

# ***NCSSM***

## ***Wachovia Mini-Term 2010***

### ***PROPOSED COURSES***

The following courses have been proposed by NCSSM Faculty and Staff for **Mini-Term 2010** (February 25 – March 5). In addition, students have the opportunity to develop **Independent Projects** of their own design. Students will indicate their preference for any **three** of these potential mini-courses, and/or their own independent project, on the Mini-Term 2010 **Pre-Registration Form** (due on-line through their Focus/SIS account no later than **October 30, 2009**). Additional courses may be added prior to that deadline. For further information, please visit the NCSSM Mini-Term website (<http://www.ncssm.edu/miniterm/>).

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NCSSM Foundation*

## ***Mini-Term 2010 Proposed Courses***

### **MT002 3D Modeling of Biological Macromolecules** (Kapral / Schmalbeck)

Students will explore the world of macromolecules as they learn to design and generate structural models from experimental data. We will cover the fundamentals of protein and nucleic acid structure and how they are represented, from physical models to interactive computer visualization. Students will embark on analyzing a protein or DNA/RNA structure of their choosing, using the display capabilities and illustrative tools of “kinemages” to search for interesting active sites, interactions and motifs—possibly fixing mistakes made by famous scientists along the way. Students will also compete in “FOLDIT”, a massively multiplayer simulation game based on protein folding techniques. The culmination of the course will be a field trip to the Duke Immersive Virtual Environment, a six-screen, fully 3D virtual reality cube where students will be able to literally stand in the center of their structure and present their findings to the rest of the group.

Cost per Student: None

Maximum Enrollment: 12

### **MT004 Alaska—Polar Research** (Bondell)

Students will travel to Fairbanks, Alaska to complete projects associated with that part of the world. Projects in the past have covered topics as diverse as Plasma Physics and Ice Carving. In addition to project work, students will participate in activities such as dog sledding, skiing, aurora viewing, curling, traveling to the Arctic Circle, and soaking in hot springs. This trip is a fun balance of work and play!

Prerequisite: Instructor Approval

Cost per Student: Approximately \$1800—includes transportation, lodging, most meals, and activities

Maximum Enrollment: 6

### **MT006 Architecture in Berlin** (Dubois / Kirk / Murphy)

The intent of this Mini-Term course is to study the development of architecture in and around Berlin from the 17<sup>th</sup> century to the present day. Berlin has great examples of architecture from the Baroque to the Postmodern. Nearby are Dresden (Baroque), Potsdam (Rococo), and Dessau (the Bauhaus). The Sachsenhausen concentration camp also will be visited.

In this Mini-Term course, students will study the development of architecture, individual structures, and eras. They will study particular structures in detail and will further their research

through visiting the actual sites. Students will present aspects of their research to their fellow students on-site.

Prerequisite: Instructor Approval

Cost per Student: \$2000-\$2500 (dependent on the number of students and exchange rates)—includes transportation, lodging, and activities (though not meals)

Maximum Enrollment: 12

### **MT008 Athens and Sparta: History, Politics, Society, and Culture** (Hudson / Moose)

Explore the world of the ancient Athenians and Spartans—how they lived, how they organized and governed their societies, how they waged war, what cultures they created, and what values they believed in during Mini-Term 2010.

Academic Goals:

- Students will gain an understanding of the ancient city-states of Athens and Sparta, their history, politics, social organization, art, culture, and values.
- Students will explore some of the most important archaeological sites in Greece related to Athens and Sparta.
- Students will practice the virtues of flexibility, humor, energy, enthusiasm, and cooperation through the experience of group travel in a landscape, environment, and culture different from what they have known at home.
- Students will expand their understanding of their world and of themselves.

Prerequisite: Instructor Approval—any student with an authentic and demonstrated interest in ancient Greek history and culture is encouraged to apply, though students who have taken, or are taking, WECS I, WRRD I, Classical Mythology, or Latin, or who can otherwise demonstrate their interest in the ancient Greek world, will be given preference in the selection process—which consists of a written application and an interview with the Instructors

Cost per Student: Approximately \$3000—includes transportation, lodging, most meals, activities, required texts, and travel insurance (\$1500 due by December 1 / \$1500 due by January 5)

Maximum Enrollment: 15

### **MT010 Bayesian Statistics** (Bullard)

Classical statistics—the stuff of the AP Statistics curriculum—is so Twentieth-Century. Bayesian statistics is cutting edge and very modern. In this course we will discuss the methodology of Bayesian statistics and related computational techniques. Topics will include adaptive experimental design and MCMC sampling.

Prerequisite: Current enrollment in Calculus or beyond—no knowledge of statistics is required

Cost per Student: None  
Maximum Enrollment: 25

### **MT012 Biomechanics of Human Movement (Sims)**

Students will learn techniques for kinetic and kinematic data acquisition. They will learn analysis and post processing techniques for human gait data. They will also complete a project in kinematic and/or kinetic data analysis using force plates and/or kinetic data analysis using force plates and/or high speed imaging. Students will also read and discuss current research in biomechanics and sports medicine. At the end of the course students will submit a report on their findings and create a related poster.

Prerequisite: Completion PH 352 or PH405 and Instructor Approval  
Cost per Student: None  
Maximum Enrollment: 4

### **MT014 Bollywood! (Blaine / Peeples)**

Bollywood is a term referring to the Hindi-language film industry of Mumbai (formerly Bombay), India. The films are characterized by their glamour and song-and-dance routines that overwhelm the senses. In this Mini-Term course we will explore the Bollywood tradition by watching representative films from the early 20th century to the present. From a literary perspective, we will examine ancient Indian epics that have influenced many Bollywood storylines, and we will engage in film criticism through short reflective writings. From a historical perspective, we will look at changes in the industry over time and examine the impact of Bollywood in a globalized world, specifically in the Triangle area of North Carolina. Students will research a topic of interest within the Bollywood tradition to present to the larger NCSSM community on Sharing Day at the end of Mini-Term.

Cost per Student: \$15 to eat out at a local Indian restaurant  
Maximum Enrollment: 15

### **MT016 Broadway Dance (Berberian)**

Students will learn the history and dances of some of the most famous Broadway musicals. The focus will be on musicals from the 1950's to the present day. Students will learn the historical context of musicals and research a topic in musical theatre of their own choice. Students will have the opportunity to perform in the ETC Auditorium at the end of Mini-Term.

Cost per Student: None  
Maximum Enrollment: 25

### **MT018 Building a Vibraphone (Riggs)**

In this course we will study the acoustics that make up the sound of each vibraphone bar, fabricate pitched bars from aluminum, and visit the Ludwig-Musser percussion manufacturing plant in Monroe, North Carolina.

Cost per Student: None

Maximum Enrollment: 10

### **MT020 Call of the Wild: Red Wolves in North Carolina (Brisk)**

Humans have had a tumultuous relationship with wolves throughout history. They have been demonized and feared, resulting in their destruction and consequent deterioration of the ecosystems they support. Ignorance continues to threaten their existence in the west, but in North Carolina the Red Wolf Coalition has managed to successfully re-introduce this keystone species back into the wild. During Mini Term we will visit the wildlife biologists and red wolves that are part of this effort at the Museum of Life Sciences, the Asheboro Zoo, and travel for two nights to the outer banks at the Pocosin Lakes National Wildlife Refuge where they have been re-introduced. We will also observe the greatest migration of waterfowl including thousands of tundra swam and bald eagles.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$250—includes transportation, lodging, most meals, and activities

Maximum Enrollment: 8

### **MT022 China on the Big Screen—Modern Chinese Film (Deng)**

This course is designed for students with advanced listening comprehension skills in Mandarin Chinese. Students will watch Chinese films and TV shows as a group or on their own. Some of these films and shows will be picked beforehand and students will have an opportunity to vote on the others. They will learn modern Chinese culture. We will have discussions on the language components and cultural topics presented by the films and shows. At the end of the course, each student will give the class an oral presentation on a topic of their choice.

Prerequisite: Advanced listening comprehension skills in Mandarin Chinese

Cost per Student: None

Maximum Enrollment: 15

### **MT024 Coastal Ecological Research in Belize (Brinson / Halpin)**

The Neotropics is a magical place—full of strange sounds, lush plant life, and exotic animals. On this Mini-Term trip to Belize, students will design and execute a field research projects at Wee

Caye Marine Lab. Wee Wee Caye is located nine miles off the coast of southern Belize and is occupied solely by the Marine Station. It is an ideal setting for the study of mangrove swamps since it displays the textbook zonation of the mangrove species and is home to several genera of land crabs, lizards and a healthy population of the Central American Boa constrictor. The surrounding crystal clear Caribbean Sea supports lush turtle grass communities and coral reefs teeming with colorful fish and invertebrates. Nearby Cayes and reefs offer unlimited study sites for the entire Belize Barrier Reef ecosystem. Students will have the opportunity to learn about coastal ecology at pre-trip seminars, so they will be prepared to design and conduct their own research project while they are in Belize. Students will be expected to present their research findings to the NCSSM community when they return from Belize. Last year students investigated damsel fish behavior, pelican behavior, and the distribution of prop roots in red mangroves.

Go to <http://www.marineecology.com/fac.html> to learn more.

Prerequisite: Instructor Approval—science teacher and SLI recommendations, excellent swimming ability, and no fear of arthropods—valid passports and non-US citizens may require visas

Cost per Student: \$2400 (payment schedule: \$800 October, \$800 November 13, and \$800 January 5)—includes transportation, lodging, meals, and research activities

Maximum Enrollment: 15

### **MT026 Combinatorial Game Theory** (Teague)

Have you ever played Nim, Dots and Boxes, Sprouts, or Clobber? How about Domineering or Hakenbush? In the Mini-Term course we will learn some basic games and mathematical methods of analyzing those games to see who wins and with what strategy. For a final project, students will create their own game (or modify an existing game) and analyze it. This project could easily turn into a research project if the student is sufficiently interested and motivated.

Prerequisite: Good performance in Precalculus and an interest in research

Cost per Student: None

Maximum Enrollment: 20

### **MT028 Critical Analysis of World War II Through Film** (Litle / Wilson)

This course will examine military, social, political, and economic aspects of World War II through an analysis of films. Participants will be responsible for reading about, viewing, and evaluating a series of films on the time period surrounding World War II. Films may include, but will not be limited to, *Tora, Tora, Tora*, *Das Boot*, *U571*, *Saving Private Ryan*, *Bridge Over the River Kwai*, *Triumph of the Will*, *Letters from Iwo Jima*, *Flags of Our Fathers*, *Thin Red Line*, *To Hell and Back*, and *Schindler's List*. Students will be responsible for preparing viewing guides for films watched during the course. Student will work in small groups to prepare a brief presentation on a particular aspect of World War II strategy. The goal of the course is to develop

a visual image of the era of World War II and to share that image through prepared viewing guides. Student groups will share favorite footage with interested students on Sharing Day.

Cost per Student: None

Maximum Enrollment: 25

### **MT030 Deep Explorations in School Mathematics (Teachey)**

Have you ever encountered a concept in a math class that you wanted to study more deeply? Have you ever asked a math teacher a question that she or he did not have time to answer? In this course, you will have the opportunity to ask these questions and to explore these concepts in greater depth. We will explore school mathematics through the lenses of both teacher and student, and will have an opportunity to design learning activities to implement during visits to local schools. This class is for serious math students and for prospective teachers.

Prerequisite: No Trimester grade lower than a C+ in math courses at NCSSM

Cost per Student: None

Maximum Enrollment: 8

### **MT032 Eastern Regional Orchestra (Laird)**

This course is intended for students who audition for and/or are accepted into Eastern Regional Orchestra. NCSSM will be hosting the event on campus the weekend of February 26-28, during Mini-Term. Following the event, students will focus on other chamber and orchestral literature and attend several musical performances around the Triangle.

Prerequisite: Member of NCSSM Orchestra or Wind Ensemble

Cost per Student: Registration Fees for ERO and tickets to performances

Maximum Enrollment: 25

### **MT034 Eating Locally: The Farm to Fork Connection (Muth)**

Where did your last meal come from? If you are like most Americans, the food you just ate traveled thousands of miles from farm to fork. But more and more people are recognizing the benefits of eating locally grown foods. We will explore some of these benefits, such as decreasing carbon emissions, protecting the rural landscape, preserving unique breeds of plants and animals, stimulating the local economy, increasing national security, and enjoying fresher, more nutritious, more delicious foods. We will tour local farms, learn about organizations promoting local foods and sustainable agriculture in NC, shop at a farmer's market, and even grow and make some of our own food. We will conclude our Mini-Term by preparing samples of delicious, local foods to share with the NCSSM community.

Cost per Student: \$50 for purchasing food  
Maximum Enrollment: 10

**MT038 Fangtasia: The Vampire in Western Literature, Art, and Film** (Regalis / Sarrocco)

This is a course about the figure of the vampire in literature and the visual arts from roughly 1818 to the present. We will consider how the publication of Darwin's *Origin of Species*, new theories of geology, and changing definitions of the family and gender are reflected the metamorphoses of the vampire from the monstrous to the beautiful and seductive. Some of the works and films we will study are LeFanu's *Carmilla*, Stoker's *Dracula* (novel and film), Muranu's *Nosferatu*, Anne Rice's *Interview with the Vampire* (novel and film), Charlaine Harris's *Dead until Dark*, HBO's *True Blood*, *The Lost Boys*, and *The Hunger*. We will also look at the evolving image of the vampire and the Monstrous Female in painting and sculpture, in artists from Munch to Burne-Jones, von Stuck, and other painters.

Prerequisite: Completion of American Studies I & II  
Cost per Student: None  
Maximum Enrollment: 15

**MT092 France Through the Ages** (Lewis / Younes)

Ever wondered who lived in the palace of Versailles or in the chateaux's of the Loire Valley? Have you wanted to be on the beaches of Normandy and learn what happened there on D-Day? Have you wanted to visit Paris and find out how Notre Dame came into being, or why the Eiffel Tower was built? This French Mini-Term course will allow you to travel through time to these locations and more, introducing you to the history, culture, and artistic values of Paris and Northern France.

Prior to leaving, students will research specific historical and cultural sites and make an initial presentation to the group. Language, culture, and basic travel skills will also be covered in the pre-trip meetings to aid students' experience while in France. Then during our trip, students will give an expanded version of their research presentation again as we visit the actual site. Our guest lecturer, Victoria Bunch, who has studied, taught, and traveled extensively in France, will be with us to enhance the students' knowledge as well as place the experience in historical context. She also will elaborate on how this history has affected modern-day France.

Prerequisite: Instructor approval, along with a brief written application and interview  
Cost per Student: Approximately \$2,500—includes transportation, lodging, tours, admissions, and activities (but not food)  
Maximum Enrollment: 18

## **MT094 Ghana and Malaria: Science, Society, Service (Fenn / Wiley)**

The centerpiece of this Mini-Term course is a trip to Ghana, West Africa, grounded in an interdisciplinary study of malaria and culminating in a community service project. Ghana has a number of qualities that make it a good “introduction” to West Africa. Ghana’s official language is English, and it has a well developed economy and educational system. It was the first sub-Saharan African colony to achieve independence (in 1957), and has a Parliamentary democracy that is considered one of the most stable governments in Africa. Currently, malaria is a pressing health concern and a topic that calls for interdisciplinary study. Malaria is the fifth most deadly infectious disease worldwide, and the most deadly tropical disease. It is the leading killer of children in sub-Saharan Africa, and nearly 90% of malaria deaths occur in sub-Saharan Africa. Moreover, many malaria infections and deaths are not reported because they occur primarily in rural areas. Malaria is both a result and a cause of poverty and underdevelopment in the equatorial belt. The rise of drug resistant strains of malaria in the late 20<sup>th</sup> century led to a resurgence of the disease that has yet to be fully controlled. Yet, the eradication of malaria is currently a major focus of innovative programs such as the “Global Malaria Action Plan,” and the “Roll Back Malaria Partnership.” This Mini-Term will therefore introduce NCSSM students to an exciting and innovative area of international research and non-profit activism.

The course will begin with a seminar in the 2<sup>nd</sup> trimester. Korah Wiley will provide information on the biology and pathophysiology of malaria, and Katy Fenn will provide the historical and social context for understanding West Africa and the history of the disease, treatments and control projects. In addition to teacher lectures, students in the seminar will be required to research the factors that contribute to the endemic nature of malaria in the Volta region of Ghana and make presentations to the entire group.

The service component of this mini-term would be carried out in the trip itself. We will work with Cross-Cultural Solutions (CCS), an organization that coordinates volunteer work in a variety of international contexts. CCS is one of the founders of the International Volunteer Programs Association (which sets standards and accredits volunteer organizations), has “Special Consultative Status” with the United Nations, and partners with CARE (one of the largest and best known international humanitarian groups), among other affiliations. CCS has had a program based in the Lake Volta region of Ghana since 1996. In 2006, they moved their Ghana program “home base” to the town of Hohoe (pronounced “Ho-Way”). The “home base” is a large building with a staff on site that provides all meals, lodging, security, and organizes volunteer activities. In the Hohoe “home base” students stay in rooms with 3-6 persons per room, separated by gender. Hohoe is a small town and the CCS program is very much integrated into the life of the town. We can expect much quality, one-one-one time with the community during our stay in Hohoe—especially with children, who are reportedly very excited when visitors arrive at the home base. Through CCS we would work with the Hohoe Municipal Health Department in their “Malaria Outreach Program” on educational outreach—going into local Schools and to Nursing Mothers’ Programs to educate about malaria transmission and prevention measures, distributing treated bed nets, and/or assisting in gathering data about the Outreach Program. In addition to volunteering, there will be cultural and learning components of the trip involving such activities as lessons in the local dialects, traditional cooking, music, guest speakers, visiting nearby

villages or natural sites. We have included two days at the beginning of the trip to explore Accra and surrounding coastal areas.

Prerequisite: Instructor Approval

Cost per Student: \$3787—includes transportation, lodging, meals, and activities

Maximum Enrollment: 15

### **MT040 Glassblowing** (Roser)

This course will provide an introduction to glassblowing skills. The goal is to develop a thorough understanding of different glassblowing techniques, safety, materials, and equipment. The student will create a number of objects using the techniques taught each day, including solid objects such as paperweights, marbles, pendants, beads, rings, and ornaments, and hollow forms such as ornaments, perfume bottles, and flower vases.

Prerequisite: Instructor Approval

Cost per Student: Yet to be Determined—includes transportation, professional instruction, all equipment and materials

Maximum Enrollment: 12

### **MT042 Infinitesimal Calculus** (Gann)

The word infinitesimal is used to express the idea of an object so small that it cannot be distinguished from zero by any available means. The founders of calculus employed infinitesimals and achieved correct results, even though the use of these quantities was not proven to be rigorous and was fiercely criticized by many philosophers. Several mathematicians attempted to prove the soundness of calculus using infinitesimals, but it was not until the 1960's that this was achieved. Thinking along the lines of the original founders of calculus, but equipped with a rigorous definition of an infinitesimal, students in this Mini Term course will re-develop calculus from a “non-standard” infinitesimal approach.

Prerequisite: B or higher in BC Calculus III at NCSSM or a BC Calculus AP score of 5

Cost per Student: None

Maximum Enrollment: 8

### **MT044 Introduction to Aviation** (Rash)

What makes airplanes fly? What's it like to fly an airplane, and what does the FAA require pilots to do and know? What mathematics and science is in aviation? This Mini-Term course, taught by one of NCSSM's resident pilots, will answer these and other questions about aviation. Some specific topics this course may include: aerodynamics, navigation, weather, avionics, air traffic control and flight rules, pilot training requirements, etc.

Based on enrollment requests from the previous year, the demand for this course may be more than the allowed maximum enrollment. To this end, students interested in this Mini-Term course will be expected to submit a brief statement (1-2 paragraphs maximum) addressing the reason(s) why they are interested in this particular course.

Prerequisites: Instructor approval and (preferably) completion of Precalculus—working knowledge of some trigonometry expected

Cost per Student: \$15-\$20 to cover field trip costs

Maximum Enrollment: 12

### **MT046 Introduction to Intraday Forex Trading (Ki / Yeh)**

This project involves macro-economics, technical analysis, trading psychology, risk management, capital preservation, and personal financial knowledge. Students will be introduced to the world of currency arbitrage and learn the basics of trading. The ultimate goal is NOT to have a profitable demo account. The goal IS to learn and follow a set of trading instructions to see if the world of trading is something students would like to pursue in the future.

Goals during mini-term:

- Learn what Forex is
  - Learn basic strategies to trade profitably...and stick to it
  - Trade during London/US time frames
  - Understand how news affects the markets
  - Personal article research
- Understand risk management
  - This applies not only to the financial aspect but also how it can apply to the real world
- Understanding how quantitative easing affects the strength of the US dollar and international currencies

Students will learn from both the Mini-Term instructor and online mentors from Forexmentor.

Prerequisite: Interview with Instructor

Cost per Student: \$150 for on-line educational tools

Maximum Enrollment: 10 students

### **MT048 Irish Language, Celtic Culture (Munroe)**

This course is an introduction to Irish Gaelic as spoken in the Gaeltacht (Irish-speaking areas) of Ireland today. It is also an exploration of Celtic culture as expressed in contemporary Ireland and Northwestern Spain. Students will learn conversational Irish and use the internet to research place names, foods, Celtic music, musical instruments, legends/and myths in both regions to determine if, indeed, there is a Celtic connection. There will be videos, songs, instruments, and

readings to support students in their projects. A final oral dialog in Irish and a final group project on one of the cultural topics will be required.

Cost per Student: None

Maximum Enrollment: 10

### **MT052 Joyce & O'Connor: Stories** (Tougas)

James Joyce (1882-1941) and Flannery O'Connor (1925-1964) – great twentieth-century writers, he from Dublin, Ireland, and she from Milledgeville, Georgia; both Irish to the core but living away from Mother Ireland; both Catholic in passion but with intensity that burned through any trace of false religion – they saw into human life, and their stories remind me of tales from a road musician who said that you learn what is right from first doing it wrong, or tales from a medieval mystic who said that a person seldom comes to great things in life without at first going somewhat astray.

Read Joyce's "Dubliners" – you will be in the hearts of Dubliners a century ago, known not so much from what is actually said but far more from what is left unsaid (because suppressed, embarrassing, or horrible). Read O'Connor's "Everything that Rises Must Converge" – you will be in the rural South of the mid-twentieth century, because O'Connor is in your face with ironies and agony directly before you.

Cost per Student: None

Maximum Enrollment: 10

### **MT054 Jump Start College Essays** (Smallwood)

Students will learn how to write personal statements and other types of college essays of varying lengths and on a variety of topics. They will write, edit, and revise at least three essays that may be used in the admissions and/or scholarship application process. They will also take part in campus visits at UNC-Chapel Hill &/or Duke.

Prerequisite: Students must submit a typed explanation (approximately 100-200 words in length) of WHY they want to take this course.

Cost per Student: None

Maximum Enrollment: 8

### **MT056 Kitchen Chemistry** (Zuraw)

This course will explore the applications of chemistry in the preparation and cooking of food as well as other activities that occur in the common kitchen. Students will design and carry out experiments to investigate the chemical reactions and physical properties involved in the

preparation and cooking of foods. The experiments will include an investigation of the crystallization and other properties of sugar in the making of candy and desserts like creme brulee. Additionally, the acidic and basic properties of foods and cleaning items will be explored as well as the relationship of these properties on their uses and effectiveness.

Cost per Student: \$15 for cooking/kitchen supplies

Maximum Enrollment: 8

### **MT058 Living Foods** (Johnson / Schmalbeck)

Everyday foods like bread, yogurt and cheese rely on microorganisms to convert raw ingredients into a finished, edible product. What are these microorganisms, and what are they doing? In this class we will explore the role of microorganisms in food, considering the biological, cultural, and historical influences of what we eat. And, of course, we will eat what we study! Cooking and eating will be an integral part of what we do, including field trips to restaurants and a local creamery.

The class will culminate in a research project, where students choose a microorganism-dependent food, give a presentation on the biological, historical and cultural aspects of it, and then the class will share in a “Research Meal” centered around each project’s food of choice. This course will be taught by Jayme Johnson, a graduate student at Duke who does genetics research with baker’s yeast.

Prerequisite: Completion of at least one Biology course at NCSSM

Cost per student: \$15, plus approximately \$40-\$60 for restaurant visits, cheese/souvenirs from the creamery tour, and ingredients for the final Research Meal

Maximum enrollment: 8

### **MT060 Logic and Set Theory** (Avineri / Noble)

In this course, we will study the pure mathematical topics of logic and set theory, including predicate and symbolic logic and model theory. Through abstract and practical perspectives, we aim to:

1. explore in greater depth the idea of logic, "the study and analysis of the nature of the valid argument, the reasoning tool by which philosophers and mathematicians draw valid inferences from a given set of facts or premises" (Nicodemi, *Discrete Mathematics*, 1987, p. 3),
2. solve problems and learn reasoning and proof techniques, and
3. think about questions such as—What constitutes truth?

Enjoy logic puzzles? How about forming logical arguments to make your case? If you do, we think you'll enjoy this course.

Prerequisite: Completion or current enrollment in Precalculus

Cost per Student: None

Maximum Enrollment: 16

**MT062 Mammoth Cave: Exploring Cave Systems and Geology** (Fleming / Thomas)

This mini-term trip will use cave systems of central Kentucky and unique natural features to broadly cover the field of geology and how geologists study natural systems. You do not have to be an “outdoors” person to enjoy this trip, but instead curious about earth systems, processes, and the environment. The trip will be a good mixture of in-depth exploration of cave systems with Cave Research and Education Staff, visits to state parks, indoor science exhibits, and cultural features of Kentucky and Indiana. While there will be an opportunity to do “wild caving” in undeveloped and more challenging portions of the cave, most of the caving experience will be on marked pathways with railings, stairs, and lighting. The trip focus will be on Mammoth Cave National Park in central Kentucky, but also other regional features in Louisville, Cincinnati, and rural central Kentucky and southern Indiana. We will stay in a hotel and travel in vans.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$400 - \$500—includes transportation, lodging, some (though not all) meals, and complete activities (\$150 deposit will be required shortly)

Maximum Enrollment: 22

**MT064 Math Modeling and Systems Biology** (Hernandez / Magwene)

This course will use a combination of computational, mathematical, and experimental approaches to introduce students to the topic of biological signal transduction. We will use the yeast pheromone response to illustrate principles of signal transduction. Students will build simulation models, carry out experiments and make observations on cellular behavior at a Duke University lab.

Prerequisite: Completion of two Trimesters of Precalculus

Cost per Student: None

Maximum Enrollment: 10

**MT096 Maui: Whales, Volcanoes, Culture and Nature** (Carpenter / Rodman)

This Mini-Term course, highlighted by a ten day trip to Maui, will be similar to a (condensed) study-abroad program. Students will have the opportunity to learn about the different aspects of Hawaii that make it unique. The specific areas of study are culture/religion, volcanoes, whales, and indigenous versus introduced species of animals and plants. Students will prepare by completing assigned reading and doing research in advance on a specific topic of individual interest.

The trip will include a whale-watching tour provided by the Pacific Whale Foundation, a full day excursion to the Haleakala Volcano National Park with ranger-guided hikes, three in nights surrounded by the lush forests, abundant wildlife, and exotic plant life of Wai'anapanapa State Park, and five nights in Wliluku for cultural and natural experiences including the Cirque du Soleil inspired musical play "Ulalena" about Hawaiian history and the Kahanu Garden research center focusing on the ethno-botany of the Pacific. There also will be time for a native Hawaiian luau, a visit to the Hui No'eau Visual Arts Center, and even the chance to go snorkeling and to learn the hula.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$2500—includes transportation, lodging, most meals, and activities

Maximum Enrollment: 14

### **MT066 Neuroscience (Powell)**

The neurosciences attempt to study the development, function, and organization of the human brain, as well as how these components form the mind. To do this, modern neuroscience combines the efforts of molecular biology, embryology, psychology, anatomy, and pharmacology to answer many of the most profound questions regarding human thought, perception, and consciousness.

In this Mini-Term course, we will explore the following topics:

- How does the brain function on a cellular and molecular level?
- What is the basic anatomy of the human brain and how does it function while healthy or following injury?
- What are the major steps in building a brain during embryogenesis?
- What aspects of the human brain separate our thoughts, actions, and feelings from those of other species?

One important aspect of this course is to introduce the class to what it is like to be a PhD or MD-PhD scientist, an exciting career option that many students do not consider until college. During this course we will take advantage of our proximity to UNC Chapel Hill and Duke to visit the labs of several neuroscientists.

Prerequisite: Completion or current enrollment in one of the following—Molecular & Cellular Biology, Anatomy & Physiology I, AP Biology—or permission of the Instructor

Cost per Student: None

Maximum Enrollment: 10

### **MT068 New Deal in North Carolina (Moulder)**

This Mini-Term course will explore the legacy of the Great Depression and the New Deal in North Carolina. The course will employ history texts, narratives and film to delve into the ways

North Carolina responded to the Great Depression and the New Deal. We will spend time visiting WPA buildings in the area and hiking the trails constructed by the CCC at Hanging Rock and Morrow Mountain State Parks. In addition, students will spend two days reading and researching the oral history work submitted by the Federal Writer's Project in the Documenting the American South and the North Carolina Collections at UNC-Chapel Hill's Wilson Library. This research will be shared with the NCSSM community. Day trips include hiking excursions and trips to Chapel Hill's Wilson Library. Students interested in history, politics and narrative with a desire to spend time hiking in the winter (rain or snow or shine) should consider this Mini-Term.

Cost per Student: None

Maximum Enrollment: 12

### **MT070 Optics and Graphics (Yeh)**

A multi-disciplinary exploration of natural and computer models of visual image formation and perception. Major topics will include optics, electromagnetism, human visual neuroscience, and computer graphics. As time permits, other topics may include comparative visual neurobiology, optical properties of materials, computational geometry, and artificial intelligence. Those with programming background will be encouraged to pursue a graphics rendering project.

Prerequisite: A/A- average in Topics level Mathematics/Physics/Chemistry courses taken at NCSSM

Cost per Student: None

Maximum Enrollment: 15

### **MT072 Philosophical Implications of Modern Physics (Milbourne)**

Space, time, and causality are concepts fundamental not just to how we do science, but to who we are as individuals. However, 20th Century advances in Physics force us to revisit and think deeply about such concepts. This course will introduce students to the major ideas of modern Physics (special and general relativity, string theory, quantum mechanics), with a particular emphasis on how those ideas impact the scientific method, our thoughts on time and space, and even our ideas about reality. Other topics include time travel, black holes, and the so-called "theory of everything."

Prerequisite: Application to Instructor

Cost per Instructor: None

Maximum Enrollment: 10

### **MT074 Physics Explorations—San Francisco (Stefan)**

We are going to fly to San Francisco for:

1. Volunteering at and visiting The Exploratorium: a hands-on museum of science, art, and human perception
2. Visit the Berkeley Labs and/or University of California at Berkeley
3. Visit and get familiar with other San Francisco Attractions as follows: California Academy of Sciences, Aquarium of the Bay, Blue and Gold Fleet Bay Cruise, San Francisco Museum of Modern Art, etc...

The Exploratorium is a museum in San Francisco full of hundreds of hands-on exhibits, most of them made onsite, that mix science and art. It is also a leader in the movement to promote museums as informal education centers. Founded in 1969 by the noted physicist and educator Dr. Frank Oppenheimer, the Exploratorium offers visitors a variety of ways—exhibits, webcasts, websites, events, and more—to explore and understand the world around them.

At the Berkeley Lab, students will learn more about the particle adventure, the theory of fundamental particles and forces, quarks, neutrinos, antimatter, extra dimensions, dark matter, accelerators and particle detectors.

Prerequisite: Instructor Approval

Cost per Student: \$1300—includes transportation, lodging, most meals, and activities (estimated—but it might turn out to be a bit cheaper!)

Maximum Enrollment: 6 students

### **MT076 Problem-Based Learning in Science and Medicine** (Warshaw / Wiggins)

This course will use concepts similar to Problem Based Learning (PBL) models that have recently gained popularity in US medical schools. In PBL and in life, problems typically begin with limited information, which may include misleading and inaccurate observations. In this PBL course students will start an assigned problem and work as a team to:

1. create a conceptual map of the universe of possibilities,
2. assess and leverage the team's collective knowledge,
3. identify uncertainty,
4. decide what additional information is needed,
5. assign team responsibilities,
6. fill knowledge gaps,
7. and solve the problem.

Prerequisite: Preference will be given to students who have completed IE350 Medical Ethics & Leadership

Cost per Student: None

Maximum Enrollment: 16

### **MT078 Programmer's View of Computer Systems** (Menchini / Morrison)

We will be looking, from a programmers perspective, at what goes on in computer systems at the

bare-metal level. This course takes a look at the relationship between the hardware and the software. Its lingua franca will be C. We will develop some key ideas in C, but we assume that you are a good programmer and you already know things like recursion, types, looping and forking.

If you are curious about the way your compy works, this is the place to learn about it. Maximum fun will be had by those who are intellectually acquisitive and who are willing to put in a serious effort.

Prerequisite: Students should have a strong programming background—they should be proficient in Python or Java, and it is helpful to know some C as well as have experience using UNIX

Cost per Student: None

Maximum Enrollment: 15

### **MT080 Quantum Theory: Entanglement, Teleportation, Computing and Cryptography** (Bennett / Kolena)

Why is it that electrons behave in some sense wave-like and in some sense particle-like? Do cats and humans have the same options? What have experimentalists actually transported and how? What would a quantum computer look like? By the time this Mini-Term course ends, we will hopefully understand if and how any of this stuff works, and therefore be able to separate the hype from the reality.

Prerequisite: Completion of two Trimesters of Physics and two Trimesters of Calculus at NCSSM (or equivalent)

Cost per Student: None

Maximum Enrollment: 16

### **MT082 Quilt Scapes** (Graves / Naiman)

Love math, color, creativity? Interested in turning a geometric pattern, a tessellation, or optical illusion into fabric? Want to learn about the mathematics of symmetry? This Mini-Term course will give you the opportunity to create a small lap quilt or wall hanging of your own while we also learn some of the math behind quilt patterns. You will learn the basics of quilt making from a quilting professional. Students will be responsible for purchasing fabric for their quilt, but all other supplies will be provided. Students also need to have access to a sewing machine that has been professionally serviced in the past five months.

Prerequisite: Instructor Approval

Cost per Student: \$70 for professional quilting instruction, plus \$50 to \$80 for student's choice of fabric

Maximum Enrollment: 10

### **MT084 Rural Nicaragua** (Russell / Sheck)

Before this trip, we will prepare by reading study packets on Nicaraguan history, culture and social justice issues. On this trip, we will spend 3 days at an organic coffee farm and nature preserve, Finca Esperanza Verde, about 20 kilometers up in the mountains above San Ramon. There we will learn about remote schools, organic coffee production and the importance of fair trade. We will also be able to explore the surrounding tropical forest, where we will see a dazzling variety of native birds and animals. We will also spend 2-3 days living and eating with a Nicaraguan family in the town of San Ramon. We will learn about village life and community in rural Nicaragua. In addition, we hope to spend 1-2 days visiting the colonial city of Granada on the shores of beautiful Lake Nicaragua.

Sister Communities of San Ramon, Nicaragua has a very informative web page at <http://www.san-ramon.org/> that gives detailed information about this project and the impact it has had on the lives of Nicaraguans and American visitors. We expect students who choose this trip to have a genuine interest in one or more of the following areas:

- Service projects involving volunteer work and support for rural schools
- Developing Spanish language skills
- Learning about Latin American history and culture

Prerequisite: Instructor Approval—valid passports and non-US citizens may require visas  
Cost per Student: Approximately \$2000 - \$2300—includes transportation, lodging, all meals, activities, and travel insurance

Maximum Enrollment: 14

### **MT086 Science & Math on the Appalachian Trail** (Gotwals / Pietropaolo)

This course will involve a five to seven day backpacking trip on the Appalachian Trail. Prior to the trip students will complete research on various science and/or math topics applicable to the Appalachian Trail experience, that they will then present to the group on the trip. This course is open to scientific and mathematical experiments that are of specific interest to the participants. Participants will also learn camping/survival skills.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$500—includes transportation, meals, activities, and equipment

Maximum Enrollment: 16

### **MT088 Shakespeare** (Miller / Woodmansee)

This course will focus on critical, historical, and theatrical approaches to Shakespeare by examining several of his major works. As a group, we will not only read, discuss, and write about plays and poems, but also view filmed versions of those plays. Students will be expected to participate in and occasionally to lead our discussions.

Cost per Student: None  
Maximum Enrollment: 18

### **MT098 Spanish Immersion in Costa Rica (Wiley)**

This Mini-Term course is an immersion experience into the language and culture of Central America, namely Costa Rica. The language immersion will be facilitated by the Pan-American Language Center where students will attend half-day, small group, Spanish classes. As a part of the language immersion program offered by the center students will be staying in the homes of families affiliated with the center.

In addition to the cultural experience afforded to the students by living with the home-stay families, this Mini-Term course will also include local community service projects. These volunteer opportunities will bring students in contact with “the everyday Costa Rican” and thus allow the students to learn first-hand the unique aspects of the culture and to forge meaningful relationships with the people of that community.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$2100—includes transportation, lodging, meals, language instruction, and activities

Maximum Enrollment: 10

### **MT090 Underwater Naturalist and Nature Writing: SCUBA Trip to Florida (Brenner / Hawkins)**

Earth is known as the Water Planet, and for good reason: oceans cover about 70% of the Earth's surface and make up 99% of the living space on the planet. It is estimated that between 50% and 80% of all life on Earth is found in the ocean.

This Mini-Term course is designed to give students a basic understanding of aquatic ecosystems as well as to learn how to interact with them responsibly both in and out of the water. During the course students will get their basic SCUBA certification, attend classes on the structure, classification, and interactions within different aquatic ecosystems, and gain first hand experience interacting with and observing marine life. As you complete your certification and diving skills tests, we will also read some of the nature writers who excel in firing the public imagination about our green (and blue) spaces and act as crucial tools to their preservation. While actually in Florida, we will discuss models and complete exercises in different genres.

This will be more than a basic SCUBA certification course. Successful completion of the program will result in students receiving their Open Water Diver certification as well as Peak Performance Buoyancy and Underwater Naturalists specialty SCUBA certification. All SCUBA certifications will be issued through the Professional Association of Dive Instructors (PADI). PADI is the worldwide leader in SCUBA certification and education.

The goal of this course is not just to get the students SCUBA certified, but to expose them to the abundance and diversity of marine life found in the world's oceans, give them an appreciation for these environments, and give them a new way of telling the world about what they have found. The Open Water certification will give the students the basic SCUBA skills and experience to be safe and comfortable in the water. The specialty certifications have been chosen to give the students an appreciation and respect for the underwater environment. The readings have been chosen to interest and engage, but also with a focus on conservation.

Prerequisite: Instructor Approval

Cost per Student: Approximately \$2095—includes SCUBA instruction, certification fees, academic materials, DAN (Diver's Alert Network) diving insurance, use of SCUBA gear, diving fees in Florida, transportation, lodging, breakfast and lunch daily. Additional expenses are snorkeling gear (mask, fins and snorkel), dinner daily and additional spending money. Specially priced snorkeling gear packages will be available from Water World.

Maximum Enrollment: 10