



Detailed curriculum for the course:  
**Introduction to Laboratory Work & Safety**

<b>Academic year:</b>	2023/2024
<b>Program:</b>	Biotechnology for the Life Sciences (1 <sup>st</sup> year)
<b>Course code:</b>	BLS103
<b>ECTS points:</b>	3
<b>Language of the course:</b>	English
<b>Teaching hours:</b>	30 hours (8 lectures, 10 seminars, 12 practical work)
<b>Pre-requisites for enrolment:</b>	No specific courses required.

**Course leader and contact information:**

Title and name:	Izv. prof. dr. sc. Nicholas J. Bradshaw
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**Time period:** 13th October 2023 – 24<sup>th</sup> November 2023

<b>Teaching staff:</b>	Izv. prof. dr. sc. Nicholas J. Bradshaw (6 hours lectures, 2 hours seminars, 2 hours practical work)
	Izv. prof. dr. sc. Nela Malatesti (2 hours lectures)
	Bobana Samardžija (1 hour seminar, 5.5 hours practical work)
	Maja Juković (3 hours seminars, 4 hours practical work)
	Martina Mušković (5 hours seminars)



### **Required literature:**

University health and safety documents (supplied over Google Drive):

Health and safety at work: General program

*Sigurnost i zaštita na radu – opći program*

Instructions for working safely with a computer

*Upute za rad na siguran način s računalom*

Instructions for working safely with chemical hazards

*Upute za siguran rad s kemijskim opasnostima*

Instructions for working safely in a laboratory with equipment and apparatus

*Upute za rad na siguran način na laboratorijskim strojevima i uređajima*

(Titles in italics indicate the original title of the document approved by the University Senate, documents supplied are translations into English of these)

### **Optional literature:**

Will be supplied over Google Drive:

Laboratory biosafety manual (3<sup>rd</sup> edition), World Health Organisation, 2004

### **Course description:**

Students will receive an intensive short course aimed at preparing them for work in the laboratory, prior to their Laboratory Apprenticeship courses, and second year Research Project.

Students will receive instructions in occupational safety in a laboratory environment, including biological, chemical and general hazards. They will sit a safety at work exam, completion of which will certify them to work in the laboratory.

Additionally, students will receive basic training and practise in standard laboratory techniques and mathematical calculations, to ensure that all students possess the core competencies required for their later research work.

Finally, students will receive a brief introduction to research being conducted in the Department of Biotechnology, which will facilitate their selection of their first Laboratory Apprenticeship.

### **Learning outcomes:**

By the end of the course, students will:

- 1) Be familiar with the various occupational safety concerns of working in a laboratory, including both biological and chemical hazards.
- 2) Have completed a test on safety in the laboratory, certifying them to begin practical work.
- 3) Be aware of the standard practises and etiquette of working in a research group, including the maintaining of



- laboratory journals.
- 4) Have refreshed their knowledge, and gained experience, at the basic mathematical calculations and IT skills required for work in a research environment
  - 5) Have gained experience at basic laboratory techniques such as pipetting, buffer preparation and handling of both bacteria and mammalian cells.
  - 6) Be aware of the research topics currently being studied at the Department of Biotechnology, allowing them to select an appropriate mentor for their first Laboratory Apprenticeship

### **Detailed course content:**

#### *Safety in the Laboratory (6 hours lectures)*

Students will receive 3x 2 hour lectures covering occupational health and safety in the laboratory. Of these: The first will these will cover general safety concerns, including electrical and physical hazards, and basic emergency response. The second will cover biological aspects of safety, including dealing with living microorganisms and cells. The third will cover chemical hazards and safety.

#### *Working in a research group (1 hour seminar)*

In these seminars, basic considerations of working in a laboratory will be discussed, including lab etiquette, the process of keeping a laboratory journal and the importance of recording and storing data in a clear and accessible manner.

#### *Basic laboratory calculations (4 hours seminars)*

Students will receive a basic revision course on some of the calculations that are required when working in a laboratory, and in particular those concerning determining concentrations of components in buffer solutions. These will be reinforced by a series of exercises.

#### *Introduction to laboratory techniques (4 hours seminars)*

Students will be given a general introduction to the techniques commonly used in biological and biochemical research, immediately before using them in laboratory exercises.

#### *Laboratory practical exercises (12 hours practical work)*

Students will undertake a range of laboratory exercises, either alone or in pairs, designed to familiarise themselves with basic techniques, skills and equipment of a laboratory. Many students will have covered all of this during their undergraduate studies; however this will provide an opportunity for revision, as well as to fill in any gaps in individual's knowledge. Early sessions will focus on pipetting, measuring and buffer preparation. Later sessions will allow students to practise aseptic methods of working, through exercises involving bacteria and mammalian cell cultures. Students will keep a laboratory journal of their work in these sessions.

#### *Research Topics in the Department (2 hours lectures)*

Over two sessions, students will listen to short (15-20 minute) presentations from representatives of the different active research groups within the Department of Biotechnology, who will provide introductions to their current research projects and interests. On the basis of these presentations, students will be asked to list the group(s) that they are interested in



performing their Laboratory Apprenticeships in. This will in turn be used to assign students to mentors.

#### Lectures

- L1: Occupational health and safety (2 hours)
- L2: Biological health, safety and ethics (2 hours)
- L3: Chemical health and safety (2 hours)
- L4: Research topics in the department (2 hours)

#### Seminars

- S1: Working in a research group (1 hours)
- S2: Calculations required for laboratory work 1 (1.5 hours)
- S3: Calculations required for laboratory work 2 (1.5 hours)
- S5: DNA cloning and PCR (2 hours)
- S5: Working with mammalian and bacterial cell cultures (2 hours)
- S6: Calculations required for laboratory work 3 (1 hour)
- S7: Electrophoresis and blotting (1 hour)

#### Practical exercises

- P1: Preparation of media for bacterial culture (1.5 hours)
- P2: Transforming bacteria (1.5 hours)
- P3: Growing bacterial cultures (0.5 hour)
- P4: PCR and DNA purification (2.5 hours)
- P5: DNA agarose gels and SDS-PAGE gel preparation (3 hours)
- P6: SDS-PAGE (3 hours)

### **Requirements, methods of assessment and evaluation:**

#### **Examination deadlines:**

The final exam will be Friday 24<sup>th</sup> November 2023, 13:00, room O-268.

For those who need to retake the test, the second test sitting will be on the 14<sup>th</sup> December, 9:00, room O-268.

Additional test sittings (maximum two more) will be by arrangement between the students and teacher.

### **Qualification and grades (according to *Pravilniku o studijima Sveučilišta u Rijeci*):**

#### *Assessment during the course (70%)*

Students will obtain score during the course, in the following areas:

Health and safety test (20%) – Students will undergo a multiple choice test based on the content of lectures 1-3.



Students must achieve at least 15/20 (75% of available marks) in order to proceed to the final exam. Students who do not achieve this on the first attempt will be offered the opportunity to sit the test again.

Seminar work (20%): – Students will be graded based on work done in class and/or as homework from seminars 2, 4, 6 7

Practical work (30%) – Students will be assessed based on the abilities and results demonstrated in the practical exercises, as well as their lab book.

#### *Final exam (30%)*

Eligibility to sit the final exam will be based on scores achieved during the course (out of a maximum of 50%). This will cover material from all of the seminars, and the techniques used in the practicals..

- Students scoring between 0 and 34.9% will not be allowed to sit the final exam
- Students scoring between 35% and 70% will be allowed to sit the final exam

Additionally, students must have achieved at least 15/20 on the health and safety test.

#### *Final grades*

The following grades will be awarded based on the final score:

Percentage score	ECTS grade	Numerical grade
90% to 100%	A	Excellent (5)
75% to 89.9%	B	Very good (4)
60% to 74.9%	C	Good (3)
50% to 59.9%	D	Satisfactory (2)
0% to 49.9%	F	Unsatisfactory (1)

The final grade is based on the sum of percentage points accumulated during the course and on the final exam. Passing grades are excellent (5), very good (4), good (3) and satisfactory (2).

To complete the course students must attain a passing mark for the entire course (50% or higher) as well as achieving at least 15% of the 30% available on the final exam.

### **Additional information:**

#### **Academic integrity**

Students are required to respect the principles of academic integrity, and refer to the documents: *Ethical rules of the University of Rijeka* and *Ethical rules for students*.



### Schedule of classes:

Date	Group	Time	Room	Activity	Teacher
13.10.23	All	13:00 – 14:30	O-268	L1 General safety	Nicholas Bradshaw
13.10.23	All	15:00-16:00	O-136	S1 Working in labs	Maja Juković
16.10.23	All	13:00-14:30	O-269	L2 Biological safety	Nicholas Bradshaw
20.10.23	All	13:00-14:30	O-268	L3 Chemical safety	Nela Malatesti
20.10.23	All	15:00-16:30	O-268	S2 Lab calculations 1	Martina Mušković
23.10.23	All	13:30-14:30	O-269	Health & Safety Test	
30.10.23	All	14:30-16:00	O-269	S3 Lab calculations 2	Martina Mušković
7.11.23	All	10:00-12:00	O-339	L4 Research topics	Nicholas Bradshaw
7.11.23	All	13:00-15:00	O-339	S4 DNA cloning	Nicholas Bradshaw
7.11.23	All	15:00-16:30	O-137	P4 DNA purification and PCR	Nicholas Bradshaw
9.11.23	All	13:00-15:00	O-269	S5 Cultured cells	Maja Juković
9.11.23	All	15:00-16:30	O-136	P1 Media preparation	Maja Juković



Date	Group	Time	Room	Activity	Teacher
14.11.23	All	13:00-14:00	O-269	S6 Lab calculations 3	Martina Mušković
14.11.23	All	14:30-16:00	O-137	P2 Transform bacteria	Maja Juković
16.11.23	All	13:00-14:00	O-269	S7 Electrophoresis	Bobana Samardžija
16.11.23	All	14:30-15:00	O-136, O-137	P3 Bacterial culture	Bobana Samardžija
27.11.23	All	13:00-16:00	O-136	P5 Agarose gels and prep SDS-PAGE	Bobana Samardžija
28.11.23	All	13:00-16:00	O-136	P6 SDS-PAGE	Bobana Samardžija
29.11.23	All	13:00-14:30	O-268	Final exam	