Administrative Unit: Science Department

Course Prefix and Number: BIOL 395

Course Title: Research Design in the Sciences

Number of: Credit Hours: 3 Lecture Hours: 3 Laboratory Hours: 0

Catalog Description: Study of applied research in the natural sciences, with special emphasis on experimental design and methodology, data generation and critical analysis, and scientific writing and presentation. Cross-listed as ENVS 395 and CHEM 395. Students majoring in biology, chemistry, or environmental studies must earn a grade of C or better. Prerequisites: Fifteen credit hours of BIOL, ENVS, and/or CHEM courses; junior standing; MATH 150. Offered spring.

Prerequisite(s)/Corequisite(s): Fifteen credit hours of BIOL, ENVS, and/or CHEM courses; junior standing; MATH 150.

Text(s): The main focus for this class will be material from the primary literature. In addition, texts addressing aspects of research design in the natural sciences are suitable, such as:

- *Explaining Science.* (Giere, Univ. of Chicago Press, 1988).

Course Objectives:

- To learn the history and philosophy of science.
- To understand the scientific method.
- To examine different approaches to research design.
- To become familiar with the use and interpretation of primary literature.
- To be able to write scientific papers using journal format.

Measurable Learning Outcomes:

- Describe and integrate major theoretical and philosophical underpinnings of scientific research.
• Discriminate between primary and secondary sources of literature; search databases to find appropriate primary literature.
• Extract and summarize information from primary scientific publications, using both oral and written presentation.
• Explain how research questions are designed according to the scientific methods.
• Use and analyze variables, relationships, theories and hypotheses relating to current scientific problems/studies.
• Implement appropriate sampling and measurement techniques for data analysis.
• Analyze and interpret scientific data.
• Write scientific papers according to the format used in peer-reviewed journals.
• Explain major difference in research design approaches, and evaluate their appropriateness to specific contexts.
• Evaluate appropriate methodologies for specific research problems in the field and/or laboratory.
• Explain how computer modeling can be used as an appropriate research design.
• Evaluate ethical issues in research, including use of live subjects, intellectual property rights, fraud, and plagiarism.

Topical Outline (major areas of coverage):

• Philosophy and history of science
• Searching and using the scientific literature
• Scientific writing and presentation
• The scientific method
• Research design
• Generation and analysis of data
• Ethical issues in research

Recommended maximum class size for this course: 20

Library Resources: Online databases are available at http://www.ccis.edu/offices/library/resources.asp. You may access them from off-campus using your eServices login and password when prompted.

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Date: September 12, 2005

NOTE: The intention of the master syllabus is to provide an outline of the contents of this course, as specified by the faculty of Columbia College, regardless of who teaches the course, when it is taught or where it is taught. Faculty members teaching this course for Columbia College are expected to facilitate learning pursuant to the course objectives and cover the subjects listed in the topical outline. However, instructors are also encouraged to cover additional topics of interest so long as those topics are relevant to the course’s subject. The master syllabus is, therefore, prescriptive in nature but also allows for a diversity of individual approaches to course material.