Biology 2290G—Scientific Methods in Biology
Course Outline (Syllabus) Winter 2013

(1) Course Information:
Biology 2290F/G is a laboratory course in the UWO Biology program dedicated to enabling students to apply sound experimental investigation and analyses to biological questions. Selected technical, analytical, and communication skills are introduced in diverse biological contexts as students rotate through four areas of study. Familiarize yourself with the philosophy and ground rules of Biology 2290F/G on pp. 6–9 in the Resource Manual.

Summary of course structure:
Students will attend classes in four Units (named for the instructors: Dean, Krajnyk, Gray, and Zabulionis) according to the following timetable:

<table>
<thead>
<tr>
<th>Rotation #1</th>
<th>Zabulionis Unit (Sections)</th>
<th>Dean Unit (Sections)</th>
<th>Krajnyk Unit (Sections)</th>
<th>Gray Unit (Sections)</th>
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</thead>
<tbody>
<tr>
<td>Jan 14–Jan 31</td>
<td>001,002,003</td>
<td>004,005,006</td>
<td>007,008,009</td>
<td>010,011,012</td>
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<tr>
<td>Rotation #2</td>
<td>Feb 4–Feb 28</td>
<td>010,011,012</td>
<td>001,002,003</td>
<td>004,005,006</td>
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<tr>
<td>Rotation #3</td>
<td>Mar 4–Mar 21</td>
<td>007,008,009</td>
<td>010,011,012</td>
<td>001,002,003</td>
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<tr>
<td>Rotation #4</td>
<td>Mar 25–Apr 11</td>
<td>004,005,006</td>
<td>007,008,009</td>
<td>010,011,012</td>
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There will be no Biology 2290 classes in the week of February 18–22 (Reading week).

Scheduled Class Times:
Sections 001, 004, 007 and 010: Monday 2:30–4:30, Wednesday 2:30–5:30.
Sections 002, 005, 008 and 011: Tuesday 9:30–11:30, Thursday 8:30–11:30.
Sections 003, 006, 009 and 012: Tuesday 2:30–4:30, Thursday 2:30–5:30.

Class Locations:
Dean Unit: NCB 325
Gray Unit: NCB 114 (Sections 1, 3, 4, 6, 7, 9, 10, 12) or NCB 117 (Sections 2, 5, 8, 11)
Krajnyk Unit: NCB 331
Zabulionis Unit: NCB 330

Instructors:
Dr. Rob Dean
Ext. 86797
NCB 301F
rdean1@uwo.ca
(Course chair)

Tricia Gray
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NCB 301C
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Irene Krajnyk
Ext. 86505
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Ray Zabulionis
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Office hours. By appointment.

Communicating with instructors and TAs: Use your uwo email account only. We will not respond to emails originating from non-uwo email accounts. Make sure, at all times, that your uwo account doesn’t go over quota as you may not be able to receive any messages or responses from us.

Technical Coordination: Jeni Duro, Sriya Peiris, and Dominique Lam.

Teaching Assistants: Graduate student Teaching Assistants will be present at each laboratory class. (Exception: Gray Unit).

(2) Prerequisites:
A grade of at least 60% in Biology 1201a/1202b/1001a/1002b (Old 1222/1223) is a prerequisite for this course. Unless you have either the prerequisite for this course or written special permission from the academic counsellors in your Faculty to enroll in it, you will be removed from the 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 the course for failing to have the prerequisites.

(3) Course Syllabus:
(3a) Attendance: Attendance in each session of each unit at your designated time is essential in order to maintain the continuity of your experiments and obtain maximum credit. Students who are absent for three of the six sessions of any given rotation will receive a grade of "F" for the entire course. This “F” may be revised to “INC” (incomplete) only upon recommendation from the academic counsellors in your Dean’s Office in cases of documented health or compassionate concerns. You must initial the attendance sheet at the appropriate time. If you fail to do so, you will be considered absent.

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:
https://studentservices.uwo.ca/secure/medical_document.pdf

Because this course is an “Essay course,” students who fail to complete and submit both written assignments, in the Gray Unit term work, will receive a grade of “F” for the entire course.

The final exam in this course must be attempted otherwise a grade of “F” will be assigned to the course.

(3b) Course Content: The content of the Dean, Gray, Krajnyk, and Zabulionis Units follows. Assignments, and the weight of each assignment as a percentage of the course mark, are included in italics in parentheses.
Accessibility
Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661–2111 ext. 82147 for any specific question regarding an accommodation.

Dean Unit:
Class #1: Introduction to the design and use of the Spectronic 20. Introduction to Lambert’s Law, Beer’s Law and the relationship between absorbance and transmittance. Calibration of the Spectronic 20 for measuring absorbance and use of the instrument to generate absorption spectra and a standard curve. Introduction to best practice in volumetric measurement.
Class #2: Principles of using the Spectronic 20 to estimate reaction rates. Students will also prepare a buffer solution for use in classes # 3 and #4.
Class #3: Use of the Spectronic 20 to measure rates of photoreduction of a dye by isolated, illuminated chloroplasts as a function of the photon fluence rate. (Graphing Assignment #1 due (1%)).
Class #4: Measurement of the rate of photoreduction of a dye by isolated, illuminated chloroplasts in the presence of different concentrations of a herbicide. Introduction to light microscopy and the principles of using a haemacytometer. (Quiz #1 (4%)).
Class #5: Determination of the number of cells/ml in liquid suspension cultures using the haemacytometer and the Spectronic 20. Start an experiment to determine the increase in cell number over a 24 hour incubation period in cultures containing different concentrations of an essential nutrient. (Graphing Assignment #2 due (2%)).
Class #6: Complete experiment started in class #5. The meaning and significance of resolution in microscopy. (Quiz #2 (5%), Laboratory Notebooks marked (2%)).

Gray Unit:
Sequence and content may be subject to minor revisions. The deadline for each assignment is at the beginning of class.
Class #1: Welcome. Unit assignments, resources, and expectations. Introduction to virtual study.
Class #2: Grammar blitz (clickers!). Primary and secondary sources. Citations and references. Academic integrity.
Class #3: Writing for clarity and conciseness. Methods and Results. (Library Assignment due (2%)).
Class #5: Abstract exercise. SciArt checklist. (Annotations due (8%)).
Class #6: Feedback from Annotations. Peer review session (Scientific Article). Scientific article (15%) due first session of next rotation
Krajnyk Unit:
Class #1: Outline of objectives for this unit. Introduction to the importance and design of lab notebook. Introduction to the scientific method. Introduction of experimental projects. Introduction to flow chart. Assignment of team projects and discussion with each team regarding their experimental design.

Class #2: Discussion and example on how to write hypotheses and protocol. Introduction to poster design and content. Set up of experiments with introduction of specific team based experimental techniques. *Failure to participate in the experimental work (Session #2) will result in a loss of 2.5% of the total mark for this unit. (Submission of Flow chart).*

Class #3: Introduction to statistical analyses. Collection of experimental data for each project. *(Assignment #1 and submission to ‘Turnitin’ (2%)).*

Class #4: Introduction with examples to writing the results section. Introduction to PowerPoint presentation of experimental results. Statistical analysis of experimental data. *(Quiz #1 (2%)).*

Class #5: Completion of outstanding experimental work and/or statistical analysis. Lab time devoted to preparation of oral and poster presentations. *(Quiz #2 (2%)).

Class #6: Submission of posters to ‘Turnitin.’ *PowerPoint presentation of experimental results (3%). Poster presentation of experimental results accompanied with an interview session (6%). Submission of lab notebook (2%).*

Zabulionis Unit:
Class #1: Welcome to the Zab Unit. Structure and philosophy of the unit, lab safety, pipette usage, and biology of bacterial plasmids and transformation will be introduced. Conduct a transformation of *E. coli* with an antibiotic resistance-coding plasmid.

Class #2: Analysis and discussion of transformation experiment from previous session. Theory of transformation and plasmid structure discussed. Prediction, Data, Conclusion, and discussion from Class Data. Introduction of “Toy Box” for Independent Experiment.

Class #3: *Quiz #1 (2%)* covering pipetting, the transformation experiment and theory. The rest of the session will be used to design your Independent Experiment.

Class #4: Discussion of dilutions, both bacterial cells and concentrated solutions. Conduct your Independent Experiment.

Class #5: Analysis of first attempt at your Independent Experiment. Repeat Independent Experiment.

Class #6: *Quiz #2 (5%)* covering dilutions, plasmid structure and transformation of *E. coli*. *Practical Test (2%)* involving pipetting and plating. Wrap up of Independent Experiment: *Prediction, Protocol, Data, Biological Mechanism, and Conclusion (3%) in Lab Book. Lab books (2%) handed in for marking by the end of class.*

(4) Required Course Materials:
A current edition of the *Resource Manual for Biology 2290* and a hard-bound lab notebook (preferably the "A91" style) are required and are available in the UWO Bookstore.
Additional required materials will be available on a regular basis from the course Biology 2290G OWL (Sakai) site (webct.uwo.ca). Use your UWO email username and password. **Lab coats and safety glasses are required for most labs.**

(5) Evaluations of assignments/final exam:
- Final Grades will be derived from “in-class” assignments and a Final Exam:
  - 70%—Assignments and tests completed while the course is in progress.
  - 30%—Final Exam (as scheduled by the Registrar)
- Assignments (including in-class quizzes, writing and graphing exercises, oral and poster presentations, practical tests and a properly maintained lab notebook) will be administered or due as indicated in the preceding section on course content (3b).
- **Once assignments, etc. have been returned there is a 48 hr cool-down period before asking questions.**
- If you wish to have your assignment/final exam reassessed, we will review the entire document/exam. Your mark may remain the same, increase, or decrease. The revised mark will replace the original mark with no basis for appeal.
- If a component of the course is missed for a validly documented reason and no make-up is possible, the instructor may transfer the allocated percentage for the missed component to the percentage of the final examination (exception Gray unit).

(6) Additional Information:
(a) **Programmable calculators** may not be used in the final examination.
(b) **Personal Response Systems (“Clickers”)** will be provided and used in the Gray Unit to facilitate class discussion. Responses will be neither assessed nor saved.
(c) **Academic Offences:** 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:


(d) **Plagiarism:** Plagiarism is a major academic offence (see Scholastic Offence Policy in the UWO Calendar) and UWO uses software and marking practices designed for plagiarism checking. The Biology 2290 Resource Manual (p. 9) defines plagiarism with respect to this course.

This course requires substantial written work on assignments and the Final Exam. Although much of the work in Biology 2290 is collaborative in some way, students are expected to write independently, in their own words. Whenever students take an idea or data from another source, they must acknowledge their debt by proper referencing. Appropriate examples will be discussed in class.

*All required papers, assignments and posters will 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 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.

The copy submitted to Turnitin (on OWL (Sakai)) must be identical to the hard copy. Failure to comply with this guideline will result in a mark of zero. Resubmission of any assignment is not permitted without consent of instructor. A late penalty may be applied.

(e) **Late Submissions:** Submissions received **within** 24 hours of the deadline will be assessed a penalty of 25%. Submissions received **later than 24 hours past the deadline** will receive a mark of zero. It is the responsibility of the student to immediately consult with an instructor and deliver late assignments to the appropriate marker. Instructors may grant an extension or a grade of “absent” in cases involving documented health or compassionate concerns (please refer these to the academic counsellors in your Faculty).

Each assignment in the Gray Unit must be received in hard (paper) copy and in Turnitin (on OWL (Sakai)) before the deadline to be relieved of any late penalty.

(f) **Academic Accommodations for Religious Holidays:** The Faculty of Science strictly adheres to the University policy on accommodation for students based upon conflicts with religious holidays. Accommodation will only be granted for the specified date of the religious holiday. Only holidays appearing on the University-approved list of dates will be accommodated. See the academic counsellors in the Office of your Dean for the list of approved dates. Students requesting accommodation must do so, in writing, to the academic counsellors in the Office of your Dean at least a month before the scheduled exams/assignments.