

**Kingsborough Community College  
The City University of New York  
Department of Biological Sciences  
In Partnership with New Dorp High School**

Biology 61 Research Methods Fall 2024 Course

**Bio 6100 – RESEARCH METHODS (2 credits, 2 hours)**

In this course you will be introduced to the nature of scientific investigation and acquiring skills needed to develop a research problem. Emphasis placed on reading primary sources of scientific literature, experimental design, data presentation and analysis, and preparation of a literature review.

This course is designed to introduce the student to the nature of scientific investigation and assist in acquiring the skills needed to develop a research problem. Emphasis is placed on reading primary sources of scientific literature, experimental design, data presentation and analysis, and preparation of a literature review on a specific research topic of interest in the Biological Sciences. Each student will be required to write a research proposal and give an in-class oral presentation (Fall final exam). This will be followed by independent research and completion of research projects in the Spring semester. The course will culminate in a research paper and oral presentation of research findings (Spring final exam).

Students will be exposed to the practical operation of basic laboratory research instruments. Students design, carry out and report on research projects utilizing the following: Instruments and techniques will include the use of analytical balances, pH meters, chromatography, gel electrophoresis, microscopy techniques and a variety of other techniques. Laboratory quizzes, practical exams to demonstrate competency in the use of instrumentation, in class oral presentations, research proposals (fall), final research paper (spring), and final oral presentations (fall and spring) will be given.

**Prerequisites and Corequisites:** waived as per permission of the Department.

**Course Objectives:**

a-To introduce students to basic research techniques employed in the Biological Sciences.

b- To provide students with the ability to develop and test basic hypotheses related to problems in the biological sciences.

c-To provide students with the opportunity to conduct a comprehensive literature search and to write a research proposal based upon their ability to solve a scientific problem, utilizing critical thinking, the scientific method, and basic research concepts presented.

**Recommended:**

A Short Guide to Writing about Biology 3<sup>rd</sup> edition (1997) by Jan. A. Pechenik. Addison Wesley Longman Inc. Additional readings from the attached reading list on select topics will be assigned to the students as needed.

**Research Proposal:** Each student will be required to prepare a research proposal and present their topic to the rest of the class. Topics and mentors will be assigned early in the semester for each student. The topic of the proposal should relate to the students' proposed summer research project. As part of the grade, students will give a Powerpoint presentation on their topic on the last day of class.

Students should use the following guideline for writing their proposal:

Statement of Project Purpose

Review of the Literature

Objectives of the Proposed Project

Proposed Methodology

a) Materials and Methods

b) Instrumentation

c) Experimental Design and Statistical Analysis

## **STUDENT OUTCOMES**

Upon completion of the course students are expected to:

1. Use the library and internet to conduct a thorough literature search in preparation for selecting a research topic and planning a research project.
2. Demonstrate an understanding of the scientific method and use its techniques to test the validity of a scientific hypothesis.
3. Use a computer for data collection and analysis.
4. Write a preliminary research proposal to include the identification of their research project, a brief literature review, project objectives, and an outline of their research protocol utilizing the scientific method.
5. Prepare and deliver a powerpoint presentation of their research proposal.
6. Demonstrate knowledge of the ethical, legal and social issues in various areas of biological research.

## **Civility Statement**

As an institution of higher education, Kingsborough Community College and its faculty and staff are committed to its entire student body. As such, we strive to interact with each student equitably and professionally while providing an environment of mutual respect and civility. In the event a student has an allegation charge brought against him/her that is a breach of the Henderson Rules to Maintain Public Order or the Campus Code of Conduct, an immediate investigation will commence followed by a conciliation conference to determine the appropriate outcome within a thirty day period. The Judicial Affairs process at Kingsborough Community College is critical in providing an agenda for safety, yet simultaneously offering protection of the rights of students who may have been accused of being in violation of the Henderson Rules to Maintain Public Order and/or the Campus Code of Conduct. These rights have been afforded to each Kingsborough student under the bylaws that were established in 1969.

## **Academic Integrity**

Academic integrity means that all the work you do in this course (exams, quizzes, reports, papers, etc.) is your OWN work and no one else's. It includes not cheating on exams or quizzes in any way, as well as avoiding plagiarism in your writing. Plagiarism is using anyone else's work or ideas without proper attribution. This means that if you quote, paraphrase, or even describe in your own words, an idea that comes from someone else's writing, you MUST acknowledge that author in parentheses at the end of the sentence or sentences in which you have summarized his or her idea. Plagiarism, whether intentional or not, is taken seriously and can result in a failing grade. It is almost always very obvious if you do it, so don't risk it. If you are not sure how to reference a source, ask the instructor for help. Your instructor adheres to CUNY policy on academic integrity, which can be found in your student handbook or online at [http://www.kingborough.edu/Academic\\_Integrity\\_Policy.pdf](http://www.kingborough.edu/Academic_Integrity_Policy.pdf). These sources explain the policy in detail and give examples. Please be aware that academic dishonesty may result in a failing grade on the exam or in the course, as well as dismissal from the college. Additional websites that may be of use include: turnitin.com, citationmachine.com and plagiarism.org. (Polizzotto, K., personal communication, 2008).

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### **Equity Statement**

In an ideal world, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. I acknowledge that much of scientific research and publications have been the work of white men. With that in mind, I have tried to select topics and activities that broaden the voice of science as well as consider and respect differences. However, although I have tried to address inequities in science, there may be both overt and covert biases in the materials you read during the course. Please contact me if you have any suggestions to improve the quality of the course materials. One of my teaching goals is to create a learning environment that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.).

To help accomplish this:

- I will ask you to tell me the name and/or set of pronouns you would like me to use to address you.
- I want to be a resource for you. If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to connect with me to talk about it.
- Like so many people, I am still in the process of learning about diverse perspectives and identities. I will make mistakes!

### **Reading List**

Weekly readings from the following reading list on basic research methods will be assigned. You will design laboratory protocols employing the scientific method and submit a research proposal based upon a comprehensive literature search and outlining a specific laboratory protocol.

Booth, W, J. Williams and G. Colomb. ***The Craft of Research*** (1995) University of Chicago Press (Chicago, IL). ISBN: 0226065847

Brown, S., S. Brown and P. Race. **500 Tips for Research Students** (1997), Taylor & Francis, Inc. (New York, NY). ISBN: 0749417676

Gibaldi, J. ***The MLA Handbook for Writers of Research Papers*** (1999) 5th ed., Modern Language Association (New York, NY). ISBN: 0873529766

Hailman, J and K. Strier. ***Planning, Proposing, and Presenting Science Effectively: A Guide for Graduate Students and Researchers in the Behavioral Sciences and Biology***, 1st ed. (1997) Cambridge University Press (New York, NY). ISBN: 0521568757

Katz, S. ***Writing in the Sciences***, 1st Ed. (1997) St. Martin's Press, Inc. (New York, NY). ISBN: 0312119712

Latour, B and S. Woolgar. ***Laboratory Life: The Construction of Scientific Facts*** (1990) Princeton University Press (Princeton, NJ). ISBN: 069102832X

McMillan, V. ***Writing Papers in the Biological Sciences***, 3rd ed. (2001) St. Martin's Press, Inc. (New York, NY) ISBN: 0312258577

Robyt, J and B. White. ***Biochemical Techniques: Theory and Practice*** (1990), Waveland Press. (Prospect Heights, IL). ISBN: 0881335568

### **Kingsborough Grading Policy**

Research Proposal (Final)	25%
PowerPoint Presentation	30%
Mini Papers, Assignments (in class and/or at home)	20%
Class Participation including Field Trips	25%
<b><u>TOTAL</u></b>	<b><u>100 points</u></b>

### **Attendance Policy,WU and INC Grades**

Attendance will be taken at the start of class. Any student not present when attendance is taken will be marked absent. If a student arrives late to class, it is the responsibility of the student to inform the instructor at the end of class that he/she came in late. At that point, the absence will be changed to late. If a student does not inform the instructor that he/she came in late, that student remains marked as absent for that class. To meet the college's attendance policy, students cannot miss more than 2 times the number of hours the class meets per week. Also, students cannot miss more than 2 labs. Over these, students will be assigned a WU grade. INC is only assigned if a student is passing the class and can pass the class if they complete the assignments that have not been submitted during the semester within the time frame established by the instructor.

### **Online Ethics in Research Course**

All students in Bio 61 must complete an online course in "Ethics in Research". Instructions on how to access the "Ethics in Research" module online will be provided by your instructor. It is your responsibility to complete this module and print out the completion certificate. This certificate must be submitted to your instructor prior to the completion of the course. If the certificate is not submitted before the end of the semester you will receive an "INC" grade for the course and will not be permitted to conduct your summer research project.

### **Accessibility**

Access-Ability Services (AAS) serves as a liaison and resource to the KCC community regarding disability issues, promotes equal access to all KCC programs and activities, and makes every reasonable effort to provide appropriate accommodations and assistance to students with disabilities. Please contact this office if you require such accommodations and assistance. Your instructor will be glad to make the accommodations you need, but you must have documentation from the Access-Ability office for any accommodations.

### **Required Materials**

Note taking supplies (dedicated notebook)

Access to Google Classroom and Google Applications for making PowerPoint ,mini writing assignments etc.

## FALL KBCC Required Topics Outline

\*This list is meant to serve as a guideline and is subject to change based on NDHS calendar

<b>Unit</b>	<b>Topic</b>
<b>1</b>	<p><b>Introduction: The Nature of Science</b>                      The Nature of Science: History and Philosophy of Scientific thought; Scientific Method.                      -Intro to lab safety online module.                      -Distribution of Research topics list                      -Claim Evidence Reasoning strategy for supporting writing</p>
<b>2</b>	<p><b>Literature Review and Literature Search</b>                      Conducting literature searches using the library, use of on-line resources to conduct literature searches, reliability of journals and magazines as sources of scientific information, and peer review of experimental results; discussion of reputation of various sources of information. Accuracy and relevance of information will also be addressed.                      -Visit from Mr. Angell, our school Librarian                      -Mini-paper assignment (critiquing a scientific study)                      -How to use APA citation (you will learn the magic of noodle tools)</p>
<b>3</b>	<p><b>The Scientific Method</b>                      Scientific Methodology: assumptions and publishing scientific findings. limitations; guidelines and ethical and legal issues of research.                      -Responsible conduct of research                      -Research proposal topics assigned</p>
<b>4</b>	<p><b>Biological Research</b>                      Ways of conducting research: case studies, blind/double-blind studies, in vitro vs. in vivo studies, epidemiology.                      -Animal models of disease will be reviewed.                      -Advantages, disadvantages and limitations of instrumentation and techniques often utilized in science will be discussed.</p> <p><b>ELSI</b>                      -Students will debate ethical, legal and social issues in various research areas.                      -Students will be assigned a paper, article, or topic which must be critiqued, based on relevance to the field, experimental design including research methodologies utilized.</p>
<b>5</b>	<p><b>Introduction to Molecular Bio</b>                      Molecular biologists examine plant, animal or human genetics and the variation and relationships between them. Molecular biologists can work with DNA and RNA from humans, plants, animals and other organisms while using their knowledge of chemistry, physiology, genetics, physics and biology in their work.                      -Students will look at DNA and its role in biological traits and processes</p>
<b>6</b>	<p><b>Biostatistics</b>                      Purpose &amp; role of statistical analysis in biological research will be discussed; common statistical tools will be presented</p>
<b>7</b>	<p><b>Computers</b>                      Use of the computer as a tool for data collection and presentation: word processing; graphing; spreadsheets; power point. The Internet and World Wide Web as scientific information sources. Students will be provided with topics to investigate and compare using both on-line and library resources.                      -Research paper distributed to read for critique in class (peer review).</p>
<b>8</b>	<p><b>Experimental Design</b>                      Various techniques and approaches utilized in biological research will be examined and discussed. Experimental design and methodologies will be critiqued, including their limitations.</p>
<b>9</b>	<p><b>PowerPoint Presentations and Critique of Scientific Papers</b>                      Presentation of research proposals and experimental methodology - critique papers.</p>
<p><b>Required Field Trips</b>                      DNA Learning Center or Genovesi Environmental Study Center (TBD)                      American Museum of Natural History (Virtual Tour- TBD)</p>	

