SCI 0901. E4 = Experiencing Evolution, Ecology, and Ethology. 6.8 Hours.
Offers students an opportunity to experience a series of high school-level laboratories, which are useful in mastering the fundamental principles of evolutionary biology. These labs, several of which include live animals as model systems, increase high school students’ interest in scientific inquiry by providing hands-on activities in the areas of animal behavior (ethology), ecology, and genetics. Participants are presented with both a lab manual and an instructor’s resource manual to foster the dissemination and the incorporation of these materials into their high school curriculum. Provides a vocabulary list, photographs of specific readings and the accompanying questionnaires, important Web sites, and a CD with PowerPoint lectures to use as a reference. Complies with the pre-K–12 Learning Standards established by the Massachusetts Department of Education.

SCI 0903. Biology: Sharks, Skates, and Rays. 6.8 Hours.
Focuses on the basic biological principles surrounding this relatively ancient and incredibly well-adapted group of fishes. Includes their acute sensory abilities, unique physiological and anatomical features, behavior, and reproductive modes that characterize these fascinating cartilage-based aquatic organisms. Seeks to dispel popular myths surrounding the indiscriminate and dangerous nature sharks possess as man-eaters while shedding light on the incredible degree and rate by which humans have depleted global shark populations. Emphasizes methods to incorporate class lessons into individual classrooms.

SCI 0904. Geographic Information Systems (GIS) for Educators. 6.8 Hours.
Focuses on the use of geographic information systems (GIS) as a teaching tool in the classroom. GIS can help learners of all ages understand the ways that geography affects their lives and helps teachers and students engage in studies that require critical thinking and integrated learning. Offers students an opportunity to gain hands-on experience using ArcView GIS software, along with a series of lessons that can be adapted to the classroom.

SCI 0909. Inquiry as Content and Teaching Methods. 6.8 Hours.
Designed to increase students’ pedagogical knowledge of inquiry as content and teaching methodology as described in the National Science Education Standards. Discusses scientific inquiry abilities and understandings as they apply within the context of the state/local standards as well. This course is an adaptation of Biological Science Curriculum Study’s (BSCS) Keys to Science Institute.

SCI 0910. Machines in Motion. 6.8 Hours.
Focuses on the Massachusetts Elementary and Secondary Education Science and Technology/Engineering Curriculum Framework. Using the playground as the science laboratory, offers participants an opportunity to explore how this environment provides for inquiry-based, open learning through the basic processes of experimentation, allowing students to think about collected results and what they mean. Examines how to pose questions to students to allow knowledge in physical science to be built in a stepwise fashion. Emphasizes group situations, allowing for the development of shared learning experiences in a problem-based learning environment. Activities are directed at the evaluation and use of common school facilities and playground equipment to study simple machines, motion, forces, fluid flow, sound, and strength of materials.

SCI 0913. Surveys of New England Coastal Ecosystems. 6.8 Hours.
Explores the following New England coastal habitats as well as current research in each: rocky intertidal zone, sandy beach, salt marsh, and nearshore benthic (ocean floor) zone. Introduces and practices authentic research models, with the final day of the course spent participating in open discussions regarding how to replicate materials with students in and out of the classroom.

SCI 0920. Earth and Space Science. 6.8 Hours.
Offers content driven by the Massachusetts Department of Education Science and Technology/Engineering Curriculum Framework. Describes each topic covered in the context of comparative planetology, including planets around other stars. Includes a summary of the current state of understanding of the topic being addressed, followed by a description of scientific methods from current studies, stories of the scientists involved, and a discussion of the data and degree of certainty in the scientific conclusions.

SCI 0922. Understanding Science: A Writing Approach. 6.8 Hours.
Focuses on writing for the science classroom—abstracts, position papers, technical reports, and exploratory essays. Guided inquiry in the science classroom always involves writing. Scientists and science students regularly write a variety of reports. Offers participants an opportunity to develop a variety of writing genres for the science classroom and to develop instructional strategies and assessment models for teaching science writing. Environmental themes—such as stewardship, global warming, and sustainability—are the science content models for the class. The writing supports the Massachusetts Science Curriculum framework.

Offers middle and high school teachers an opportunity for hands-on training to implement an innovative robotics curriculum that integrates concepts in engineering and technology with topics from the physical sciences. The engineering and technology concepts are derived from components of the Massachusetts Science and Technology/Engineering Curriculum Frameworks and presented for use in an inquiry-based learning environment. Using the engineering design process (EDP), offers participants an opportunity to identify a problem, design a solution with easy-to-use structural components, add appropriate automation and controls, and program and test their designs, as well as to develop experience using robotic components such as LEGO Mindstorms, TETRIX, and VEX Robotics. Emphasizes group situations, allowing for the development of shared learning experiences in a problem-based learning environment.

SCI 1990. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 2990. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 3990. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 4990. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.
SCI 5976. Directed Study. 1-4 Hours.
Offers independent work under the direction of members of the department on a chosen topic.

SCI 5978. Independent Study. 1-4 Hours.
Offers independent work under the direction of members of the department on a chosen topic.

SCI 5984. Research. 1-4 Hours.
Offers students an opportunity to conduct research under faculty supervision.

SCI 6209. Inquiry as Content and Teaching Methods. 4 Hours.
Designed to increase students’ pedagogical knowledge of inquiry as content and teaching methodology as described in the National Science Education Standards. Discusses scientific inquiry abilities and understandings as they apply within the context of the state/local standards as well. This course is an adaptation of Biological Science Curriculum Study’s (BSCS) Keys to Science Institute.

SCI 6503. Biology: Sharks, Skates, and Rays. 4 Hours.
Focuses on the basic biological principles surrounding this relatively ancient and incredibly well-adapted group of fishes. Includes their acute sensory abilities, unique physiological and anatomical features, behavior, and reproductive modes that characterize these fascinating cartilage-based aquatic organisms. Seeks to dispel popular myths surrounding the indiscriminate and dangerous nature sharks possess as man-eaters while shedding light on the incredible degree and rate by which humans have depleted global shark populations. Emphasizes methods to incorporate class lessons into individual classrooms.

SCI 6506. Research Experience for Teachers. 6 Hours.
Offers teachers an opportunity to participate in active research projects in professional laboratory settings. Seeks to provide participants with an extensive summer research experience and to make real connections between the research experience and the teacher’s classroom curriculum. Offers a comprehensive summer research experience within the research laboratories of CenSSIS for urban schoolteachers and an opportunity for participants to review and select research-based curriculum programs or units that are aligned with local, state, and national Frameworks, as well as the research experience.

SCI 6508. E4 = Experiencing Evolution, Ecology, and Ethology. 4 Hours.
Offers students an opportunity to experience a series of high school-level laboratories, which are useful in mastering the fundamental principles of evolutionary biology. These labs, several of which include live animals as model systems, increase high school students’ interest in scientific inquiry by providing hands-on activities in the areas of animal behavior (ethology), ecology, and genetics. Participants are presented with both a lab manual and an instructor’s resource manual to foster the dissemination and the incorporation of these materials into their high school curriculum. Provides a vocabulary list, photocopies of specific readings and the accompanying questionnaires, important Web sites, and a CD with PowerPoint lectures to use as a reference. Complies with the pre-K–12 Learning Standards established by the Massachusetts Department of Education.

SCI 6510. Threats to Marine Biodiversity. 4 Hours.
Focuses on the five primary threats the human race poses on the diversity of ocean life. The vast biodiversity of our oceans is not only a source of fascination and intrinsic value but provides sustenance and key products globally relied upon by humans. However, it is the human race itself that is both directly and indirectly exploiting these rich ecosystems at an alarming rate. Addresses the modes in which these threats have developed as well as their consequences, including the continued population reductions of the most preferred fish and shellfish species and marked changes in ecosystems dynamics. Explores the overall health of our oceans, as well as potential reductions/losses of species associated with current or potential biomedical products.

SCI 6512. Capstone Course: The Nature of Science and Inquiry. 4 Hours.
Explores the use of inquiry as a teaching method, as well as inquiry as a content piece throughout the sciences. Students read and discuss the most recent studies on inquiry as applied in K–12 settings. Studies the National Science Education Standards, various state standards, and local goals in the framework of inquiry. Offers students an opportunity to challenge their own conceptions of inquiry and consider their work from previous science courses while constructing lessons that are learner-centered.

SCI 6520. Earth and Space Science. 4 Hours.
Offers content driven by the Massachusetts Department of Education Science and Technology/Engineering Curriculum Framework. Describes each topic covered in the context of comparative planetology, including planets around other stars. Includes a summary of the current state of understanding of the topic being addressed, followed by a description of scientific methods from current studies, stories of the scientists involved, and a discussion of the data and degree of certainty in the scientific conclusions.

SCI 6521. Assessing Student Understanding in Today's Science Classrooms. 4 Hours.
Seeks to provide students with an in-depth focus on authentic assessment in the elementary science classroom and how to use the results of assessment to chart more effective pathways for instruction. Topics include the different types of assessment strategies, the distinction between evaluation and assessment, the nature of authentic assessment, and the design and use of rubrics and checklists. Seeks to review research that shows how assessment can enrich and focus learning, to examine national and state assessment items, to develop model assessments to be shared on a database, and to experience ways to evaluate student work to probe student understanding.

SCI 6522. Understanding Science: A Writing Approach. 4 Hours.
Focuses on writing for the science classroom—abstracts, position papers, technical reports, and exploratory essays. Guided inquiry in the science classroom always involves writing. Scientists and science students regularly write a variety of reports. Offers participants an opportunity to develop a variety of writing genres for the science classroom and to develop instructional strategies and assessment models for teaching science writing. Environmental themes—such as stewardship, global warming, and sustainability—are the science content models for the class. The writing supports the Massachusetts Science Curriculum framework.
SCI 6523. Assessing Student Work in Science and Its Impact on Instruction. 4 Hours.
Focuses on how to use assessment results to inform instruction in science. Offers participants an opportunity to examine student work critically in order to evaluate what students have learned regarding key concepts in science. Explores how to edit and perfect teacher-developed assessments to probe for deeper understanding and design learning opportunities for students that deepen their mastery of content and standards.

SCI 6524. Connecting the Classroom to Real-World Engineering Experiences. 4 Hours.
Explores real-world teaching pedagogy and tools. Offers teachers an opportunity to utilize real-life projects from industry formulated for classroom delivery. High school teachers are immersed in an experience that is based on the engineering design process (EDP) and designed to help them teach science, technology, engineering, and mathematics (STEM) subjects more effectively. Topics covered include inquiry, the relationship between design and manufacturing, product design and analysis, design tools, hands-on projects, and capstone-based pedagogy. Participants should have a familiarity with EDP.

SCI 6530. AP (Advanced Placement) Environmental Science. 1-4 Hours.
Designed for educators who teach advanced or capstone environmental science courses for high school juniors or seniors and who want to prepare students for college-level work in environmental science or for the College Board AP environmental science exam. Focuses on college-level content and process skills such as lab experiments, problem solving, open response writing, preparing students for assessments, and integrating knowledge and results of scientific inquiry. It may also touch upon three areas of importance to teachers in urban schools: (1) how advanced work can be integrated into the typical urban high school setting and used to increase rigor throughout high school programs at all levels, (2) pedagogical strategies in science, and (3) capitalizing on existing supports and resources.

SCI 6535. Energy 1: Integrating the Sciences through Energy. 4 Hours.
Offers a graduate-level science course designed for preservice and inservice K–12 science teachers. Contextualized to the standards/inquiry-based curricula found in the Massachusetts state curriculum standards. Provides graduate-level content while modeling sound pedagogy. Aims to use the concept of energy to integrate interdisciplinary relationships between the biological, physical, chemical, and earth sciences. Using current and future curriculum materials, as well as state and national standards for the teaching of science at the middle-school level, this course offers an in-depth exploration of energy and the fundamental physical processes that shape climate (such as heat transfer, solar variability, orbital mechanics, greenhouse gases, atmospheric and oceanic circulation, volcanic aerosols, and biological cycles) and provides evidence for past and present climate change.

SCI 6541. Backyard Ecology: Exploring the Local Ecosystem. 4 Hours.
Focuses on environmental science through an intensive field study in a local outdoor ecosystem, working collaboratively to carry out an in-depth exploration of that ecosystem. Some of the topics covered include the six-kingdom classification system of organisms, characteristics common to all organisms, plants and plant processes, weather conditions, the use of taxonomic keys, food webs and food chains, predator/prey relationships, producers/consumers/decomposers, interdependent relationships, and soil types and conditions. Asks students to design and carry out an inquiry-based project.

SCI 6542. Documenting Students’ Science Knowledge. 4 Hours.
Designed to help teachers learn how to determine what their students really know (or think they know) and understand about the science in their everyday world. A great deal of research has been focused on this subject because it is now known that students’ science misconceptions can actually interfere with learning new information. Offers participants an opportunity to explore ways to unveil student misconceptions and learn how to deal with them when they arise.

SCI 6543. Assessing Inquiry-Based Science. 4 Hours.
Designed to provide participants with an in-depth focus on authentic assessment in the elementary science classroom. Topics include the difference between formative and summative assessment, the distinction between evaluation and assessment, the nature of authentic assessment, the design and use of rubrics and checklists, and the use of assessment to improve planning and instruction. Covers questioning strategies and a protocol for looking at student work. Emphasizes how to use the daily science journal as an assessment of what students have learned.

SCI 6544. Integrating Technology into the Science Classroom. 4 Hours.
Seeks to broaden participants’ knowledge about and to strengthen their ability in the selection of software and identification of Web sites that can be integrated into the science classroom. Reviews the research supporting the use of software and Web sites in science classrooms at all levels. Offers participants an opportunity to select, review, analyze, and evaluate various software and Web sites and then design technology-based lesson plans to match the content that they teach in their own classrooms.

Offers middle and high school teachers an opportunity for hands-on training to implement an innovative robotics curriculum that integrates concepts in engineering and technology with topics from the physical sciences. The engineering and technology concepts are derived from components of the Massachusetts Science and Technology/Engineering Curriculum Frameworks and presented for use in an inquiry-based learning environment. Using the engineering design process (EDP), offers participants an opportunity to identify a problem, design a solution with easy-to-use structural components, add appropriate automation and controls, and program and test their designs, as well as to develop experience using robotic components such as LEGO Mindstorms, TETRIX, and VEX Robotics. Emphasizes group situations, allowing for the development of shared learning experiences in a problem-based learning environment.

SCI 6610. Machines in Motion. 4 Hours.
Focuses on the Massachusetts Elementary and Secondary Education Science and Technology/Engineering Curriculum Framework. Using the playground as the science laboratory, offers participants an opportunity to explore how this environment provides for inquiry-based, open learning through the basic processes of experimentation, allowing students to think about collected results and what they mean. Examines how to pose questions to students to allow knowledge in physical science to be built in a stepwise fashion. Emphasizes group situations, allowing for the development of shared learning experiences in a problem-based learning environment. Activities are directed at the evaluation and use of common school facilities and playground equipment to study simple machines, motion, forces, fluid flow, sound, and strength of materials.

SCI 6961. Internship. 1-4 Hours.
Provides students with an opportunity for internship work. May be repeated without limit.

SCI 6962. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.
SCI 6964. Co-op. 0 Hours.
Provides eligible students with an opportunity for work experience.

SCI 6966. Practicum. 1-4 Hours.
Provides eligible students with an opportunity for practical experience.

SCI 6970. Seminar. 1-4 Hours.
Offers an in-depth study of selected topics.

SCI 6980. Capstone. 1-4 Hours.
Offers students an opportunity to integrate their course work, knowledge, and experiences into a capstone project.

SCI 6983. Topics. 1-4 Hours.
Covers special topics in science. May be repeated without limit.

SCI 6995. Project. 1-4 Hours.
Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.