Sveučilište u Rijeci
University of Rijeka

BIotech

Odjel za biotehnologiju
51000 Rijeka, Radmile Matejčić 2
Tel. +385 51 584 550
Fax. +385 51 584 599
e-mail: ured@biotech.uniri.hr

Detailed curriculum for the course:
Introduction to research methods

Academic year:	2020/2021
Program:	Biotechnology for the Life Sciences
Course code:	BLS101
ECTS points:	9
Language of the course:	English
Teaching hours:	90 hours (34 hours lecture, 28 hours seminar, 28 hours practical exercises)
Pre-requisites for enrolment:	No specific courses required.

Course leader and contact information:

Title and name:	Doc. dr. sc. Christian A. Reynolds
Address:	Odjel za biotehnologiju
E-mail:	christian.reynolds@uniri.hr

Time period: 02 Nov 2020 – 11 Dec 2020

Teaching staff:
Christian Reynolds, PhD 53 (18L + 27S + 8P)
Petra Anić, PhD 30 (10L + 20P)
Nicholas Bradshaw, PhD 6 (5L + 1S)
Rozi Andretić Waldowski 1 (1L)

Required literature:

None, although students will be required to undertake independent reading in preparation for the seminars.

Course description:

This course will give students the basic knowledge required for their future research work in research laboratories, which includes: preparing a hypothesis driven research plan based on scientific evidence in accordance with bioethical standards, application of statistical methods for data analysis and skills in presenting results of their work.

In the bioethics part of the course students will learn: to distinguish scientific from non-scientific approaches, explain the characteristics of the scientific method, understand the importance of ethical approaches in performing scientific research and objectively discuss about ethical principles in modern bioscience.

In the science writing part of the course, students will learn to: independently search different literature databases, become proficient in the use of a reference management software, formulate a pertinent scientific question based on researched literature, formulate a hypothesis, understand the difference between different types of research methods, acquire skills in scientific writing and be able to write a Master thesis, research paper and be able to present their work in oral or poster form to either expert or lay audience.

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After completion of the section on statistical analysis students should be able to: choose appropriate parametric or nonparametric test for data analysis and be able to interpret the outcome in the context of statistical significance and accepting or rejecting the hypothesis proposed in the research plan.

Learning outcomes:

1. Gain general knowledge about the scientific method process and hypothesis-driven research
2. Gain general knowledge about types of scientific investigation and its structure
3. Gain general knowledge about the characteristics and types of scientific literature
4. Gain practical skills related to using different search databases for literature searches and references management
5. Gain general knowledge about the elements and practical skills involved in formatting a Master Thesis
6. Gain general experience in scientific writing
7. Gain specific experience in writing different sections of a scientific paper
8. Gain general knowledge of bioethics as it applies to peer review, privileged information, conflicts of interest, research misconduct and plagiarism.
9. Gain general knowledge about bioethical issues pertaining to the use of animals and humans in research, and use of human tissues
10. Gain general knowledge about the use of statistical methods for accepting or rejecting a hypothesis.
11. Practice and develop their skills in applying different parametric and nonparametric statistical tests
12. Gain practical experience in preparing poster and oral presentations
13. Gain experience in communicating science to experts and lay audiences

Detailed course content:

Lectures:
L1: Course introduction, scientific method, and hypothesis testing – 1 hour
L2: Research Strategies and experimental design – 1 hour
L3: Conducting ethical research, bioethical issues relating to the use of human and/or animals subjects – 1 hour
L4: Scientific misconduct, authorship, and plagiarism – 1 hour
L5: Introduction to the process of scientific publication – 3 hours
L6: Sci Writing I: Introduction to scientific writing – 1 hour
L7: Statistics I – 1 hour
L8: Statistics II – 1 hour
L9: Sci Writing II: Use the active voice – 1 hour
L10: Sci Writing III: Sentence structure and punctuation – 1 hour
L11: Sci Writing IV - Paragraphs
L12: Statistics III – 1 hour
L13: Statistics IV – 1 hour
L14: Sci Writing V: Overview of the writing process – 1 hour
L15: Web-based databases for accessing scientific literature and reference management software – 2 hours
L16: Sci Writing VI: Tables and figures – 1 hours
L17: Statistics V – 1 hour
L18: Statistics VI – 1 hours

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L19: Sci Writing VI: The Results – 1 hours
L20: Sci Writing VII: The Methods – 1 hour
L21: Sci Writing VII: The Introduction" – 1 hour
L22: Statistics VII – 1 hour
L23: Statistics VIIII – 1 hours
L24: Sci Writing VIII: The Discussion – 1 hour
L25: Sci Writing IX: The Abstract" – 1 hour
L26: Sci Writing X: Writing a review article – 1 hour
L27: Statistics IX – 1 hour
L28: Statistics X – 1 hours
L29: Sci Writing XI: Grants – 1 hour
L30: Preparing oral and poster presentations – 1 hours
L31: The Master's Thesis – 1 hour

Seminars:
S1: Group discussion about hypotheses and hypothesis testing – 2 hours
S2: Practise defining a research question and identifying variables – 2 hours
S3: Group discussion about ethics in research – 2 hours
S4: Group discussion about real-world examples of scientific misconduct – 2 hours
S6: Principles of effective writing – 2 hours
S7: Active voice practice – 2 hours
S8: Experiment with punctuation and sentence editing – 2 hours
S9: Practise with pre-writing – 2 hours
S10: Literature searching and citing references – 1 hour
S11: Group discussion of "tables and figures" from selected literature – 2 hours
S12: Group discussion of "methods" from selected literature – 2 hours
S13: Group discussion of "discussions" from selected literature – 2 hours
S14: Group discussion of selected review articles – 2 hours
S15: Mock oral presentations – 3 hours

Exercise:
E1: Statistics I – 2 hours
E2: Statistics II – 2 hours
E3: Paragraph editing – 2 hours
E4: Statistics III – 2 hours
E5: Statistics IV – 2 hours
E6: Statistics V – 2 hours
E7: Statistics VI – 2 hours
E8: Practice writing "results" – 2 hours
E9: Practice writing an "introduction" – 2 hours
E10: Statistics VII – 2 hours
E11: Statistics VIII – 2 hours

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E12: Practice writing an "abstract" – 2 hours
E13: Statistics IX – 2 hours
E14: Statistics X – 2 hours

* Note: Statistics lectures/exercises (I-X) are designed to introduce students to: types of variables, measurement scales, data sampling, data classification and representation, central tendency measures, variability measures, normal distributions, standard scores, testing for categorical data, normality testing, examining categorical data, contingency tables, Chi-square test, hypothesis testing in statistics, foundations for inference, the central limit theorem, inference for numerical data, one sample t-test (about a population mean), comparing two population means (T-test: independent, repeated), non-parametric tests for two groups, comparing many means (ANOVA: one-way, two-way, repeated, mixed), non-parametric tests for three or more groups, correlation, linear regression models, fitting models, model checking (the significant of coefficients, model assumptions), and model predicting.

Examination deadlines:

The final exam will be Friday 11th December 2020, 13:00, room O-268.
If necessary, a second test date will be Monday 21st December 2020, 10:00, room O-269.
Additional test deadlines (maximum two, between July and September) will be by arrangement with the students if needed.

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

Assessment during the course (50%)
Students will obtain score during the course, in the following areas:

Seminar work (25%) – Students will be assessed based on their contributions to the debates (S3, S4 and S5). This will include content of their presentations (10%), presentation delivery (5%) and their involvement in both asking (5%) and answering questions (5%) during the discussion phase.

Practical work (25%) – Students will be assessed based on both their results and understanding shown during the practical tasks

Final exam (50%)
The final exam will consist of two sections:
Short answer questions - based on content of lectures
Multiple choice questions - taken from the entire course

Eligibility to sit the final exam will be based on scores achieved during the course (out of a maximum of 50%):
- Students scoring between 0 and 24.9% will not be allowed to sit the final exam
- Students scoring between 25% and 50% will be allowed to sit the final exam

Final grades

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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).

Schedule of classes:

Date	Time	Activity	Room	Instructor
Week 1				
MON 02 Nov 2020	9:00-9:45	L1: Course introduction, scientific method, and hypothesis testing	O-269	Christian Reynolds
MON 02 Nov 2020	10:00-11:30	S1: Group discussion about hypotheses and hypothesis testing	O-269	Christian Reynolds
TUE 03 Nov 2020	9:00-10:30	L2: Research Strategies and experimental design	O-269	Christian Reynolds
TUE 03 Nov 2020	10:45-11:30	S2: Practise defining a research question and identifying variables	O-269	Christian Reynolds
WED 04 Nov 2020	9:00-9:45	L3: Conducting ethical research, bioethical issues relating to the use of human and/or animals subjects	O-269	Christian Reynolds
WED 04 Nov 2020	10:00-11:30	S3: Group discussion about ethics in research	O-269	Christian Reynolds
THU 05 Nov 2020	9:00-9:45	L4: Scientific misconduct, authorship, and plagiarism	O-269	Christian Reynolds
THU 05 Nov 2020	10:00-11:30	S4: Group discussion about real-world examples of scientific misconduct	O-269	Christian Reynolds
FRI 06 Nov 2020	14:00-16:30	L5: Introduction to the process of scientific publication, authorship, and plagiarism	O-269	Nicholas Bradshaw
Week 2				
MON 09 Nov 2020	9:00-9:45	L6: Sci Writing I - Introduction to scientific writing	O-269	Christian Reynolds
MON 09 Nov 2020	10:00-11:30	S6: Principles of effective writing	O-269	Christian Reynolds

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TUE 10 Nov 2020	9:00-9:45	L7: Statistics I		Petra Anić
TUE 10 Nov 2020	10:00-11:30	E1: Statistics I - Exercises		Petra Anić
WED 11 Nov 2020	9:00-9:45	L8: Statistics II		Petra Anić
WED 11 Nov 2020	10:00-11:30	E2: Statistics II - Exercises		Petra Anić
THU 12 Nov 2020	9:00-9:45	L9: Sci Writing II - Use the active voice	O-269	Christian Reynolds
THU 12 Nov 2020	10:00-11:30	S7: Active voice practice	O-269	Christian Reynolds
FRI 13 Nov 2020	9:00-9:45	L10: Sci Writing III - sentence structure and punctuation	O-269	Christian Reynolds
FRI 13 Nov 2020	10:00-11:30	S8: Experiment with punctuation and sentence editing	O-269	Christian Reynolds
Week 3				
MON 16 Nov 2020	9:00-9:45	L11: Sci Writing IV - Paragraphs	O-269	Christian Reynolds
MON 16 Nov 2020	10:00-11:30	E3: Paragraph editing	O-269	Christian Reynolds
TUE 17 Nov 2020	9:00-9:45	L12: Statistics III		Petra Anić
TUE 17 Nov 2020	10:00-11:30	E4: Statistics III - Exercises		Petra Anić
WED 18 Nov 2020	9:00-9:45	L13: Statistics IV		Petra Anić
WED 18 Nov 2020	10:00-11:30	E5: Statistics IV - Exercises		Petra Anić
THU 19 Nov 2020	9:00-9:45	L14: Sci Writing V - Overview of the writing process	O-269	Christian Reynolds
THU 19 Nov 2020	10:00-11:30	S9: Practise with pre-writing	O-269	Christian Reynolds
FRI 20 Nov 2020	9:00-10:30	L15: Web-based databases for accessing scientific literature and reference management software		Nicholas Bradshaw
FRI 20 Nov 2020	10:45-11:30	S10: Literature searching and citing references		Nicholas Bradshaw
Week 4				
MON 23 Nov 2020	9:00-9:45	L16: Sci Writing IV - Tables and figures	O-269	Christian Reynolds
MON 23 Nov 2020	10:00-11:30	S11: Group discussion of "tables and figures" from the literature	O-269	Christian Reynolds

TUE 24 Nov 2020	9:00-9:45	L17: Statistics V	Computer room	Petra Anić
TUE 24 Nov 2020	10:00-11:30	E6: Statistics V - Exercises	Computer room	Petra Anić
WED 25 Nov 2020	9:00-9:45	L18: Statistics VI	Computer room	Petra Anić
WED 25 Nov 2020	10:00-11:30	E7: Statistics VI - Exercises	Computer room	Petra Anić
THU 26 Nov 2020	9:00-9:45	L19: Sci Writing VI - Result	O-269	Christian Reynolds
THU 26 Nov 2020	10:00-11:30	E8: Practice writing result	O-269	Christian Reynolds
FRI 27 Nov 2020	9:00-9:45	L20: Sci Writing VII - Methods	O-269	Christian Reynolds
FRI 27 Nov 2020	10:00-11:30	S12: Sci Writing VII - Group discussion of "methods" from the literature	O-269	Christian Reynolds
Week 5				
MON 30 Nov 2020	9:00-9:45	L21: Sci Writing VII - Introduction	O-269	Christian Reynolds
MON 02 Nov 2020	10:00-11:30	E9: Sci Writing VII - Practice writing an introduction	O-269	Christian Reynolds
TUE 01 Dec 2020	9:00-9:45	L22: Statistics VII	Computer room	Petra Anić
TUE 01 Dec 2020	10:00-11:30	E10: Statistics VII - Exercises	Computer room	Petra Anić
WED 02 Dec 2020	9:00-9:45	L23: Statistics VIII	Computer room	Petra Anić
WED 02 Dec 2020	10:00-11:30	E11: Statistics VIII - Exercises	Computer room	Petra Anić
THU 03 Dec 2020	9:00-9:45	L24: Sci Writing VIII - Discussion	O-269	Christian Reynolds
THU 03 Dec 2020	10:00-11:30	S13: Group discussion of "discussions" from the literature	O-269	Christian Reynolds
FRI 04 Dec 2020	9:00-9:45	L25: Sci Writing IX - Abstract	O-269	Christian Reynolds
FRI 04 Dec 2020	10:00-11:30	E12: Practice writing an abstract	O-269	Christian Reynolds
Week 6				
MON 07 Dec 2020	9:00-9:45	L26: Sci Writing X - Writing a review article	O-269	Christian Reynolds

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MON 07 Dec 2020	10:00-11:30	S14: Group discussion of selected review articles	O-269	Christian Reynolds
TUE 08 Dec 2020	9:00-9:45	L27: Statistics IX	Computer room	Petra Anić
TUE 08 Dec 2020	10:00-11:30	E7: Statistics IX - Exercises	Computer room	Petra Anić
WED 09 Dec 2020	9:00-9:45	L28: Statistics X	Computer room	Petra Anić
WED 09 Dec 2020	10:00-11:30	E7: Statistics X - Exercises	Computer room	Petra Anić
THU 10 Dec 2020	9:00-9:45	L29: Sci Writing XI - Grants	O-269	Christian Reynolds
THU 10 Dec 2020	9:45 -10:30	L30: Preparing oral and poster presentations	O-269	Christian Reynolds
THU 10 Dec 2020	10:45 -11:30	L31: The Master's Thesis	O-269	Rozi Andretić Waldowski
FRI 11 Dec 2020	9:00 -11:30	S15: Mock oral presentations	O-269	Christian Reynolds
FRI 11 Dec 2020	13:00-14:00	Final Exam	O-269	Christian Reynolds

Additional information:
Academic integrity

Students are required to respect the principles of academic integrity and refer to the documents: *Etički kodeks Sveučilišta u Rijeci* and *Etički kodeks za studente.*