PGSAS 2008 Curriculum Guide

PGSAS

PENN STATE

PENNSYLVANIA GOVERNOR'S SCHOOL FOR THE AGRICULTURAL SCIENCES

THE PENNSYLVANIA GOVERNOR'S SCHOOL FOR THE AGRICULTURAL SCIENCES

2008 CURRICULUM

CORE CURRICULUM*

AGRONOMY ESSENTIALS

The curriculum will cover practical aspects of agronomy: the science of field crop production and soil management. Participants will be involved in a number of activities that will provide an overview of agronomic principles from "seed to feed", such as soil sampling and fertility management, crop planting and harvesting considerations, pest management techniques, farm equipment uses and needs, and criteria for quality livestock forages. After completing this course, scholars will be "out standing in their field!"

Coordinators: Mr. Dwight Lingenfelter, Extension Agronomist
Mr. Scott Harkcom, Agronomy Farm Manager

ANIMAL GENETICS

Although there is a long tradition of plant and animal breeding over the last 25,000 years, the field of Genetics is relatively new to the life sciences. It was the rediscovery of Mendel's work in the early l900's and concurrent investigations into the chemistry of life, which led to Watson and Crick's discovery in the 1950's. These historic events set the stage for the "crash course" between population/quantitative genetics and biochemical genetics. Though some suspected, few expected the impact that this merger would have in our lives. This course is designed for individuals to understand the genetics and breeding of domestic animals from both economic and social (or cultural) perspectives. Topics stressing the integration of traditional Mendelian genetics, animal breeding and contemporary molecular genetics into the 'grand synthesis' will be discussed.

Instructor: Dr. Guy Barbato, Associate Professor of Poultry Science

CONTEMPORARY TOPICS IN ANIMAL SCIENCES

This course will deal with many current issues currently faced by animal owners and managers. Topics to be discussed are the importance of biotechnology in food production, animal ownership versus guardianship, the ethical challenges faced by no-kill animal shelters, impact of alternative fuels on animal agriculture, animals and their environmental impact, and animal behavior and handling. Other current issues will be included as time permits. The course will integrate lectures with hands-on activities, and visits to various university animal facilities will help demonstrate the concepts.

Instructors: Mr. Dale Olver, Instructor in Dairy and Animal Science
Ms. Jana Peters, Animal Sciences Advising Coordinator

ENERGY ANSWERS FROM THE COLLEGE OF AGRICULTURAL SCIENCES AND BEYOND

This series will provide information on renewable and alternative energy from agricultural and other sources. A group of experts in the field will discuss traditional and cutting edge solutions to energy production and management as it relates to the agricultural sciences.

Coordinator and Instructor: Dr. Aaron Yoder, Instructor of Agricultural and Biological Engineering

FOOD SCIENCE: CARBOHYDRATES IN FOODS -- CHEMISTRY, NUTRITION, AND INGREDIENT TECHNOLOGY

Many consumers believe that the carbohydrate content of food should be carefully taken into account in choosing foods for a healthful diet. Several popular weight-loss programs emphasize low levels of carbohydrate consumption. Even many consumers not on weight loss programs are "watching their carbs." At the same time, "energy bars" are popular, and these products often are exceptionally high in carbohydrate. How can this make sense? We will explore the following questions: What are the forms of dietary carbohydrate? What common food ingredients are high in carbohydrate, and what types of carbohydrate do they contain? How do these ingredients contribute to the perceived physical and sensory attributes of foods? How does the fate of different carbohydrates differ in digestion, absorption, and metabolism? What does nutrition science tell us about low-carbohydrate weight loss programs? How are foods marketed with respect to carbohydrate content?

As a way of exploring the ideas above, scholars will taste and compare samples of "energy bars" currently on the market. They will also compare package label statements related to nutrition, health, well being, or athletic performance for each bar. Scholars will examine the ingredient statement for each product. Scholars will then make reasonable inferences about the quantitative amount of each carbohydrate-containing ingredient and the types of carbohydrate present. From these estimates scholars will draw conclusions about the probable "nutritional performance" of the product. At the end of the module scholars will be better able to assess the validity of marketing statements related to food carbohydrates, based on label information for particular commercial retail products and knowledge about the chemistry and nutrition of carbohydrate ingredients.

Instructor: Dr. Donald Thompson, Professor of Food Science

NUCLEAR SCIENCE

A discussion of nuclear applications in agriculture and details about the Breazeale Nuclear Reactor on the Penn State Campus, including tour of nuclear reactor.

Instructor: Ms. Candace Davison, Research and Education Specialist
Breazeale Nuclear Reactor

PHYSIOLOGY OF LACTATION

The objectives of this course are to show scholars the importance of mammary biology to the survival of baby mammals; to teach scholars about the physiology and microscopic anatomy of mammary glands; to explain the value of dairy products in the human diet. We will discuss the relationship between milk yield and neonate weight gain in mammals; scholars will have an opportunity to visit a modern dairy farm to observe calf rearing, machine milking, and PSU intensive dairy research facilities as well as to hand milk a cow.

Instructor: Dr. Craig R. Baumrucker, Professor of Animal Nutrition and Physiology

THE PLANT SCIENTIST

Plants have always been essential to human and animal life on earth. They provide the major portion of our food supply, many of our building materials and the fiber to weave the clothes we wear. Ancient plants, transformed into oil and natural gas, fuel our cars, heat our homes and workplaces, and form the plastics we use everyday. Plants are the source of today's wonder drugs, and are an important part of occupational and physical therapy programs. They enhance our environment and social condition through their presence in outdoor and indoor landscapes, and they will ultimately travel with us into space. In "The Plant Scientist", scholars will explore the mysteries and the elegance of the plant world through hands on applications of sustainable architecture, tissue culture, computer aided landscape design, and molecular biology.

Instructor: Mr. Robert Cameron, Ph. D. Candidate in Horticulture

POULTRY SCIENCE

Scholars will learn about the internal and external anatomy of the chicken and physiology of the hen's reproductive system. They will get hands-on experience in dissecting hen's reproductive tract and learn about various reproductive organs and how a hen makes eggs.

They will also learn first hand how the egg is developed in the female bird, the true purpose of the egg, and why the chicken egg is such an excellent subject for the study of embryology. Specifically will study the hen's reproductive tract and how the egg forms, consumer egg grading, the science of incubation and embryonic development of the chicken.

Instructors: Dr. Ramesh Ramachandran, Assistant Professor of Poultry Science
Mr. Phillip Clauer, Senior Extension Associate of Poultry Science

RENEWABLE NATURAL RESOURCE CONSERVATION

Wise management and use of natural resources will be introduced by means of indoor and outdoor lab exercises, lectures, and discussion. Subjects to be explored include water quality, fishery management, forest history, forest stewardship, and invasive plant ecology.

Instructors: Dr. Paola Ferreri, Associate Professor, Fisheries Management
Dr. Sanford Smith, Lecturer & Extension Specialist

REPRODUCTIVE PHYSIOLOGY

This course will consist of exercises in reproductive anatomy of farm animals, oocyte maturation and fertilization, and examining developmental aspects of fetal growth. Structure and function of the reproductive system, and integration with other systems will be emphasized.

Instructor: Dr. Daniel Hagen, Professor of Dairy and Animal Science

WETLAND ECOLOGY - COME JOIN US FOR A SHORT INVESTIGATION OF WETLANDS.
Learn about those things that make a wetland so interesting, including water, soils, plants, and the critters ... if we're lucky.
Finally, we'll stop at a wetland made by people and see how it differs from a natural wetland. Be prepared to get your feet wet and muddy!

Instructor: Dr. C. Andrew Cole, Assistant Professor of Landscape Architecture

FOOD, AGRICULTURE, & NATURAL RESOURCES RESEARCH

METHODS AND TECHNIQUES OF AGRICULTURAL RESEARCH (ACADEMIC PROJECT MANAGEMENT CLASS)
This component of the school is designed to provide scholars with a practical, hands-on research experience. After an exploration of the scientific methods of research, each scholar will work with their assigned mentor(s) to develop, design, and conduct an independent study project in the agricultural sciences. Using scientific writing methods, each scholar will also prepare a final abstract and a presentation on their research. Most research is conducted in pairs or small groups.

The course will describe in detail the technical aspects of reporting on research and assist scholars in managing their projects and completing the requirements on time. The course will also assist scholars in navigating communication software using in the Penn State system, creating an electronic portfolio and archiving their portfolio.

Instructor: Ms. Valerie Reinoso, Academic Project Coordinator

ELECTIVE CURRICULUM**

CATEGORY 1

AGRICULTURAL ECONOMICS - THE BUSINESS OF FOOD, MANAGING TO FEED A HUNGRY WORLD
Explore the mysteries of the world food system. Learn what needs to be done to feed the world in the 21st century. Discover how to harness the business management skills needed to enhance the efficiency and effectiveness of the worldwide food system. Understand the role of marketing in the efficient operation of the food system. Identify the worldwide forces of change that are reshaping this industry. The course will conclude with a “field trip” to the moon to study the dynamics of group versus individual decision making. No prior lunar business decision making experience is required.

Instructor: Dr. James Beierlein, Professor of Agricultural Economics

BIRDS AND BUGS

This course gives scholars hands-on experiences in ornithology and entomology. The ornithology section is called Marsh Bird Conservation - First scholars will learn about marsh ecosystems and the bird community associated with them, including bird identification and conservation issues. Then they will focus on using this information to find and identify birds in the field and to discuss their associations with their habitat.

Then in entomology: Insects are arguably the most abundant and important animals on earth. Some are devastating pests, while others help humans in extraordinary ways. We will explore insect interactions in several agricultural systems by studying live insects in the lab and the field. By identifying different insects and their ecological relationships, we will discuss why insects have such a huge impact on our food supply. Get ready to learn about some amazing survival strategies -- we'll even see the insect that inspired the movie *Alien* !

Instructors: Ms. Sarah Pabian, Graduate Assistant in Wildlife and Fisheries Science
Ms. Katie Ellis, Graduate Assistant in Entomology

COMPOSTING: NATURE'S RECYCLING STRATEGY

Scholars will have the opportunity to learn about composting principals and composting as a form of recycling. The class will include an introduction to basic principals of composting, development of a compost recipe and organics processing at Penn State. Scholars will construct a compost pile using various organic materials and will monitor the compost piles using a temperature probe, oxygen meter and visual observation. In addition, compost utilization practices will be discussed. Scholars will create planters using a compost based potting mix and flowers, and learn about composting practices used in the production of mushrooms. To conclude the course, scholars will evaluate their compost piles and awards will be given for the best compost pile.

Instructors: Dr. Tom Richard, Associate Professor of Agricultural and Biological Engineering
Dr. Robert Graves, Professor of Agricultural Engineering
Ms. Nadine Davitt, Manager, Organic Materials Processing and Education Center
Ms. Megan Marshall, Research Associate in Agricultural Engineering

CATEGORY 2

ENVIRONMENTAL RESOURCES ENGINEERING

Learn how engineering and science play a role in pollution prevention and the protection of streams and rivers. Discover how wetlands can be designed and constructed to treat wastes, and how they differ from conventional waste treatment systems.

We will discuss a variety of engineering practices used in resource management, including practices to control soil erosion, nutrients, and animal and human waste. About one-third of the class time will be devoted to lectures and discussion, and two-thirds will be devoted to planned field trips to local resource engineering sites.

Instructor: Dr. Robert Shannon, Associate Professor of Agricultural Engineering

OUR LAND, OUR LIFE: SOILS AND THE ENVIRONMENT
Students of Our Land, Our Life: Soils and the Environment will participate in both lab and field studies. In the field they will visit numerous sites representing a variety of landscapes and ecosystems. At several locations students will collect soil samples and perform basic field analysis. In the laboratory the students will further analyze these soil samples using state-of-the-art equipment. In the classroom students will learn the basics of soils and environmental science and the significance of the data that they have collected and analyzed. Through this combination of classroom, field, and lab experiences the students will discover the intricate interconnections between our soils, a valuable and essentially non-renewable natural resource, and overall environmental quality. In particular, students will observe the impact of soil loss, the significance of soil as a natural filtering system, and the influence of human activities on our land and our life.

Instructors: Ms. Katharine Butler, Sr. Lecturer of Soil Science
Dr. Richard Stehouwer, Associate Professor Environmental Soil Science
Dr. Jack Watson, Professor of Soil Science

TUBE STEAKS AND OTHER WONDERS OF MEAT SCIENCE
What makes meat tasty and tender? How much protein and fat are in meat products? Why are some sausages juicy and flavorful while others are chewy and dry? From where do hot dogs and luncheon meats come? In this mini-course on Meat Science scholars will learn about meat products of all sorts. The instructor will explain quality and safety considerations for meat products and processes. Scholars will manufacture various meat products and complete the process by tasting the results of their efforts. This is an interesting course with lots of opportunity of hands-on activities.

Instructor: Dr. Edward Mills, Associate Professor of Dairy and Animal Science

VET SCI 101
The occurrence of disease is usually related to animal and environmental factors interacting with infectious agents. During this module, we will examine several of the host, agent and environmental factors that influence the prevalence of disease in a population and how prevention measures work to minimize the occurrence of disease. We also will learn some common disease detection techniques based on physical examination of the patient as well as laboratory tests.

Instructor: Dr. Lester Griel, Professor of Veterinary Science

CATEGORY 3

AGROECOLOGY
Agroecology involves complex systems which employ the smallest soil microbe, energy from the sun, rainfall, plants, nutrients, and human intelligence (to mention only a few components) to produce quality food with limited affects on the environment. Scholars will have the opportunity to visit four systems and explore how the ecosystem of each is managed to produce food and fiber.

Coordinator and Instructor: Dr. Heather Karsten, Associate Professor of Agroecology
Co-Instructors: Ms. Kate Butler, Senior Lecturer of Agronomy
Dr. Elsa Sanchez, Assistant Professor of Horticulture Systems Management
Dr. Michael Saunders, Professor of Entomology

FOOD PRODUCT DESIGN FOR MICROWAVE HEATING***

Microwaveable food product development offers many interesting challenges to the food industry. We will explore scientific, engineering and marketing aspects of Microwaveable Food Product Development through lectures, discussions and laboratory sessions. Prerequisite: An aptitude for Physical and Engineering Sciences.

Instructor: Dr. Swamy Anantheswaran, Professor of Food Science

FOOD UNWRAPPED***

You are what you eat! In this exciting and hands-on elective, you will learn how you are connected to the world through the science in food! You will also apply science to preserve, process, and package the very foods you eat (Juice, Jellies, and Dairy Products). You're Here for the Food….and it's Science!!

Food Science offers students hands-on, real-world careers in applied science and technology. Industrial food scientists are needed in food product development, quality management, processing, and research/development. Employment can be found with regional, national, and multinational companies that manufacture food products and food ingredients.

Instructor: Dr. Naveen Chikthimmah, Instructor of Food Science and Recruitment Coordinator

VET SCI 101

The occurrence of disease is usually related to animal and environmental factors interacting with infectious agents. During this module, we will examine several of the host, agent and environmental factors that influence the prevalence of disease in a population and how prevention measures work to minimize the occurrence of disease. We also will learn some common disease detection techniques based on physical examination of the patient as well as laboratory tests.

Instructor: Dr. Lester Griel, Professor of Veterinary Science

***** Each scholar participates in <u>all</u> core courses.
****** Each scholar participates in <u>one</u> elective course in each category.
******* Food Product Design and Food Unwrapped are offered in conjunction.

PROFESSIONAL, CAREER, & PERSONAL DEVELOPMENT

A LIVING MOSAIC
Each class of Governor's School scholars develops its own unique identity. This identity draws on the diverse backgrounds and experiences that scholars bring to the school. In this workshop, scholars will be encouraged to reflect on both their own unique backgrounds and experiences and those of the other scholars. Furthermore, this activity will highlight the strength that comes through unity and diversity.

Instructors: Ms. Ketja Lingenfelter, Assistant Director
Governor's School Assistants

AG LEADERSHIP WORKSHOP
This workshop will expand scholars' knowledge, skills, and understanding of specific leadership concepts and current leadership issues in applied settings. The concepts learned can be applied to scholars' groups at home, and will help them grow as leaders within their own groups. Plan to move around a bit in this exciting Saturday event!

Instructor: Ms. Nicole Marinos

AN EVENING OF ETIQUETTE
Proper etiquette is important when interviewing for a job or in any professional setting. Scholars and staff will have an opportunity to explore their etiquette knowledge and improve their skills.

Instructor: Ms. Lori Connelly, Director of Communications, PennAg Industries

GUEST SPEAKER SERIES
Guest speakers will discuss a wide variety of subjects including career opportunities, international agriculture, study abroad, success in college and many more.

Coordinators: The Graduation/Special Events Committee will introduce and thank each guest speaker.

NATIVE AMERICAN MEDICINE WHEEL
The Medicine Wheel program offers participants a way to examine team building and problem solving, and value diversity in teams. Energizing, informative and fun, the interactive program helps individuals and teams understand one another and make full use of individual's unique contribution.

Instructors: Penn State's Shaver's Creek Staff

SERVICE PROJECT
The Pasto Agricultural Museum invites visitors to learn about early farm life through hands-on experience with historical farm equipment. The museum, located on the Ag Progress Days site, is staffed by volunteer guides. The Governor's School has the opportunity to give the volunteers some much needed assistance as they prepare to expand their building.

Coordinator: Dr. Daryl Heasley, Volunteer Curator

SPECIAL TOPICS: ADVISING OPPORTUNITIES
Scholars will have the option to explore academic and career opportunities in or related to food, agriculture, and the natural resource sciences. Scholars will have the opportunity to explore Penn State resources.

Coordinator: Dr. Marianne Fivek, Assistant to the Dean of Undergraduate Education

TEAMBUILDING
Teambuilding at Shaver's Creek provides an opportunity for PGSAS Scholars to get to know each other through an interactive, action packed program. Through a series of challenges, the participants share in the exhilaration of building stronger teams, enhancing relationships, and learning from one another. A great way to start off five weeks of learning and fun together!

Instructors: Penn State's Shaver's Creek Staff

THE WEB FACTOR!
Scholars will be challenged to find clues, figure out puzzles, search the web, and just have some intense team building times. The Web Factor is a team based exercise that pits your team against the others in a fast-paced experience. Come ready to work together and find answers to questions that you may never need to know or may never have thought of. Also, learn a few things along the way. Who will be the team that outscores the others and is able to use the web to become the victor?

Instructor: Dr. Ellen Taricani, Lecturer in Communication Arts & Sciences

COMMITTEE DESCRIPTIONS

NEWSLETTER
Scholars produce a biweekly newsletter as the authors, photographers, and editors; which is sent to families, guidance counselors, legislators, county extension agents, and VIPs. *22 Scholars participate on this committee.*

SOCIAL/RECREATION
This committee plans events making use of campus facilities and the surrounding environment. Events are planned according to scholar interest. In the past, scholars have participated in volleyball and basketball tournaments, a hike up Mt. Nittany, and planned swimming and ice skating events. This committee decides on movies for movie nights and field trips, the theme for the Theme Party, and designs a scholar produced t-shirt. *21 Scholars participate on this committee.*

GRADUATION/SPECIAL EVENTS
This committee begins working soon after the scholars arrive. Scholars organize and prepare for the Talent Show; Family Day; Graduation with speeches and a video or slideshow; and other special events as they occur. In addition, this committee works with guest speakers and field trip hosts to introduce them and thank them for their contributions to the program. *21 Scholars participate on this committee.*