

Detailed teaching plan for the course  
**Protein Research Methods**  
***Metode istraživanja proteina***

|   |  |
|---|--|
| <b>Academic year:</b>                   | 2024/2025  |
| <b>Study:</b>                           | Biotehnologija u medicini<br>Istraživanje i razvoj lijekova7   |
| <b>Course code:</b>                     | IRL103   |
| <b>ECTS points:</b>                     | 5  |
| <b>Language of the course:</b>          | English, Croatian  |
| <b>Teaching hours of the course:</b>    | 50 hours (12 lectures + 18 seminars + 20 practical exercises)  |
| <b>Pre-requisites for the course:</b>   | None   |
| <b>Course leader and contact:</b>       |  |
| Title and name:                         | Izv.prof.dr.sc. Nicholas J. Bradshaw<br>Doc.dr.sc. Željka Maglica  |
| Address:                                | Fakultet biotehnologije i razvoja lijekova O-226, O-201  |
| E-mail:                                 | <a href="mailto:nicholas.b@biotech.uniri.hr">nicholas.b@biotech.uniri.hr</a> , <a href="mailto:zeljka.maglica@biotech.uniri.hr">zeljka.maglica@biotech.uniri.hr</a>  |
| <b>Consulting hours:</b>                | By arrangement over email  |
| <b>Associates &amp; teaching hours:</b> | Izv. prof. dr. sc. Nicholas J. Bradshaw<br>5 lectures + 18 seminars<br>Doc. dr. sc. Željka Maglica<br>6 lectures + 6 seminars<br>Doc. dr. sc. Christian A. Reynolds<br>1 lecture + 1 seminars<br>Maja Juković<br>40 practical exercises<br>Matea Kršanac<br>40 practical exercises |

**Required literature:**

Scientific papers will be supplied during the course.

**Optional literature:**

None

**Course description:**

Proteins are fundamental to how all biological systems function, being the core molecules encoded for by our DNA, and essential for biological processes varying from cell structure and system transduction, to immunity. Protein research is therefore at the heart of investigations in to biology, while most biotechnology approaches revolve around the creation of proteins in artificial systems.

This course will help students to understand both how we study and how we make use of proteins in biotechnology. In lectures, students will learn about experimental approaches to studying proteins, via cell biology, proteomics, biophysics and structural biology approaches. This will be supplemented by computer-based seminars in which students get experience of handling data and investigating proteins through bioinformatics. Students will also study individual proteins in group work. Finally, students will gain laboratory experience at producing, purifying and testing recombinant proteins from bacteria, using a combination of previously covered and novel experimental techniques.

**Detailed teaching plan (lectures, seminars, exercises):****A. Lectures (12 hours):**

- P1. Overview of protein structure and function (1 hour)
- P2. Electrophoresis (1 hour)
- P3. Expression systems for studying proteins (1 hours)
- P4. Purifying proteins (1 hour)
- P5. Industrial protein production (1 hour)
- P6. Mass spectroscopy analysis (1 hour)
- P7. Fluorescence-based techniques (1 hour)
- P8. Investigating protein-protein interactions (1 hour)
- P9. Biophysical approaches to studying proteins (1 hour)
- P10. Structural biology methods for studying proteins (2 hours)
- P11. Single molecule techniques (1 hour)

**B. Seminars (17 hours – add 1 more hour somewhere to take to 18 hours):**

- S1-2. Protein bioinformatics (2.5 hours & 2.5 hours, 5 hours total)
- S3-S5. Paper break down 1 (1 hour each – 3 hours total)
- S6-9. Protein presentations (2 hours each, 8 hours total)
- S10. Protein presentation finale (1 hour)

**C. Practical exercises (20 hours):**

- V1. Bacterial transformation (1.5 hours)
- V2. Liquid stock cultures (0.5 hours)
- V3. Test protein induction and expression (3 hours)
- V4. Western blotting (4 hours)
- V5. Antibody staining, and final culture set up (4 hours)

V6. Protein purification (4 hours)

V7. Protein concentrations & SDS-PAGE (3 hours)

**Final exam and grading:**

*Continuous assessment during the course (70%)*

70% of the final grade will come from continuous assessment, divided as follows:

Mid-course exam (Kolokvij, 15%)

Seminar work (40%)

Practical exercises (15%)

*Final exam – 30%*

The final exam is 30% of the final grade. The exam will consist of multiple choice questions and questions requiring short answers.

**Exam times:**

The 1st exam sitting will be on 06.06.2025, 9.00-11.00, O-030.

The 2nd exam sitting will be on 23.06.2025, 14.00-16.00, O-268.

The 3rd and 4th exam sittings will be by arrangement with the course leader

**Format of the final grade (according to the Pravilniku o studijima Sveučilišta u Rijeci):**

Students can obtain a maximum of 70% of grade points from continuous assessment in class, and 30% from the final exam. Students who, during the continuous part of the class, achieved:

- from 0 to 34.9% of grade points cannot take the final exam
- more than 35% of grade points can take the final exam

According to the total number of grade points achieved, the following final grades are awarded:

| Percentage of skills & knowledge acquired | ECTS score | Numerical score    |
|---|------------|--------------------|
| 90% - 100%                                | A          | Excellent (5)      |
| 75% - 89.9%                               | B          | Very good (4)      |
| 60% - 74.9%                               | C          | Good (3)           |
| 50% - 59.9%                               | D          | Satisfactory (2)   |
| 0% - 49.9%                                | F          | Unsatisfactory (1) |

The final grade is the sum of the points achieved during classes and the points achieved on the final exam, and the passing grades are excellent (5), very good (4), good (3) and satisfactory (2).

**Academic integrity:**

Students are obliged to respect the principles of academic integrity and refer to the documents of the University of Rijeka: the Code of Ethics of the University of Rijeka and the Code of Ethics for Students.

All students are asked to respond to the evaluation of the quality of the teaching work of teachers and associates, so that the teaching in this course can be improved based on the assessments and suggestions. Evaluation of classes through the ISVU system is carried out using the "Studomat" application on a form defined at the University of Rijeka level, and the results are anonymous. You can find more information about all aspects of this process in the Handbook for Study Quality of the University of Rijeka.

**Timetable****Week 1**

| Date     | Group | Time        | Location | Teaching | Teacher           |
|----------|-------|-------------|----------|----------|-------------------|
| 14.05.25 | Svi   | 9.00-9.45   | O-030    | P1       | Nicholas Bradshaw |
|          |       | 10.00-10.45 | O-030    | P2       | Nicholas Bradshaw |
| 15.05.25 | Svi   | 9.00-9:45   | O-030    | P3       | Nicholas Bradshaw |
|          | Svi   | 10.00-10.45 | O-030    | P4       | Nicholas Bradshaw |
| 16.05.25 | All   | 11.00-11.45 | O-030    | P5       | Željka Maglica    |
|          | 2     | 9.00-11.00  | O-339    | S2       | Nicholas Bradshaw |
|          | 1+3   | 12.00-14.00 |          |          |                   |

**Week 2**

| Date     | Group | Time        | Location | Teaching        | Teacher            |
|----------|-------|-------------|----------|-----------------|--------------------|
| 19.05.25 | All   | 11.00-12.00 | O-030    | P6              | Christian Reynolds |
|          | 2     | 9.00-11.00  | O-339    | S3              | Nicholas Bradshaw  |
|          | 1+3   | 12.00-14.00 |          |                 |                    |
| 20.05.25 | All   | 11.00-11.45 | O-030    | P7              | Nicholas Bradshaw  |
|          | All   | 12.00-12.45 | O-030    | S4              | Nicholas Bradshaw  |
| 21.05.25 | All   | 11.00-12.00 | O-030    | Mid-course exam |                    |
|          | All   | 12.00-12.45 | O-030    | P8              | Željka Maglica     |
|          | All   | 13.00-13.45 | O-030    | P9              | Željka Maglica     |
| 22.05.25 | All   | 11.00-13.00 | O-030    | P10             | Željka Maglica     |
|          | All   | 13.00-13.45 | O-030    | S5              | Christian Reynolds |
| 23.05.25 | All   | 11.00-11.45 | O-030    | P11             | Željka Maglica     |
|          | All   | 12.00-12.45 | O-030    | S6              | Željka Maglica     |

**Week 3**

| Date     | Group            | Time        | Location | Teaching | Teacher                       |
|----------|------------------|-------------|----------|----------|-------------------------------|
| 26.05.25 | All              | 12.00-14.00 | O-030    | S7       | Bradshaw / Maglica            |
|          | 3                | 10.30-12.00 | O-353    | V1       | Maja Juković<br>Matea Kršanac |
|          | 1                | 14.00-15.30 | O-352    |          |                               |
|          | 2                | 14.00-15.30 | O-353    |          |                               |
| 27.05.25 | All              | 11.00-12.30 | O-030    | S8       | Bradshaw / Maglica            |
|          | 3                | 10.00-10.45 | O-353    | V2       | Maja Juković<br>Matea Kršanac |
|          | 1                | 12.30-13.15 | O-352    |          |                               |
|          | 2                | 12.30-13.15 | O-353    |          |                               |
| 28.05.25 | All              | 11.30-13.00 | O-030    | S9       | Bradshaw / Maglica            |
|          | 3                | 8.00-11.00  | O-353    | V3       | Maja Juković<br>Matea Kršanac |
|          | 1                | 13.30-16.30 | O-352    |          |                               |
|          | 2                | 13.30-16.30 | O-353    |          |                               |
| 29.05.25 | All              | 12.00-13.30 | O-030    | S10      | Bradshaw / Maglica            |
|          | 3                | 8.00-12.00  | O-353    | V4       | Maja Juković<br>Matea Kršanac |
|          | 1                | 13.30-17.30 | O-352    |          |                               |
|          | 2                | 14.30-18.30 | O-353    |          |                               |
| 30.05.25 | National holiday |             |          |          |                               |

**Week 4**

| Date     | Group | Time        | Location | Teaching                                | Teacher                       |
|----------|-------|-------------|----------|---|-------------------------------|
| 02.06.25 | 1     | 8.00-12.00  | O-353    | V5                                      | Maja Juković<br>Matea Kršanac |
|          | 2     | 13.00-17.00 | O-352    |   |                               |
|          | 3     | 13.00-17.00 | O-353    |   |                               |
| 03.06.25 | 1     | 8.00-12.00  | O-353    | V6                                      | Maja Juković<br>Matea Kršanac |
|          | 2     | 13.00-17.00 | O-352    |   |                               |
|          | 3     | 13.00-17.00 | O-353    |   |                               |
| 04.06.25 | 1     | 9.00-12.00  | O-353    | V7                                      | Maja Juković<br>Matea Kršanac |
|          | 2     | 13.00-16.00 | O-352    |   |                               |
|          | 3     | 13.00-16.00 | O-353    |   |                               |
| 05.06.25 | All   | 11.00-12.00 | O-030    | S11                                     | Bradshaw / Maglica            |
| 06.06.25 | All   | 9.00-11.00  | O-030    | Final exam<br>(1 <sup>st</sup> sitting) |                               |