

**Kingsborough Community College**  
**The City University of New York**  
**Department of Biological Sciences**

**Biology 62: Biological Instrumentation**

**Spring 2018**

**BIO 6200 – BIOLOGICAL INSTRUMENTATION (2 crs. 3 hrs.)**

Theory and practical operation of basic laboratory instruments and techniques, including analytical balances, pH meters, UV/VIS spectrophotometers, atomic absorption spectroscopy, chromatography, gel electrophoresis, computer-based instrumentation and other techniques.

**Prerequisites:** Passing scores on the CUNY Reading and Writing exams; a passing score on the COMPASS parts 1 and 2 or a passing grade in MAT M200; and department permission

**Corequisite:** BIO 6100

This laboratory course presents the theory and 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, UV/VIS spectrophotometers, atomic absorption, chromatography (paper, thin layer, column), gel electrophoresis, microscopy techniques (dissecting, compound, phase contrast, photomicroscopy, digital imaging), O<sub>2</sub> electrode, microbial cell culture and a variety of other techniques. Laboratory quizzes, practical exams to demonstrate competency in the use of instrumentation, in class oral presentations, research proposal, and a final oral presentation will be given.

Biology 62, Biological Instrumentation, is a 2-credit, 3-hour course required of students in the Bridges to the Baccalaureate and CSTEP Programs. Classes meet Fridays 11:30AM–2:50 PM. Pre-requisites: permission of the department and passing CUNY Math and English. Co-requisite: Bio 61 Research Methods. Classes meeting at Medgar Evers College will meet in Rm C310; Travel directions to the College will be provided.

**Course Objectives:**

- a- To introduce students to the use of basic biological research instrumentation.
- b- To develop the laboratory skills and techniques required to design experimental protocols and test hypotheses utilizing basic laboratory research equipment.
- c- To develop and improve scientific writing and oral communications skills based upon laboratory experiences and ability to think critically.

**STUDENT OUTCOMES**

Upon completion of this course, students will be able to:

1. Demonstrate the correct use of basic biological instrumentation.
2. Perform various laboratory techniques and field procedures.
3. Use the appropriate computer algorithms to identify specific protein sequences, and DNA polymorphisms.
4. Use the techniques and instrumentation demonstrated in class to carry out a faculty mentored research project.
5. Demonstrate critical thinking and the responsible/ethical use of biological instrumentation and laboratory techniques in the conduct of their research project.

## Textbook

Supplements and specific readings will be assigned by the instructor. Additional readings from the attached reading list on select topics will be assigned to the students as needed.

Weekly readings from the following reading list on the use of specific instruments will be assigned. Students will design laboratory protocols utilizing appropriate equipment, and submit a laboratory report.

## 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.

## Reading List

Alexander, S.K. and D. Strete. Microbiology. *A Photographic Atlas for the Laboratory*\_2001. Benjamin Cummings, New York.

Biermann, C, P. Lanzetta, G. Lind, T. Markus, M.T. Ortiz, P. Pilchman and A.M. Stavroulakis. *General Biology I. Laboratory Manual*. Updated Revised Second Edition. 2008. McGraw-Hill Primis Custom Publishing, New York.

Boylestad, R. and Nashelsky, L. *Electronic Devices And Circuit Theory*. Third Edition. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1982

Boyer, R. *Concepts in Biochemistry* (1999) Brooks/Cole, Pacific Grove, CA.

Cromwell, L. *Biomedical Instrumentation And Measurements*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1973.

Hames, B. and D. Rickwood, Editors, *Gel Electrophoresis of Proteins: A Practical Approach*, 2<sup>nd</sup> ed. (1990), IRL Press (Oxford). An excellent book for starters.

Hanai, T. *HPLC: A Practical Guide* (1999), Springer-Verlag (New York) HPLC introduction and application.

Holme, D. and H. Peck. *Analytical Biochemistry*, 3<sup>rd</sup> ed. (1998), Addison Wesley Longman (Essex).

- Maniatis, T, E.F. Fritsch and J. Sambrook. *Molecular Cloning: A Laboratory Manual*. Second Edition. 1989. Cold Spring Harbor Laboratory Press, New York.
- Matejschuk, P., Editor, *Affinity Separations: A Practical Approach* (1997), IRL Press (Oxford). Principles and applications.
- Mathews, C., K. van Holde, and K. Ahern. *Biochemistry*, 3<sup>rd</sup> ed. (2000), Benjamin/Cummings (San Francisco).
- Mertens, T.R. and R.L. Hammersmith. *Genetics. Laboratory Investigations*. 2001. Prentice Hall, New Jersey.
- Mirabella, F. *Modern Techniques in Applied Molecular Spectroscopy* (1998), John Wiley & Sons (New York). Theory and application in all areas of spectroscopy.
- Risley, J. *J. Chem. Educ.* 68, 1054 (1991) "Preparing Solutions in the Biochemistry Lab."
- Roby, J and B. White. *Biochemical Techniques: Theory and Practice* (1987), Brooks/Cole (Monterey, CA).
- Tortora, G.J., B.R. Funke and C.L. Case. *Microbiology. An Introduction*. 2001. Benjamin Cummings, New York.
- Welkowitz, W. and S. Deutsch. *Biomedical Instruments: Theory And Design*. Academic Press, New York. 1976.

### 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.

### 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).

## Grading Policy

Lab Assignments	30 points
Class Participation including Field Trips	30 points
Competency in the use of lab instrumentation and techniques as assessed in laboratory activities	<u>40 points</u>
<b><u>TOTAL</u></b>	<b><u>100</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 61-62 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.

## Lab Safety Training Class

All students in Bio 61-62 must complete the Lab Safety Training class. The date for this class is indicated on the course calendar. It is your responsibility to attend this class. If you do not attend the Lab Safety Training class you will receive an "INC" grade for the course and will not be permitted to conduct your summer research project.

## Required Materials

- Full length lab coat
- Goggles
- Lab note book
- Non-Latex gloves (vinyl or nitrile)
- Close-toed shoes
- Tie backs for long hair

## Spring 2018 Topical Course Outline Bio 62

<b>Week #1</b> 3/02/18	<b>Introduction</b> The Nature of Science: History and Philosophy of Scientific thought; Scientific Method.	<b>All Faculty</b> <b>KCC</b>
<b>Week #2</b> 3/09/18	<b>Microscopy</b> Introduction to and use of the Compound light, dissecting and phase contrast microscopes. Demonstration of the Scanning Electron Microscope	<b>Zeitlin</b> <b>KCC</b>
<b>Week #3</b> 3/16/18	<b>Introduction to Measurements</b> Analytical balances, accuracy and the metric system, use of common laboratory glassware. Solutions, serial dilutions, use of automatic pipettors, pH measurement, and buffers	<b>Catapane</b>  <b>MEC</b>
<b>Week #4</b> 3/23/18	<b>Biotechnology and Bioinformatics</b> Using computers to analyze genetic and protein data	<b>Hinkley</b> <b>KCC</b>
3/30-4/06/18	<b>SPRING BREAK – NO CLASSES</b>	
<b>Week #5</b> 4/13/18	<b>CSTEP CONFERENCE – NO CLASSES</b> <b>Sagamore Hotel Lake George NY</b>	<b>Hinkley</b>
<b>Week #6</b> 4/20/18	<b>Field Methods in Biology</b>	<b>Colon</b> <b>Polizzotto</b> <b>KCC</b>
<b>Week # 7</b> 4/27/18	<b>Statistical applications in Biology and Lab Safety</b> Using statistical software to analyze data	<b>Rozenboym</b> <b>KCC</b>
<b>Week #8</b> 5/04/18	<b>Introduction to spectrophotometry</b> Use of the UV/VIS spectrophotometer (recording) and Atomic Absorption. Use of computer for analysis and graphical presentation of data.	<b>Carroll</b> <b>Catapane</b> <b>MEC</b>
<b>Week #9</b> 5/11/18	<b>Field Trip:</b> Cold Spring Harbor Laboratory – <b>Dolan DNA Learning Center</b>	<b>Several Faculty</b> <b>KCC/MEC</b>
<b>Week #10</b> 5/18/18	<b>Cell Biology Techniques</b> Cellular Fractionation techniques, O <sub>2</sub> probe <b>Electrophoresis</b> Protein/nucleic acid identification and characterization by electrophoresis. DNA extraction. Student teams offer hypotheses, and design experimental protocols to investigate selected problems	<b>Catapane</b> <b>Carroll</b>  <b>MEC</b>
<b>Week #11</b> 5/25/18	<b>FIELD TRIP: American Museum of Natural History</b>	<b>Several Faculty</b> <b>AMNH</b>
<b>Week #12</b> 6/01/18	<b>Student Power Point Presentations</b> Submission of research proposals & student presentations	<b>All Faculty</b> <b>KCC</b>