**New York City College of Technology**

**Department of Biology & Chemistry**

**Course Code:** IS901

**Title:** Exploring Biodiversity at Newtown Creek

**Number of hours, credits:** 3 credits, 3 hour independent study, with lab hours included in class hours)

**Instructors:** Anna Feitzinger ( feitzin@cshl.edu ) and Peter Spellane (peter.spellane80@citytech.cuny.edu)

**Course description:**

Students explore a cutting-edge methodology that has helped scientists all over the world identify and study biodiversity: DNA barcoding. Students will learn concepts in conservation biology and genetics and gain hands-on experience performing DNA extractions, PCR, gel electrophoresis, and bioinformatics analyses. Students will apply these skills to conduct an independent research project examining biodiversity in Newtown Creek, a designated Superfund site along the Brooklyn-Queens border. This research will contribute to a growing body of knowledge about how decades of pollution has impacted water quality, ecosystem health, and species richness. Students will propose a research project, collect samples from Newtown Creek, carry out experimental protocols, and present posters of their findings.

**Pre/Co-requisite:** BIO101 or equivalent

**CUNY Pathways (Life and Physical Sciences) and Discipline Specific Learning Outcomes**

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| **LEARNING OUTCOMES** | **ASSESSMENT** |
| Identify and apply the fundamental concepts and methods of a life or physical science. | Make connections to fundamental concepts in project proposal and presentation. |
| Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation. | Develop a reasonable research project proposal and successfully implement. |
| Use the tools of a scientific discipline to carry out collaborative laboratory investigations | Successful field collection, biochemical procedures, and bioinformatics analysis |
| Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report. | Successful research project implementation and presentation. |
| Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data. | Successful research project proposal development, implementation, and presentation. |

**General Education Learning Outcomes**

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| **LEARNING OUTCOMES** | **ASSESSMENT** |
| Identify and apply the basic principles of mathematics, physics, biology, chemistry, and engineering as they relate to the environment at an introductory level | Incorporate cross-disciplinary ideas into research project proposal and presentation. |
| Apply the scientific method to explore environmental issues. | Conduct a research project on Newtown Creek, a Superfund pollution site in rehabilitation. |
| Gather, analyze, visualize, and interpret data. | Successful field collection, biochemical procedures, and bioinformatics analysis |
| Participate effectively in a multi-disciplinary team environment. | Collaborative, critique, and present research projects. |

**Course Outline**

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| **WEEK** | **Class** |
| 1 | Course syllabus, introduction to history and industry of Newtown Creek, introduction to DNA barcoding (homework: visit Newtown Creek) |
| 2 | DNA barcoding of student plant and animal specimens (homework: visit Newtown Creek) |
| 3 | DNA barcode analysis (homework: proposal development) |
| 4 | Individual project and proposal development (homework: proposal development) |
| 5 | Proposal presentation and critique (homework: specimen collection ideas) |
| 6 | Specimen collection planning and approach (homework: Newtown Creek map planning) |
| 7 | Collection visit to Newtown Creek, specimen storage (homework: specimen documentation) |
| 8 | DNA extraction, PCR amplification, and sequencing (homework: prep for bioinformatics) |
| 9 | DNA barcode bioinformatics analysis (homework: Genbank and Barcode of Life analysis) |
| 10 | DNA metabarcode bioinformatics analysis (homework: data visualization) |
| 11 | Follow-up specimen collection, DNA extraction, PCR amplification, and DNA sequencing (homework: bioinformatics analysis) |
| 12 | Follow-up bioinformatics analysis (homework: bioinformatics analysis)  |
| 13 | Poster preparation (homework: poster preparation) |
| 14 | Poster preparation (homework: poster preparation) |
| 15 | Poster Session and oral presentations |

**Evaluation Methods and Criteria**

Course grade is based on a combination of the following: exams, laboratory exercises, discussion/participation, research report and presentation. Final grades will be determined as indicated in the table below.

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| A | 93-100% | C+ | 77-79% |
| A- | 90-92% | C | 70-76% |
| B+ | 87-89% | D | 60-69% |
| B | 83-86% | F | 0-59% |
| B- | 80-82% |  |  |
| Homework | 20% |
| In-class Participation | 20% |
| Research Proposal | 20% |
| Research Poster and Presentation | 40% |

**Academic Integrity Statement:**

*“Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion.”* The complete text of the College policy on Academic Integrity may be found in the catalog.

**Technology Statement:**

Before entering the course, students must be familiar with MS Word, MS Excel (simple graphing), and MS PowerPoint, accessing and using various features of Blackboard.

**Accessibility Statement:** Our goal is to create learning environments that are usable, equitable, inclusive, and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify the instructor as soon as possible. Students with disabilities are to contact the Student Accessibility Center (300 Jay Street. Room L-237; 718-260-5143; <http://www.citytech.cuny.edu/accessibility/>) to formally establish accommodations. Students with accommodation letters must provide me with a copy of your letter and make an appointment to meet with me as soon as possible to discuss your needs. (Adapted from Cooper Union)