Western Science

Department of Biology

Techniques in Physiology and Biochemistry
Biology 3625G
Course Outline/Syllabus Winter 2024

1. Course Information

Tutorial: See details posted on OWL
Lab: See details posted on OWL
Biology 3625G is a lab-based course that meets twice per week; once for a 50 min lecture/tutorial and again for a continuous 5-hour lab session. The course is divided into two modules: one investigating a plant system and one investigating an animal system. Each module contains an integrated series of experiments run over several weeks. At the end of each module there will be an in-class test, and a manuscript-style report summarizing and integrating the experiments from that module will be due.

List of Prerequisites
Biochemistry 2280A; Biology 2290F/G, Biology 2382A/B; one of Biology 2601A/B, Physiology 3120 or 3140A. Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Dr. Chris Guglielmo will be available for in person or virtual (Zoom) meetings outside of the lab and tutorial sessions by appointment cguglie2@uwo.ca. The Graduate Teaching Assistant is Kevin Young (kyoun24@uwo.ca). Students must use their Western (@uwo.ca) email when contacting the instructor or Teaching Assistant with the subject Bio3625. Online help is also available through the Forum on OWL.

3. Course Description, Learning Objectives, Schedule, and Delivery Mode

Course Description: Organismal physiology and biochemistry are functional manifestations of gene expression patterns. This intensive laboratory course will connect the dots from genes to proteins to physiology and finally to whole organism performance in both plants and animals. Emphasis will be placed on the concepts needed to integrate between different levels of biological organization and on the acquisition of laboratory skills required for this type of study.

Topics include:

Photosynthesis
Light harvesting complexes
Chlorophyll fluorescence
Phenotypic plasticity
Animal migration
Lipid metabolism
Body composition analysis
Chromatography
Energetics and respirometry
Spectrophotometry
Enzyme assay
Electrophoresis

Learning Outcomes and Objectives:

From labs and tutorials student will be able to:

- Execute experimental laboratory procedures according to written and verbal directions.
- Measure accurately and precisely plant and animal morphology and physical quantities of reagents using a balance, calipers, microscope, manual and digital image analysis (e.g. Image J software), pipettes, and micropipettes.
- Explain the conceptual basis of chromatography methods, and use paper chromatography, high-performance liquid chromatography, and gas chromatography to separate and quantify chemical species from plant and animal tissues.
- Explain the conceptual basis of chlorophyll fluorescence methods and use this technique to measure photosynthetic parameters of plants.
- Explain the conceptual basis of indirect calorimetry and use open flow respirometry to measure resting and active metabolic rates of insects.
- Use a spectrophotometer to measure and interpret absorption spectra of chemicals (plant pigments), measure metabolic enzyme activities (kinetic assay), and measure concentrations of metabolites (endpoint assay).
- Enter data accurately into a spreadsheet (excel), quality control the data, and use a statistical software package (R) to import data and manipulate data, calculate measures of central tendency and variation, graphically plot and visualize data, and analyze data using ANOVA, ANCOVA, MANOVA, T-test, correlation, and linear regression.
- Keep and accurate and detailed laboratory notebook.
- Critically evaluate and discuss scientific publications.
- Prepare scientific manuscripts in journal format suitable for submission for publication.
- work in a lab safely

Contingency Plan: This course will be delivered in-person, however in the unlikely event of any university-declared emergency, some or all of this course may be required to be delivered online, either synchronously or asynchronously. **The grading scheme will not change.** Any assessments affected will be conducted online as determined by the professor.

Schedule: The schedule of tutorials and labs is provided at the end of this document.

4. Course Materials

Lab manual: A laboratory manual outlining all experiments will be available through the Biology 3625G OWL website, in pdf format. Students are expected to read the labs in advance and be ready when lab

starts. A hard copy of the procedures is recommended, but tablets/laptops are acceptable. We are not responsible for damage of electronic devices due to chemical exposure or other reasons.

1. Lab coat and safety glasses: These must be worn at all times while you are in the lab, regardless of what you are doing.
2. Hard-Bound Laboratory Notebook: Keeping a detailed, legible laboratory notebook is crucial to any research endeavor. It is the primary documentation of your experimental procedures and results. In it you can keep a narrative record of what you do each day, raw numerical data, images, and explanations of what went wrong. You should get used to documenting things as you go along, as well as taking some time at the beginning and end of the day to set out your plan and sum up what happened, respectively. It is a working document, and as such does not need to be especially neat or pretty; however, it does need to be legible so that you and others would be able to replicate exactly what you did. It should be hard-bound with numbered pages. All entries in your notebook should be in pen, with absolutely no whiteout used! Incorrect entries should simply be crossed out and the correct value written in beside it.
3. Statistical Software: With help and instruction from us you will analyze your data using a variety of statistical methods including the Students T-test, ANOVA, ANCOVA, MANOVA, post-hoc multiple comparison tests, correlation, and linear regression. Data analysis and instruction will be done with R and RStudio software, which is available free online.
4. Portable Data Storage Device: Much of the data for Biology 3625G will be collected using computers. In order to take your data with you, you will need a USB flash drive.

Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. All course material will be posted to OWL: http://owl.uwo.ca. Much material, including handouts, lab and tutorial instructions, additional reading, pictures, data and some assignments will appear on the OWL site. The forum is available for you to ask content- related questions, discuss concepts, and to help each other out. The instructor will monitor the forum discussions and respond to content questions. Use of social media group sites for the sharing of course information and discussions is not sanctioned or recommended. Your marks will be given under 'Gradebook' in OWL.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

If the course must be offered in online mode all students must have access to a stable internet connection, and a computer with working microphone and/or webcam. During in-person learning it is highly recommended that students bring a portable computer to lab and tutorial that can be used for data analysis.

Stable internet connection

Laptop or computer with webcam

Working microphone

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Lab reports	25% per module = 50%
Lab notebook	= 10%
Pre-lab quizzes	3% per module = 6%
Tutorial tests	10% per module = 20%
Lab practical test	= 10%
Participation and engagement	2% per module = 4%
Total	100%

Grading will be on a traditional percentage scale. The reports will be written in the style of a journal manuscript according to the "Instructions for Authors" (separate handout) and each report will be worth 25% of the final grade (50% total). You must keep an individual lab notebook, which will be worth 10% of the final grade. There will be in-lab quizzes that will be worth 3% per module (6% total). There will be multiple choice/short answer tests at the end of each module that will be worth 20% of the final grade. There will be one lab practical test that will be worth 10% of the final grade. Student participation and engagement in the lab and tutorial will be marked based on the four criteria (attendance, readiness, professionalism, safety, and performance) and will contribute 4% of the final grade. **Both module reports must be handed in to pass the course. Since the course is designated as an "essay course" (i.e., with a suffix of G), to satisfy the Senate requirement students must demonstrate "some minimal competence in essay writing" in order to pass the course. Therefore, the combined mark on the lab reports must exceed 50% in order to pass the course. If it does not the highest mark you can achieve is a 45%.**

Module tests will be given in tutorial on **Tuesday February 13, 2024** and **Tuesday April 2, 2024.** The lab practical exam will be given in lab on **Thursday March 28, 2024**. The deadline to submit the Module 1 report is **Thursday February 29, 2024 at 11:55 pm (23:55)**. The due date to submit the lab notebook is **Tuesday March 26, 2024** in tutorial. The Module 2 report is due **Thursday April 4, 2024 at 11:55 pm (23:55)**. The due dates for the lab notebook and reports are fixed and will not be changed. **In the interest of universal accommodation, deadlines for reports 1 and 2 will have a 48-h grace period following the deadline during which late penalties will not be applied. After this, a late deduction of 5% of the value of the assignment will be deducted per each day late.**

Submitting lab reports: To submit your lab report, perform the following actions by the deadline:

1. Lab reports must be submitted as .doc or .docx or pdf files (not as images or other files that cannot be checked by Turnitin software). Please name the files: yoursurnameyourinitialassignment.doc(x). For example, GuglielmoCreport1.docx. **To receive credit, the submitted document must have a title page with a title, your full name, date and name of the course.**

2. Submit your electronic copy to OWL Assignments, via the link provided on Bio.3625 OWL. If there is a software problem or you note an error before finalizing the submission you will be allowed to resubmit the lab report by contacting the Teaching Assistant or Instructor. **Note that if you fail to submit your lab report to OWL we will consider your work 'not submitted' and you will receive a mark of zero for the assignment. Once submitted, do not return to the assignment in OWL and save as a draft. This will result in the assignment being unsubmitted and will be considered late.**

Accommodated Evaluations
Generally, missed assignments and tests will not be reweighted to other parts of the course. There will be no makeup tests or exams. With appropriate accommodation if module tests or the lab practical are missed, the course grade will be reweighted using all of the other graded components. Report and notebook deadlines will be extended in accordance with direction from the Academic Counselling Office. Unless official accommodation is provided directing otherwise, written assignments will be accepted for 20 days after the end of the penalty grace period has expired (when the accrued 5% daily penalty exceeds the value of the assignment). Students with appropriate accommodation can take their module tests through the accommodated exam service.

6. Student Absences

When the University is permitting in-person instruction, attendance in the lab and tutorial is expected. Each unexcused absence from lab will result in a 5% deduction from the report for that module (i.e. 1 unexcused absence = maximum mark of 95% for the module report). If you are unable to attend lab or to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade (e.g. missing a lab): Talk to the instructor.

Assessments worth 10% or more of the overall course grade:

For work totaling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

7. Accommodation and Accessibility

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies
Students with disabilities work with Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and

cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf,

8. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Use of cell/smart phones and other unnecessary electronic devices is prohibited during labs and tutorials.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Plagiarism: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com). Students must write their assignments in their own words. Whenever an idea, or a passage, is taken from another author, the debt must be acknowledged by using proper referencing such as footnotes or citations. Quotation marks should be used whenever a phrase, sentence or passage is copied verbatim; rewording or paraphrasing another's idea requires a citation only. Generally, however, direct quotes are not used in scientific writings. We encourage you to discuss the research data freely with classmates. However, work turned in for evaluation (text, figures, tables) must be yours alone. Do not copy from each other, the laboratory manual, journal articles, books, websites or any other sources, and do not cite web site addresses as primary sources. **This especially means that all sections of your reports must be written and/or made by you alone including methods, results, figures, and tables.** If you have any questions about what constitutes plagiarism or how to properly cite references, ask the instructors before handing anything in. Plagiarism in lab reports or cheating in exams will be viewed as academic offenses and dealt with as such. Penalties range from severe mark reduction, to failure of the course, or expulsion from the University. More information on academic integrity is available via the plagiarism links on OWL. Common sources of plagiarism include making use of a previous year's report and deliberately or inadvertently copying it, large similarities arising from lab partners working together, and (most commonly) overt copying of someone else's report, with or without their permission. In cases of plagiarism, both the copier and copy-ee will be penalized, and you are thus advised to guard the text of

your lab report closely. Please bear in mind that turnitin.com does not conduct analyses for within-course plagiarism until after the deadline has expired, and that previous years' lab reports are stored in the turnitin.com database.

It is anticipated that Module 1 and 2 tests and the lab practical exam will be proctored in person. If the course is online then the tests will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

https://remoteproctoring.uwo.ca.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

This course is supported by the Science Student Donation Fund. If you are a BSc or BMSc student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Counselling site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at ssc@uwo.ca.

10. Equity, Diversity, Inclusion and Decolonization (EDID):

The pronouns used by Instructors and GTA:
Chris Guglielmo (He, Him)
Kevin Young (He, Him)

Western is a very diverse working and learning environment, and the instructor endeavours to create an inclusive, welcoming, and safe classroom environment for all learners. If students would like to discuss ways to make the class more equitable and inclusive they are invited to talk with the instructor during office hours.

Land Acknowledgement: We acknowledge that Western University is located on the traditional lands of the Anishinaabek, Haudenosaunee, Lūnaapéewak, and Chonnonton Nations, on lands connected with the London Township and Sombra Treaties of 1796 and the Dish with One Spoon Covenant Wampum. This land continues to be home to diverse Indigenous peoples (First Nations, Métis and Inuit) whom we recognize as contemporary stewards of the land and vital contributors of our society. Throughout Canada, North America, and the world, Indigenous Peoples are vital contributors to their communities, and we greatly value their presence, knowledge, and wisdom.

BIOLOGY 3625G Schedule. Winter 2024

Week	Tutorial	Laboratory
Plant Module		
Wk1: Jan 9/11	Introduction to the course, the plant module and first lab	Photosynthetic pigment isolation & identification
Wk2: Jan 16/18	HPLC and Chlorophyll Fluorescence	Three concurrent experiments: - Pigment analysis (HPLC) - Chlorophyll fluorescence - Photosynthesis
Wk3: Jan 23/25	Photosynthesis and photoinhibition	
Wk4: Jan 30 / Feb 1	Report guidelines, paper discussion	
Wk5: Feb 6/8	Data analysis	Data analysis
Animal Module		
Wk6: Feb 13/15	Module 1 test (10%); Introduction to the animal module; paper discussion	Moths: morphometrics, body composition, and reproductive development.
Wk7: Feb 19-23	**Reading Week, no classes**	
Wk8: Feb 27/29	Fatty acids and their analysis; Paper discussion Data analysis	Fatty acid analysis of storage and muscle membrane lipids (gas chromatography). Report 1 and notebook due Feb 29.
Wk9: Mar 5/7	Metabolic fuels and flight; Paper discussion; Data analysis.	Two concurrent experiments: - Lipid mobilization in flight - Resting and flight metabolic rates
Wk10: Mar 12/14	Paper discussion, Data analysis.	
Wk11: Mar 19/21	Muscle aerobic capacity; Paper discussion TBA; Data analysis.	Flight muscle citrate synthase and stereology; data analysis and statistics.
Wk12: Mar 28/30	Data analysis, report consultation. Notebook due	Lab Practical Examination. Notebook returned
Wk13: Apr 2/4	Module 2 test (10%), stats consulting	Report 2 due April 4