technique and tools | P8S_UW/1<br>P8S_UW/2                                     | Laboratory                              | laboratory report.  |
| 2  | critically analyses research results and is able to participate in scientific discourse  | P8S_UK/1<br>P8S_UK/2<br>P8S_UK/3<br>P8S_UK/4<br>P8S_UK/5 | Laboratory                              | Paper, discussion, and lab report.  |
| <b>Social competence (no.)</b>   | <b>(Ready to)</b>  |  |   |   |

|  |  |                                  |                        |                       |        |      |
|--|--|----------------------------------|------------------------|-----------------------|--------|------|
| 1  | critically appraise the body of knowledge and recognise the importance of knowledge in determining issues of nutrient bioavailability and/or bacterial survival  | P8S_KK/1<br>P8S_KK/3<br>P8S_KO/2 | Lectures<br>Laboratory | Paper and lab report. |        |      |
| <b>LEARNING FORMAT – NUMBER OF HOURS</b>   |  |                                  |                        |                       |        |      |
| Semester<br>(no.)  | Lectures   | Seminars                         | Lab classes            | Internships           | others | ECTS |
| 6  | 5  |                                  | 10                     |                       |        | 0    |
| <b>METHODS OF INSTRUCTION</b>  |  |                                  |                        |                       |        |      |
| Lecture with multimedia presentation.  |  |                                  |                        |                       |        |      |
| Laboratory equipped with equipment and reagents for simulated in vitro digestion- performance of experiments.  |  |                                  |                        |                       |        |      |
| <b>COURSE CONTENT</b>  |  |                                  |                        |                       |        |      |
| Physiology of the digestive system. Models for determining bioavailability. Factors shaping nutrient bioavailability and survival of probiotic bacteria. Evaluation of bioavailability of micronutrients or macronutrients or other bioactive compounds or survival of probiotic bacteria by simulated in vitro digestion in the analysis laboratory of the Dairy Technology Department. |  |                                  |                        |                       |        |      |
| <b>COURSE ASSESSMENT CRITERIA</b>  |  |                                  |                        |                       |        |      |
| Lecture- paper on a selected topic.  |  |                                  |                        |                       |        |      |
| Laboratory- a graded report.   |  |                                  |                        |                       |        |      |
| The prerequisite for passing the course is the attainment of all the learning outcomes.  |  |                                  |                        |                       |        |      |
| The pass mark for the course is determined by the number of points obtained (>50% of the maximum number of points): 3,0 (51-60%), 3,5 (61-69%), 4,0 (70-79%), 4,5 (80-89%), 5,0 (90-100%)  |  |                                  |                        |                       |        |      |
| <b>TOTAL PhD STUDENT WORKLOAD REQUIRED TO ACHIEVE THE INTENDED LEARNING OUTCOMES – NUMBER OF HOURS AND ECTS CREDITS</b>  |  |                                  |                        |                       |        |      |
| Activity   |  |                                  | Number of hours        |                       |        |      |
| Scheduled course contact hours   |  |                                  | 15                     |                       |        |      |
| Other contact hours involving the teacher (consultation hours, examinations)   |  |                                  | 2                      |                       |        |      |
| Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)  |  |                                  | 8                      |                       |        |      |
| <b>Total number of hours</b>   |  |                                  | 25                     |                       |        |      |
| <b>Total number of ECTS credits</b>  |  |                                  | 0                      |                       |        |      |
| <b>INSTRUCTIONAL MATERIALS</b>   |  |                                  |                        |                       |        |      |
| Compulsory literature:   | 1.Górski J. (red). Fizjologia człowieka. Wydawnictwo lekarskie PZWL, 2010, Warszawa<br>2.Gronowska- Senger A. Podstawy biooceny żywności. Wydawnictwo SGGW, 2004, Warszawa   |                                  |                        |                       |        |      |
| Complementary literature:  | 1.Kowalczyk, M.; Znamirska-Piotrowska, A.; Buniowska-Olejnik, M.; Pawlos, M. Sheep milk symbiotic ice cream: Effect of inulin and apple fiber on the survival of five probiotic bacterial strains during simulated <i>in vitro</i> digestion conditions. <i>Nutrients</i> 2022, 14, 4454.<br>2.Szopa, K.; Szajnar K.; Pawlos, M.; Znamirska-Piotrowska, A. Probiotic fermented goat's and sheep's milk: Effect of type and dose of collagen on survival of four strains of probiotic bacteria during simulated in vitro digestion conditions. <i>Nutrients</i> 2023, 15(14), 3241.<br>3.Kowalczyk, M.; Znamirska-Piotrowska, A.; Buniowska-Olejnik, M.; Zagała G., Pawlos, M. Bioavailability of macroelements from synbiotic sheep's milk ice cream. <i>Nutrients</i> 2023, 15(14), 3230. |                                  |                        |                       |        |      |

