**BIOL-340 (*3 credits only*)**

**Biology Research TUTORIAL Syllabus**

**Instructor:** Faculty of the Dept. of Biology [SUBSTITUTE YOUR NAME HERE]

You will be conducting research this semester for a grade. I want you to be clear on my learning goals for this experience, of the expectations that accompany these goals, and of the source of your grade.

**Learning Goals:**

As you might expect, the learning goals for your TUTORIAL are only partially about the scientific knowledge involved and largely about the process of science. The learning goals listed below are drawn from the Biology Department learning goals and are used to highlight the ones most important in your research project. At this stage in your undergraduate career, we expect you to use this opportunity to REINFORCE of many of these learning goals.

* Content Knowledge:
  + Broad context of [FILL IN AREA OF STUDY]
  + Deep knowledge of current knowledge and research in your specific area of study
* Process Knowledge: [SELECT APPROPRIATE SUBSET FOR RETENTION]
  + Integrate New Knowledge into Existing Intellectual Frameworks
    - Ability to interpret, evaluate and critique texts, primary literature and presentations
    - Ability to structure and contextualize understanding with proper reference to literature
    - Ability to speculate on meanings of scientific data and on possible future directions
    - Intersection with other natural sciences and intersecting fields
  + Engage with Scientific Inquiry
  + Ability to evaluate the significance and context of the area of investigation
  + Ability to use and evaluate texts, primary literature, presentations and construct mathematical models to stimulate questioning and develop scientific hypotheses
  + Ability to appropriately design and perform experiments and construct mathematical models in order to test scientific hypotheses
  + Ability to interpret data to evaluate hypotheses and place findings into an intellectual framework to plan further experiments
* Represent and Interpret Data in Quantitative and Statistically Meaningful Forms
  + Recognize the critical importance of quantitative data and the facility to work with it in biological inquiry and understanding
  + Distinguish between and work rigorously with both qualitative and quantitative data
  + Construct and interpret visual representations of quantitative data
  + Use probability and statistical analyses to evaluate and interpret data
  + Communicate Scientific Understanding in Oral and Written Forms
    - Ability to communicate scientific understanding to scientific audiences
    - Ability to present scientific ideas arguing from evidence
    - Ability to write and speak precisely
  + Appreciate the Epistemology of Science
    - Ability to apply scientific principles to interpret new data
    - Ability to recognize the limitations of methodologies as they affect the interpretation of data
    - Ability to understand the biological basis of scientific debate and the role of probability and uncertainty in science
    - Ability to appreciate and participate in a scientific community as a forum for scientific thinking, research, debate and progress

**Expectations:**

* First, that you will take your research seriously as a commitment to your intellectual development. Being a good scientist is very difficult – requiring knowledge of scientific concepts, familiarity with scientific techniques, and the ability to think creatively and critically at the same time about new ideas, experimental design, and data analysis. There is no shortcut to success in all of this. Just lots of time and effort.
  + - You should expect to put it at least 12 hours/week on your TUTORIAL.
    - Some of this time will be spent in our weekly meetings and/or journal clubs.
    - Some of this time will be spent reading the scientific literature, preparing your own presentations, and writing your TUTORIAL paper.
    - The remainder should be devoted to conducting the work of your TUTORIAL project.
    - Obviously in some weeks, you will spend more time writing and less time doing experiments – but often you can read/write about your research while an experiment is going that doesn’t require your constant attention (i.e. doing other homework while an experiment is running does not count as TUTORIAL time.)
* Second, that you will take your research seriously as a commitment to the [laboratory, classroom, scholarly field]. Your research is using human resources: you will find that you are mentored by many different people in your research [faculty, graduate students, research staff, classroom teachers, internship supervisors], and taking your research seriously is a sign of respect for the time and expertise they are devoting to you. Additionally, your research is also using monetary resources, and taking your research seriously is necessary to make the best possible use of this money. Not incidentally, the data that we collect with this current allotment of money will determine our chances of obtaining funding in the next funding cycle.
  + - One marker of a serious research commitment is the quality of your research notebook. You should keep a research notebook for all types of TUTORIAL projects, and this notebook should be orderly, detailed, and complete. It must document your work such that anyone could pick it up and reproduce what you had done. You can expect me to routinely check this.
    - You must contribute to other laboratory records – e.g. freezer records of oligos, cell lines, plasmids, etc.
* Third, that you will embrace your research as an opportunity to be a member of a scientific community. Your research community may be local and/or dispersed around the world (check the literature!), so your project doesn’t exist in isolation. Hence your responsibility isn’t just to yourself: you are responsible to a much larger community, and the quality of your research will influence the work of others. Scientific communities flourish best as intellectual democracies where all members are needed to help each member advance on their own path – and to advance our progress toward our common goals. You’ll learn both from what others teach to you as well as from what you teach to others.
* Fourth, that you will embrace your research as an opportunity to play with science. In many course settings, you are rewarded for what you know – and thus most of your efforts are directed toward gaining knowledge. In research, knowledge is just the starting point, and you are rewarded for your ability to creatively build on that knowledge. You’ll often learn just as much from getting things wrong as you will from getting something right – but only if you really put in the time to be critically reflective and to use your failures to inform future successes.

**Grading**:

* ~10% - Attendance: you are required to attend all weekly research meetings unless you request permission to be absent in advance because of a legitimate conflict.
* ~20% - Discussion: you will be required to present your data regularly at lab meetings and introduce scientific papers at journal club. You will be graded both on your presentation and your ability to answer questions.
* ~30% - Time in Lab: research requires a significant time commitment. I cannot possibly grade productivity since too much depends on forces beyond your control, but I can reward your effort and the time you devote to trying to achieve productivity.
* ~30% - Written Research Paper:
  + This is a grant proposal that will describe and justify the series of experiments that you are proposing for your TUTORIAL research; your research from this semester should serve as preliminary data in this proposal. OR
  + This is a scientific paper that summarizes your research progress thus far; this will serve as the core of your TUTORIAL paper next year. OR
  + This is a thorough introduction to the literature that is relevant to your research; in essence, the background and significance for your TUTORIAL research.
  + This paper should be ~10 pages, 1.5 line spacing, 1 inch margins. Standard scientific citations should be used.
  + Again, you will have various due dates throughout the semester for components of the proposal. Meeting these draft deadlines with *quality writing* will constitute half of the final grade. Please remember that my role is NOT to serve as a copy editor for your writing. The drafts that you turn in should already have been repeatedly edited by you for clarity of argument, organization, and grammar/punctuation/spelling. If you are challenged to write well, please seek the help of the writing center. Poorly written drafts will simply be returned to you without comment and will lower your grade.
* ~10% - Final Presentation:
  + You will be presenting your TUTORIAL research to the lab at our final lab meeting.
  + You are expected to use Powerpoint for this presentation, and I will ask for an electronic copy of your slides.

I will follow the standard grade divisions for your TUTORIAL project:

≥90% is a grade in the A range

≥80% is a grade in the B range

≥70% is a grade in the C range

≥65% is a D

<65% is an F

As is true for other course work, I believe that an A in your TUTORIAL project is appropriate only for a truly superior performance. Meeting all expectations and doing solid work will earn you a B. Since TUTORIAL is optional – for both you and your mentor – you should remember that a strong performance on your TUTORIAL will be important as a gateway into your TUTORIAL project.

The last page of this document is a signatory form that defines your TUTORIAL project specifications and that requires the signatures of you and your mentor(s) (both internal and external if appropriate). You are expected to make a sufficient number of copies of the signed form such that all signators can be given a copy.

**Honest Scholarly Work:**

All work done in connection with RISE must adhere to the rules of the Georgetown honor system. As *responsible scholars*, you are expected to properly reference your sources at all times both through in-text citations and bibliographies. Direct quotations are discouraged in scientific writing, but if you do directly quote a source (use exact words), use quotation marks. You must cite sources for ideas and facts even when you do not directly quote.

Georgetown’s honor code prohibits plagiarism – intentional or otherwise – and we must report any suspicion of plagiarism to the Honor Council. We have come across several instances of plagiarism in our time at Georgetown. Common themes: (1) plagiarism typically results from last minute pressures to complete an assignment. Work ahead of schedule! (2) Plagiarism is remarkably easy to detect (even without using services such as Turnitin.com, though we retain the right to use such services). (3) All experiences with the Honor Council have been thoughtful and respectful – yet also painful for everyone involved. Let’s not go there.

To learn more about the Honor System:

<http://gervaseprograms.georgetown.edu/hc/honor_system.html>

If you are unclear what constitutes plagiarism, please read:

<http://gervaseprograms.georgetown.edu/hc/plagiarism.html>

On all written assignments, please include and each member must sign (on electronic documents an inclusion of the statement with your names is sufficient) the University Honor Pledge: *“In the pursuit of the high ideals and rigorous standards of academic life,* *I commit myself to respect and uphold the Georgetown University Honor System:* *To be honest in any academic endeavor, and To conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.”*

Proper citations include a notation within the text (author name, year) and a reference list at the end of the text (follow the guidelines of a journal agreed to by your mentor).

**Commitment to Biology Research TUTORIAL (BIOL-340-xx)**

**Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Faculty Mentor Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Research Project Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Research Project Description:**

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By signing below, I am certifying that I have read and agree to the terms of this TUTORIAL Project as required of my role as the enrolled student: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_

By signing below, I am certifying that I have read and agree to the terms of this TUTORIAL Project as required of my role as a mentor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

By signing below, I am certifying that I have read and agree to the terms of this TUTORIAL Project as required of my role as a mentor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_