CSM 510: Biology Education Research: Teaching, Learning, and Assessment

Introduction to core policy documents, standards, concepts, and empirical methods in biology education research and their applications to undergraduate classroom settings. Appropriate for graduate students in the biological sciences and/or those enrolled in the Ph.D. Program in Science Education.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 545: The Nature of Science

The nature of science refers to the values and assumptions inherent in the development, understanding and interpretation of scientific knowledge. Scientific knowledge is empirically based, culturally embedded, tentative, and incorporates subjectivity and creativity. This course will address the following: What is science? What distinguishes science from other ways of knowing or as being basic science, applied science or technology? What philosophical, social, ethical and historical perspectives are important in understanding the nature of science?

3 credits, Letter graded (A, A-, B+, etc.)

CSM 546: Topics Biotechnology

An introduction to the field of biotechnology. The course will survey the history of the development of genetic engineering, methodologies used in biotechnology, applications of biotechnology in medicine, agriculture and manufacturing, and the implications of these technologies for society. Intended for the students in the MAT Science and MALS programs. This course has an associated fee. Please see www.stonybrook.edu/course fees for more information.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

CSM 547: Topics in Genetics

A survey of genetics organized around a particular topic, including gene regulation, developmental genetics, cancer genetics, epigenetics with emphasis on areas with emerging new insight. The methodology used to study these areas will also be explored. Intended for students in the MAT Biology and PhD Science Education programs.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 548: Current Topics in Microbiology

A survey of microbiology with an emphasis on microbial ecology, the role of microbes in the biosphere and the methodology used to explore these areas. The course is organized around two resources available online: Unseen Life on Earth: An Introduction to Microbiology, which was produced by The American Society for Microbiology (http://www.learner.org/resources/series121.html) and the New York State core curriculum for The Living Environment (http://www.p12.nysed.gov/ciai/mst/sci/ls.html). Intended for the students in the MAT Science and MALS programs. This course has an associated fee. Please see www.stonybrook.edu/course fees for more information.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 549: Laboratory Science Curriculum Development

Development of curriculum materials appropriate for a secondary school biology classroom. Students may take this course in their second semester of the Master of Arts in Teaching Science program.

1 credit, Letter graded (A, A-, B+, etc.)
May be repeated 1 times FOR credit.

CSM 550: Independent Study in Biology

A research project or body of readings will be selected with an instructor. It is expected that participants will gain current information in a topic of interest with applicability to middle school or high school curriculum. Prerequisite: Permission of instructor.

1-6 credits, Letter graded (A, A-, B+, etc.)

CSM 551: Polymerase Chain Reaction: Theory and Practice

The polymerase chain reaction (PCR) has become an indispensable tool in biology. PCR has revolutionized our approach to medical diagnostics, basic research, and forensic applications. This laboratory and lecture course is designed to teach a solid theoretical and practical framework for PCR, including primer and application protocol design, trouble-shooting, and interpretation of results.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 552: Current Concepts in Neurobiology

Neurological disorders such as Parkinson's and Alzheimer's have been the center of much media attention recently. This lecture and laboratory course is designed to provide students with a basic overview of the brain and nervous system. Course participants will also utilize current approaches taken by research scientists to investigate the properties of the nervous system and its disorders. Laboratory activities that can be used in secondary school curricula will be emphasized. Prerequisite: Undergraduate degree in Biology.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 553: Biology and Human Social and Sexual Behavior

A biological theory of human uniqueness is presented and explored through the examination of empirical evidence from a multidisciplinary perspective including insights from ethnology, human social and sexual behavior, evolutionary biology, history, economics, the humanities and political science.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 554: Current Topics in Immunology

This is a comprehensive course in Immunology designed to be taught to secondary school teachers and it will address the new living environment curriculum standards for Immunology. The proposed course will combine lectures in Immunology with practical laboratory exercises. Laboratory activities will be provided that can be modified for secondary school education. Emphasis will be made on recent developments in Immunology and the essential role of the immune system in protection from infections and cancer. Concepts to be covered include how the immune system distinguishes self from non-self, how it handles various pathogens and why it sometimes fails.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 556: Ecology

An examination of the interactions of living organisms with their physical and biological environments. Special attention is given to population dynamics and the interactions among organisms that determine the structure, function, and evolutionary development of biological communities. In addition, teacher candidates will conduct an independent project consisting of either a research paper or development of an ecology laboratory for a secondary school science class.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 557: Forensic Science

Forensic science is focused upon the application of scientific methods and techniques to crime and law. In this course, scientific methods specifically relevant to crime detection and analysis will be presented.
Emphasis is placed upon understanding the science behind the techniques used in evaluating physical evidence. Science MAT students or permission of the instructor.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 560: Life Sciences for Grades 5-8
This is an integrated lab/lecture course designed to increase confidence and enthusiasm while building fundamental knowledge of middle-level science teaching and learning in the Life Sciences. Topics include chemical basis of life (biochemistry), cell structure and function, vital life process (respiration and photosynthesis), genetics, evolution and ecology. This course includes standards-based curriculum design and research-based teaching strategies as well as hands on laboratory experiences. It focuses on developing and presenting inquiry-based lessons designed to encourage students to investigate science using educational technologies to support science lessons, integrated other subject matter areas with science, designing differentiated lesson that include all students in learning science, and assessing student understanding of science and the nature of science.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 562: Chemistry for the Pre-High School Teacher
This course provides participants with the necessary chemistry content needed to teach physical science applications at the upper elementary and middle school levels. The New York State Science and Learning Standards (NYSSLS) are utilized to provide a structure for the topics that teachers are required to teach within the new standards. In addition, the science and engineering practices and cross-cutting concepts addressed in NYSSLS are integrated within the discussion of chemistry content. During each lesson, chemical safety requirements are addressed and discussed. This course is designed to provide teachers with chemistry content required for the disciplinary core ideas of the NYSSLS standards through integration of activities, hands on learning and reading assignments.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 599: Graduate Research in STEM Education
Research to be supported by a faculty member in the Programs in Science and STEM education. Prerequisite: Permission required.

Fall, 1-9 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

CSM 600: History and Philosophy of STEM Education
An introduction to the history of the field of STEM (science, technology, engineering, mathematics) and the related philosophical underpinnings. The course will survey the major events, ideas and philosophies and how these have changed over time. Particular focus will be on the time period from 1890 to the present day. Offered Fall, 3 credits, Letter graded (A, A-, B+, etc.)

CSM 610: The Nature and Practice of Science
An overview of the nature and practice of science through the analysis of current issues in science. Through the extensive use of case studies, students will address questions such as: What is science? What distinguishes science from other ways of knowing? What standards of evidence and scientific explanations, processes, and conventions are used in science? What philosophical, social, ethical, and historical perspectives are important in understanding science?

Offered Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)

CSM 620: STEM Teacher Education
Introduction to the historical, philosophical and pedagogical issues surrounding STEM (science, technology, engineering, mathematics) teacher education. Introduction to the nature of the research that has been conducted on teacher education in the past and current trends. Offered Spring, 3 credits, Letter graded (A, A-, B+, etc.)

CSM 630: STEM Education Research Seminar
Introduction to the major theoretical frameworks and paradigms in societal issues (gender, culture, and diversity) contextualized in STEM (science, technology, engineering, mathematics) education. Students will be required to critique research papers in the field and will conduct a literature review in their general thesis area. Offered Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)

CSM 635: Qualitative Research Methods in STEM Education
Introduction to qualitative research methods in STEM (science, technology, engineering, mathematics) education including a) its purposes, b) data collection techniques, c) methods of data analysis, and d) preparing appropriate research reports.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 640: Directed Study in STEM Education
In their fifth semester students will individually complete a directed study with a faculty advisor. The intent of this course is to prepare the students for the doctoral qualifying examination and assist them in refining their research topics. Offered Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

CSM 645: Introduction to Quantitative Research Methods
This course will provide doctoral student with an introduction to various quantitative research methods (non-experimental, experimental, and quasi-experimental designs) and the corresponding data analysis/statistical procedures used for conducting empirical research in STEM (science, technology, engineering, mathematics) education. Appropriate statistical analysis associated with each research method will be discussed and SPSS assignments included. Students will develop a research proposal for a peer reviewed conference of journal.

3 credits, Letter graded (A, A-, B+, etc.)

CSM 650: Introduction to Measurement and Assessment in Science Education
Spring 650: Introduction to Measurement and Assessment in Science Education. 3 Credits. Introduction to core standards, concepts, and empirical methods in educational measurement and assessment; introduction to the development, use, and evaluation of measurement instruments in science education. Semesters Offered: Fall and Spring 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated 1 times FOR credit.

CSM 699: Dissertation Research on Campus
Prerequisite: Must be advanced to candidacy (G5); major portion of the research will take place on SB campus, at Cold Spring Harbor; or at Brookhaven National Lab. Semesters offered:

Fall, 0-9 credits, S/U grading

May be repeated for credit.

CSM 700: Dissertation Research Off Campus-Domestic
Prerequisite: Must be advanced to candidacy (GS); major portion of the research will take place off Campus, but in U.S. and/or U.S. provinces. All international students must enroll in one of the graduate student

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insurance plans and should be advised by an International Advisor.

Fall, 1-9 credits, S/U grading
May be repeated for credit.

**CSM 701: Dissertation Research Off Campus-International**

Prerequisite: Must be advanced to candidacy (GS). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance (if they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable); all international students must receive clearance from an International Advisor.

Fall, 1-9 credits, S/U grading
May be repeated for credit.