

**Faculty of Science and Faculty of Graduate Studies Course Syllabus
Department of Biology**

***BIOL 3872.03
Biologist's Toolkit
Winter 2024***

Instructor: Dr. Diego Ibarra | email: Diego.Ibarra@dal.ca | Office: LSC-5014 (Biology)

Questions **MUST be posted in Brightspace's Discussion boards** (see guidelines below). Only use email for private/personal matters.

Lectures/labs: Fridays 2:35 pm-5:25 pm | *Location:* KENNETH C ROWE MANAGEMENT 3080

Course delivery: In-person or online

TA: Sophie Tattrie | sp490888@dal.ca

Time zone: All times (syllabus, Brightspace, calendar, etc.) are in **Halifax Time (ADT/UTC-3 or AST/UTC-4)**

Course Description

Best practices for scientific computing and data handling, theory of visualisation, and scripting, teaching students how to create, store, and manipulate data using the object-oriented programming language R. Examples and projects will be drawn from a wide variety of biological areas, covering typical problems encountered with computer use.

Course format

This course will be delivered face-to-face. However, in case of a pandemic, we may switch to an online format.

Course Prerequisites, Cross-listings and Restrictions

- **Prerequisites:** BIOL 2030.03 or BIOL 2040.03 or BIOL 2060.03

Course Objectives/Learning Outcomes

- Students will be able to store, import, and manipulate data in R, as well as execute basic concepts in data and research reproducibility, webpage data scraping, and graphical representation.

Course Materials

- No textbooks
- Use of a personal laptop is encouraged
- Class notes: Class notes are posted on Brightspace

Announcements: Electronic announcements and additional material will be posted on Brightspace. Students should check the site frequently.

Course Assessment

Component	Weight (% of final grade)	Date
Lab Report 1: Introduction to RStudio and R	9.09	See schedule below
Lab Report 2: Project management and version control	9.09	See schedule below
Lab Report 3: R basics	9.09	See schedule below
Lab Report 4: Data wrangling and basic plotting	9.09	See schedule below
Lab Report 5: Advanced data manipulation and analysis with tidyverse	9.09	See schedule below
Lab Report 6: Data visualization and advanced plotting with ggplot2	9.09	See schedule below
Lab Report 7: SQL databases and R	9.09	See schedule below
Lab Report 8: Flow control and Functions explained	9.09	See schedule below
Lab Report 9: Temporal data and string manipulation	9.09	See schedule below
Lab Report 10: Mapping and geospatial analysis	9.09	See schedule below
Lab Report 11: Producing reports with knitr	9.09	See schedule below
Participation in Discussion Boards	2% bonus	Continuously
TOTAL	/100	

Lab Reports

Each week, we will do the lab in-person in our designated computer lab. The labs are designed to be finished in less than 3 hours (i.e. during lab time), however you will have until the end of the day (11:59 pm) to submit the lab report in case you don't finish it during lab time. Note that, in this case, you will need to install R in your own laptop because we do not have access to the lab after the class is done. You can also ask questions in the respective Discussion board. However, note that questions directly related to your own lab answers (e.g. "why I got question 37 wrong?") will not be answered until after all reports have been submitted.

If you missed the deadline to submit a report:

- **A 10% reduction in grade will be applied for every day an assignment is late.**
- **Email the TA and Cc the Instructor**, briefly explaining your circumstance and dates (note that the TA is the one in-charge extending lab deadlines; thus, emailing only the instructor will delay the process).
- Fill in a [Student Declaration of Absence \(SDA\) form](#) and upload it to the Brightspace Dropbox designated for SDAs.
- Students with an Accessibility or Accommodation Plan in place do not need to submit SDA form.
- For prolonged absences where you missed many labs in a row (e.g. prolonged illness, family matters, etc.), contact the instructor to develop a mitigation plan.

Participation in Discussion Boards

Contributions to the discussion boards (questions **AND ANSWERS**) will earn you bonus points. Please follow the posting guidelines below:

- Before you post your question, **CHECK** if the question has already been asked/answered.
- Post only ONE question per post. If you have multiple questions, post them in separate posts.
- The post's TITLE should be your question.
- If you know the answer to a question, please help by answering the post.
- Be respectful and polite.

Participation bonus points will be computed at the end of the course. First, *engagement points* (see below) will be tallied for each student. Then, a curve will be calculated (after removing outliers) to compute the participation bonus points for each student.

Item	Score (units: engagement points)
New question	1
Already posted question	0 for the first 3 events, -1 for additional events
Correct answer	1
Partially correct answer	0.5
Incorrect answer	0 for the first 3 events, -1 for additional events
Useful comment or sharing a link to a useful resource	1
Using offensive tone or language	-1

Conversion of numerical grades to Final Letter Grades

Undergraduate students follow the Dalhousie Common Grade Scale. Graduate students follow a stricter scale, where a minimum of 70% (B-) is required to pass.

%	Letter Grade	Grade Point Value	Definition
90 - 100	A+	4.30	Exceptional
85-89	A	4.00	Excellent
80-84	A-	3.70	Very Good
77-79	B+	3.30	
73-76	B	3.00	Good
70-72	B-	2.70	
65-69	C+	2.30	Satisfactory
60-64	C	2.00	
55-59	C-	1.70	
50-54	D	1.00	Marginal Pass
<50	F	0.00	Failure

Course Policies

Questions. All questions MUST be posted in Brightspace's Discussion boards (see posting guidelines above). Only use email for private/personal matters.

Missing or late academic requirements:

- **Email the TA and Cc the Instructor**, briefly explaining your circumstance and dates (note that the TA is the one in-charge extending lab deadlines; thus, emailing only the instructor will delay the process).
- Fill in a [Student Declaration of Absence \(SDA\) form](#) and upload it to the Brightspace Dropbox designated for SDAs.
- Students with an Accessibility or Accommodation Plan in place **do not** need to submit SDA form.
- For extenuating circumstances where you missed many labs in a row (e.g. prolonged illness, family matters, etc.) contact the instructor to develop a mitigation plan.

Brightspace will be used to post labs, updates and announcements.

Late assignments: **A 10% reduction in grade will be applied for every day an assignment is late.**

Course Content

Detailed Schedule

All dates and times are in **Halifax Time** (ADT/UTC-3 or AST/UTC-4). Note that due dates are shown in **red**.

Week	Date	Content
Course Introduction		
LAB 1. Introduction to RStudio and R		
1	Fri, Jan 12 @ 2:35 pm	Presential lab work
	Fri, Jan 12 @ 11:59 pm	Submit: Lab Report 1
LAB 2. Project management and version control		
2	Fri, Jan 19 @ 2:35 pm	Presential lab work
	Fri, Jan 19 @ 11:59 pm	Submit: Lab Report 2
LAB 3. R basics (variables, functions, data types, data structures and indexing)		
3	Fri, Jan 26 @ 2:35 pm	Presential lab work
	Fri, Jan 26 @ 11:59 pm	Submit: Lab Report 3
LAB 4. Data wrangling and basic plotting		
4	Fri, Feb 2 @ 2:35 pm	Presential lab work
	Fri, Feb 2 @ 11:59 pm	Submit: Lab Report 4
LAB 5. Advanced data manipulation and analysis with tidyverse		
5	Fri, Feb 9 @ 2:35 pm	Presential lab work
	Fri, Feb 9 @ 11:59 pm	Submit: Lab Report 5
LAB 6. Data visualization and advanced plotting with ggplot2		
6	Fri, Feb 16 @ 2:35 pm	Presential lab work
	Fri, Feb 16 @ 11:59 pm	Submit: Lab Report 6
7	Mon, Feb 19... ...Fri, Feb 23	Reading week Reading week
LAB 7. SQL databases and R		
8	Fri, Mar 1 @ 2:35 pm	Presential lab work
	Fri, Mar 1 @ 11:59 pm	Submit: Lab Report 7
LAB 8. Flow control and Functions explained		
9	Fri, Mar 8 @ 2:35 pm	Presential lab work
	Fri, Mar 8 @ 11:59 pm	Submit: Lab Report 8
LAB 9. Temporal data and string manipulation		
10	Fri, Mar 15 @ 2:35 pm	Presential lab work
	Fri, Mar 15 @ 11:59 pm	Submit: Lab Report 9
LAB 10. Mapping and geospatial analysis		
11	Fri, Mar 22 @ 2:35 pm	Presential lab work.
	Fri, Mar 22 @ 11:59 pm	Submit: Lab Report 10
LAB 11. Producing reports with knitr		
12	Fri, Mar 29 @ 2:35 pm	Presential lab work
	Fri, Mar 29 @ 11:59 pm	Submit: Lab Report 11
	Fri, Mar 29 by 11:30 pm	Please do your SRI (Student Rating of Instruction)
13	Fri, Apr 5	No class (buffer in case we had a snow day previously)

NOTE: Dates and topics may change depending on course pace and weather-related class cancellations.

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and

supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.html>

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates):

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol:

https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies:

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803:

<https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>