



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

Academic year:	2020/2021
Program:	Biotechnology for the Life Sciences (1 st year)
Course code:	BLS103
ECTS points:	3
Language of the course:	English
Teaching hours:	30 hours (10 lectures, 8 seminars, 12 practical work)
Pre-requisites for enrolment:	No specific courses required.

Course leader and contact information:

Title and name: Doc. dr. sc. Nicholas J. Bradshaw
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Time period: 4th January 2021 – 15th January 2021

Teaching staff: Doc. dr. sc. Nicholas J. Bradshaw
(8 hours lectures, 2 hours seminars, 12 hours practical work)
Izv. prof. dr. sc. Nela Malatesti
(2 hours lectures)
Beti Zaharija, mag. med. chem.
(3 hour seminar, 6 hours practical work)
Bobana Samardžija, mag. pharm. inv.
(1 hour seminar, 6 hours practical work)
Martina Mušković, mag. med. chem.
(3 hours seminars)



Required literature:

Students will be supplied with University safety documents, which they will be required to read and learn,

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 (3 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 (3 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 (4 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 and safety (2 hours)
- L3: Chemical health and safety (2 hours)
- L4: Research topics in the department 1 (2 hour)
- L5: Research topics in the department 2 (2 hour)

Seminars

- S1: Working in a research group (1 hours)
- S2: Calculations required for laboratory work 1 (1 hour)
- S3: Working with mammalian and bacterial cell cultures (1 hour)
- S4: Calculations required for laboratory work 2 (1 hour)
- S5: Electrophoresis and blotting (1 hour)
- S6: Calculations required for laboratory work 3 (1 hour)
- S7: DNA cloning and PCR (2 hours)



Practical exercises

- P1: Preparation of media for bacterial culture (1 hour)
- P2: Transforming bacteria (2 hours)
- P3: Growing bacterial cultures and preparing SDS-PAGE gels (3 hours)
- P4: SDS-PAGE and staining (3 hours)
- P5: PCR (1 hour)
- P6: DNA agarose gels (2 hours)

Requirements, methods of assessment and evaluation:

Examination deadlines:

The final exam will be Friday 20th November 2020, 14:00, room O-268.

For those who need to retake the test, the second test sitting will be Friday 27th November 2020, 14:00, 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 (15%): – Students will be graded based on work done in class and/or as homework from seminars 2, 3, 6 7

Practical work (35%) – 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:

Week 1:

Date	Group	Time	Room	Activity	Teacher
04.01.20	All	13:00-14:30	O-268	L1 General safety	Nicholas Bradshaw
	1	15:00-15:45	O-136	S1 Working in labs	Beti Zaharija
	2	16:00-16:45			
05.01.20	All	11:00-11:45	O-268	S2 Lab calculations 1	Martina Mušković
	All	16:30-18:00	O-268	L2 Biological safety	Nicholas Bradshaw
06.01.20	Public holiday				
07.01.20	All	12:00-13:30	O-268	L3 Chemical safety	Nela Malatesti
	All	14:00-14:45	O-268	S3 Cultured cells	Beti Zaharija
08.01.20	All	14:00-14:45	O-268	S4 Lab calculations 2	Martina Mušković
	1	15:00-15:45	O-352	P1 Media preparation	Nicholas Bradshaw Beti Zaharija
	2		O-353		



Week 2:

Date	Group	Time	Room	Activity	Teacher
11.01.20	All	10:00-11:30	O-268	L4 Research topics 1	Nicholas Bradshaw
	All	12:40-14:00	O-268	L5 Research topics 2	Nicholas Bradshaw
	1	15:00-16:30	O-352	P2 Transform bacteria	Nicholas Bradshaw Beti Zaharija
	2		O-353		
12.01.20	All	10:00-11:00	O-268	Health and safety test	
	1	12:00-14:15	O-352	P3 Cultures & gel prep	Nicholas Bradshaw Beti Zaharija
	2		O-353		
13.01.20	All	9:00-9:45	O-268	S5 Electrophoresis	Bobana Samardžija
	1	10:00-12:15	O-352	P4 SDS-PAGE	Nicholas Bradshaw Bobana Samardžija
	2		O-353		
14.01.20	All	12:00-12:45	O-268	S6 Lab calculations 3	Martina Mušković
	All	13:00-14:30	O-339	S7 DNA cloning	Nicholas Bradshaw
	1	15:00-15:45	O-352	P5 PCR	Nicholas Bradshaw Bobana Samardžija
	2		O-353		
15.01.20	1	9:00-10:30	O-352	P6 Agarose gels	Nicholas Bradshaw Bobana Samardžija
	2		O-353		
	All	15:00-16:00	O-268	Final exam	