



University Bulletin

Undergraduate Degree Programs

Primary Navigation

Agricultural Sciences

The COLLEGE OF AGRICULTURAL SCIENCES conducts education and research programs dealing with the proper utilization of land and water resources for the production of crops, livestock, and forest products to meet food and fiber needs, as well as plants for aesthetic use; protection and management of the environment, with its many ecological systems, so that it may be enjoyed by all; operation of agriculturally related industries that provide professional services to producers who process and market farm products; and the development of human resources and community services.

Agriculture is a science, a business, and a profession that requires many well-educated people to meet the demand for animal and plant specialists, conservationists, food technologists, environmental resource managers, engineers, veterinarians, entomologists, farm and forest managers, and many other agricultural professions. The college carries out its responsibilities through instruction, research, and extension. These activities are described more fully below.

UNDERGRADUATE EDUCATION

EDUCATION AND TRAINING in food, agricultural, natural-resource, and related sciences are as critical today as they ever have been. Experts forecast a 50 percent growth in world population to about 9 billion in the next forty years. That increase, combined with the predicted improvement in standard of living and diet across developing nations, will require a doubling in food production.

Graduates in these fields have opportunities to help solve challenges related to the food versus fuel debate, the health of the Chesapeake Bay and other ecosystems, Marcellus Shale gas exploration, biofuels and other renewable energy production, use of technology in farming and food manufacturing, invasive species, sustainability, emerging diseases that affect people, animals, and plants, and many other issues.

A wide range of majors in the College of Agricultural Sciences offers students almost unlimited opportunities to merge their natural inclinations, talents, and specific individual abilities.

First-year students in a four-year program in the College of Agricultural Sciences study basic courses common to all majors. By deferring the selection of a major until the end of the sophomore year, students are given the opportunity to explore their interest areas and to acquire a better basis for making a decision.

A faculty adviser guides each student in choosing his or her course of study. Advisers are available throughout a student's college career to help plan course schedules and to assist with scholastic problems.

ADMISSION REQUIREMENTS for the college are listed in the Admission portion of the General Information section of this bulletin. The Biological Engineering major is jointly administered by the Colleges of Agricultural Sciences and Engineering. Students who are interested in this major should consult requirements for admission to the College of Engineering. MINOR programs enable students to supplement their four-year major. Minors are listed under the "Minors" heading on the left side of this page.

TWO-YEAR MAJORS lead to the associate degree. See the heading "Associate Degrees" on the left side of this page. Students in these majors, who must begin study of technical subjects the first year, are given assistance in planning their work by their faculty advisers.

GRADUATE PROGRAMS -- Information on programs leading to the M.S. and Ph.D. degrees is given in the Penn State [**Graduate Degree Programs Bulletin**](#).

TEACHER CERTIFICATION PROGRAM -- Agricultural students may qualify for certification to teach in the public school systems of Pennsylvania by completing the minimum course requirements of a subject matter field and the professional education requirements, which include student teaching. Professional courses are taken in the Department of Agricultural Economics, Sociology, and Education, College of Agricultural Sciences, and the College of Education. Students who are interested in teacher certification should see [**Teacher Education Programs**](#).

PRE-VETERINARY MEDICINE -- Students can prepare for admission to veterinary school through various majors in the College of Agricultural Sciences. In most cases, students are not accepted to veterinary school prior to the completion of four or more years of college. Because of the limited number of admissions to veterinary schools, each candidate should select an undergraduate program that offers alternatives as well as preparation for admission to the professional program. The wide number of electives allowed in undergraduate majors in the College of Agricultural Sciences provides students with the opportunity to obtain strong preprofessional preparation in majors such as Veterinary and Biomedical Sciences, Animal Sciences, and Wildlife and Fisheries Science.

Students who want to pursue studies in other disciplines of agriculture or in other colleges may obtain information about veterinary school admission requirements by contacting members of the faculty of the Departments of Veterinary and Biomedical Sciences, and Animal Science.

RECOMMENDED ACADEMIC PLANS

Recommended Academic Plans provide, in table form, the courses students might schedule semester by semester as they pursue a specific undergraduate degree. Each college or campus maintains Recommended Academic Plans for its own majors/degree programs. Links to these plans are on the Division of Undergraduate Studies website at: [**http://www.dus.psu.edu/semplans.htm**](http://www.dus.psu.edu/semplans.htm). Questions concerning the Recommended Academic Plans should be directed to the college or campus involved or the Division of Undergraduate Studies.

CERTIFICATE PROGRAMS

The college offers four certificate programs that provide training in agriculturally related occupations.

The Food Technology certificate program, conducted on the Berks campus, is a credit program of formal classroom and laboratory instruction. The program consists of 25 credits that focus on the areas of basic chemistry, introduction to microbiology, basic

food sciences, communication, writing skills, and business administration or management. For further information, contact **Dr. Hassan Gourama**, associate professor of food science, 610-396-6121, or Penn State Berks, Continuing Education, Tulpehocken Road, P.O. Box 7009, Reading, PA 19610-6009; 610-396-6220.

The Golf Course Turfgrass Management certificate program consists of two eight-week winter terms a year for two years. To gain practical experience, a six-month on-the-job internship is required between the first and second years. High school graduates 17 or older are eligible to apply. Admission to the program is limited and competitive. Offers to enroll are based on scholastic achievement, work experience, letters of recommendation, and the applicant's personal goals. For more information, contact the Golf Course Turfgrass Management Program, 441 Agricultural Administration Building, University Park, PA 16802; or **Dr. John Kaminski**, 442 Agricultural Administration Building, University Park, PA 16802; 814-865-3007; or visit **www.turf.psu.edu/certificate**.

The Turfgrass Management online certificate is a 15-credit minimum program of study. Early courses in the program introduce the field and cover turfgrass pest management, turfgrass cultural systems, and turfgrass edaphology. The final required course comprises a series of case studies in turfgrass management. The delivery method for the core courses in this program is "online group," with a group of students progressing together through each course. The courses are offered in a time frame comparable to a traditional semester schedule, with fixed start and end dates. The course content and activities are available in electronic format, and access to the web is required in order to complete this program. For more information, visit:

www.worldcampus.psu.edu/TurfgrassManagementCertificate.shtml.

The advanced Turfgrass Management online certificate is a 30-credit program that builds upon the basic Turfgrass Management certificate. To earn this certificate, students must successfully complete 30 required turfgrass credits. Courses in the program cover turfgrass pest management, turfgrass cultural systems, and turfgrass edaphology, and case studies in turfgrass management. The delivery method for the courses in this program is "online group," with a group of students progressing together through each course. The courses are offered in a time frame comparable to a traditional semester schedule, with fixed start and end dates. The course content and activities are available in electronic format, and access to the web is required in order to complete this program. For more information, visit:

www.worldcampus.psu.edu/TurfgrassManagementAdvancedCertificate.shtml.

CONFERENCES AND SHORT COURSES

Agricultural conferences and short courses that may last from one day to several weeks are held regularly on the University Park campus and around the state. The Office of Conferences and Short Courses works with Penn State faculty, government agencies, rural and urban organizations, and farm groups in planning and organizing these meetings. Using University-based resources, the conferences and short courses help businesses, industry, and individuals keep abreast of the latest developments that affect their lives and livelihoods. Conference announcements may be obtained from the Office of Conferences and Short Courses, The Pennsylvania State University, 306 Agricultural Administration Building, University Park, PA 16802-2601; 814-865-8301; Fax, 814-865-7050.

AGRICULTURAL RESEARCH

The college, in association with its counterparts in other states and in federal agencies,

supports research related to the production and use of food, fiber, and forestry products and to the economic and social well-being of those living in rural and urban areas. It has a primary role in providing research information for use by Penn State Cooperative Extension and other public educational institutions.

Not only does the college fund research to increase the economic and technical efficiency with which products are produced and utilized, but it also seeks ways of achieving greater agricultural abundance in harmony with the environment and of achieving an ever-increasing level of quality in those products.

To a large extent, faculty researchers also are actively engaged in the resident education, short course, and extension programs. This interaction enriches the content of the instructional experience and also guides the research efforts toward the solution of broad social concerns.

The college maintains many specialized research facilities for students, faculty, and staff to use. Researchers work in a wide span of state-of-the-art facilities tailored to their focus areas, from livestock and domestic fowl facilities and three regional specialty-crop research centers to 13,800 acres of research forests and farmland. To learn more about laboratories and research centers in the college, visit agsci.psu.edu/departments/centers-institutes.

PENN STATE COOPERATIVE EXTENSION

Cooperative extension is a nonformal, community-based educational resource of Penn State, funded cooperatively by state and county governments and the U.S. Department of Agriculture. For more than seventy-five years, Pennsylvanians have turned to Penn State Cooperative Extension for new ways to address community and individual issues related to agriculture; natural resources and environmental quality; family development and resource management; leadership and volunteer development; and nutrition, diet, and health.

Each year, more than 2 million people participate in Penn State Cooperative Extension seminars, workshops, conferences, short courses, computer-assisted learning, learn-at-home programs and other activities. Countless others request information and guidance from county educators and staff, and many more receive extension-related information through newspapers, radio, television, publications, websites, and other media.

About 300 county extension educators, 130 paraprofessionals, and 50,000 volunteers help plan, deliver, and evaluate cooperative extension education programs in all sixty-seven Pennsylvania counties. Teams of extension educators and Penn State faculty develop and provide leadership for educational programs and materials.

Penn State Cooperative Extension 4-H youth programs reach about 120,000 young people between the ages of 8 and 19 through organized clubs, special or short-term programs, school enrichment activities, and individual study. About 11,000 adult and 1,600 teen volunteer leaders work with county 4-H extension educators to deliver these programs. Youth participants come from cities (22 percent), suburbs (11 percent), medium-sized towns (21 percent), small towns (40 percent), and farms (6 percent).

COLLEGE OF AGRICULTURAL SCIENCES

RICHARD ROUSH, *Dean*

BARBARA CHRIST, *Senior Associate Dean*

TRACY S. HOOVER, *Associate Dean for Undergraduate Education*

GARY A. THOMPSON, *Associate Dean for Research and Graduate Education*

DENNIS D. CALVIN, *Associate Dean and Director of Penn State Extension*

DEANNA BEHRING, *Assistant Dean for International Programs*

PATREESE D. INGRAM, *Assistant Dean for Multicultural Affairs*

COLLEGE ORGANIZATION

Agricultural and Biological Engineering -- PAUL H. HEINEMANN, *Head*

BioRenewable Systems -- NIKKI BROWN, *Program Coordinator*

Biological Engineering -- MEGAN MARSHALL, *Program Coordinator* [offered jointly with College of Engineering]

Agricultural Economics, Sociology, and Education -- C. DANIEL AZZARA, *Interim Head*

Agribusiness Management -- DAVID ABLER, *Program Coordinator* [offered jointly with Smeal College of Business]

Agricultural and Extension Education -- JOHN C. EWING, *Program Coordinator*

Agricultural Science -- JOHN C. EWING, *Program Coordinator*

Community, Environment, and Development -- LELAND L. GLENNA, *Program Coordinator*

Animal Science -- TERRY D. ETHERTON, *Head*

Animal Sciences -- ROBERT MIKESELL, *Program Coordinator*

Ecosystem Science and Management -- MICHAEL G. MESSINA, *Head*

ELLEN A. MANNO -- *Coordinator of Undergraduate Programs*

Forest Ecosystem Management

Wildlife and Fisheries Science

Entomology -- GARY W. FELTON, *Head*

Food Science -- ROBERT F. ROBERTS, *Head*

Food Science -- RANIA AGIL, *Undergraduate Program Coordinator*

Plant Pathology and Environmental Microbiology -- CAROLEE T. BULL, *Head*

Plant Science -- ERIN L. CONNOLLY, *Head*

Plant Science -- DENNIS DECOTEAU, *Program Coordinator*

Landscape Contracting -- DAN T. STEARNS, *Program Coordinator*

Turfgrass Science -- ANDREW McNITT, *Program Coordinator*

Veterinary and Biomedical Sciences -- GARY H. PERDEW, *Interim Head*

Immunology and Infectious Disease -- PAMELA HANKEY, *Program Coordinator*

Toxicology -- JOHN VANDEN HEUVEL, *Program Coordinator*

Veterinary and Biomedical Sciences -- LESTER C. GRIEL, *Program Coordinator*

INTERDEPARTMENTAL PROGRAM

Environmental Resource Management -- ROBERT D. SHANNON, *Program Coordinator*

Baccalaureate Degrees

Agribusiness Management

University Park, College of Agricultural Sciences (AG BM)

University Park, The Smeal College of Business

World Campus

PROFESSOR DAVID ABLER, *Program Coordinator*

Graduates can be found working in the food production, processing, financial services, wholesaling and retailing industries, both in the United States and abroad. A substantial number are employed by agricultural supply firms. Typically, B.S. degree holders begin their careers in sales or as management trainees, and then progress to management as they develop higher levels of expertise and experience. Penn State Agribusiness Management graduates chose careers in many other places. They also are employed in banking and the investment and mutual funds industries, and others have gone to law school, graduate school, or into rural development. The quality and diversity of the program enables Agribusiness majors to undertake a variety of jobs.

This major, which is offered jointly with The Mary Jean and Frank P. Smeal College of Business, includes a core of courses required of all business students. Combining the required specialization area with a minor or electives also allows a student to focus on a particular area of interest.

For the B.S. degree in Agribusiness Management, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-9 credits

REQUIREMENTS FOR THE MAJOR: 81- 84 credits

(This includes 15 credits of General Education courses: 6 credits of GQ courses; 6 credits of GS courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (43 credits)

AGBM 102(3)[11], AGBM 106(3)[11], ECON 104 GS(3) (Sem: 1-4)

ACCTG 211(4), AGBM 302(3)[11], AGBM 308(3)[11], AGBM 320(3)[11], AGBM 338 IL(3), ENGL 202D GWS(3), MIS 204(3), FIN 301(3), SCM 301(3), MKTG 301(3), MGMT 301(3) (Sem: 5-6)

ADDITIONAL COURSES (26-29 credits)

AGBM 101 GS(3)[11] or ECON 102 GS(3)[11] (Sem: 1-4)[77]

MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 3-4)

RSOC 11 GS(3) or SOC 1 GS(3) (Sem: 3-6)[78]

SCM 200 GQ(4) or STAT 200 GQ(4) (Sem: 3-4)

AGBM 407(3) or AGBM 408(3) (Sem: 5-8)

Take 3-6 credits in Social, Ethical and Legal Environment of Business from the following: BA 243(4); BLAW 341(3) and BA 342(3); BLAW 243(3) (Sem: 2-6)

Take 6 credits of 400-level AGBM courses (excluding, unless approved by the AGBM program, AGBM 495A, AGBM 495B, and AGBM 496).

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 12 credits in a specialty area, in consultation with an adviser (at least 6 of these credits must be at the 300 or 400 level) (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[77] AG BM 101 required unless ECON 102 was taken before entering the AGBM major.

[78] R SOC 011 required unless SOC 001 was taken before entering the AGBM major.

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-04-003

Review Date: 1/10/2017

UCA Revision #1: 8/2/06

AG/BA

Agricultural and Extension Education

University Park, College of Agricultural Sciences (AEE)

PROFESSOR JOHN C. EWING, *Program Coordinator*

This major helps prepare students for positions in education in agriculture, including schools and colleges, Cooperative Extension, business, trade and professional associations, and government agencies. The Department administers a program approved by the Pennsylvania Department of Education for the preparation of agriculture teachers in public school systems. This includes programs in agricultural production, mechanics,

supplies, resources, products, forestry, horticulture, and other agricultural areas.

Students take courses in agricultural and natural resource sciences, leadership and communications, natural science, social science and general education. Students seeking teacher certification schedule professional courses in education and psychology.

Pennsylvania Teacher certification regulations require students to have a GPA of 3.0; satisfactorily complete any basic-skills or entrance testing requirements as specified by the Pennsylvania Department of Education in force at the time of application for entrance to the major; and complete an approved Educator Preparation Program. The Educator Preparation Program at Penn State includes documentation of at least 80 hours of volunteer or paid education work experience with learners of the age group the candidate plans to teach. At least 40 of these age-appropriate 80 hours must be with learners whose cultural, social, or ethnic backgrounds differ from the candidate's own; completion of an early field experience specified by the certification program; completion of at least 48 semester credit hours, including ENGL 15 or ENGL 30, 3 credits of literature, and 6 credits of quantification and secure occupational experience in the requested area of certification. (See also: **Teacher Education Programs**)

For students seeking teacher certification, the B.S. degree in Agricultural and Extension Education, a minimum of 125-129 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(22 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin for additional information)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-3 credits

REQUIREMENTS FOR THE MAJOR: 99-104 credits

(This includes 22 credits of General Education courses: 22 for the teacher certification options--6 credits of GS courses; 9 credits of GN courses; 4 credits of GQ courses; 3 credits of GWS courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 79 credits

PRESCRIBED COURSES (72 credits)

AEE 100(3), AEE 295(1)[1], AEE 313(2)[1], AEE 412(4)[1] Sem: 1-2)

AGBM 101 GS(3), BIOL 110 GN(4), ENGL 202C GWS(3) (Sem: 3-4)

AEE 311(3), INTAG 100 GS;IL(3) (Sem: 5-6)

AEE 413(3)[1], ASTRO 1 GN(3), CHEM 101 GN(3), CHEM 202(3), EDPSY 14(3)[1], EDTHP 115 US(3)[1], PHYS 1 GN(3), STAT 200 GQ(4), SOILS 101 GN(3), WFED 413(3), WFED 414(3), WFED 450 US;IL(3) (Sem: 6-8)

AEE 349(3), AEE 350(3) (Sem: 7-8)

AEE 495(3) (Sem: 7-8)

ADDITIONAL COURSES (4 credits)

BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 2-7)

SUPPORTING COURSES AND RELATED AREAS (3 credits)
Select 3 credits of W courses offered in the College (Sem:1-7)

REQUIREMENTS FOR THE OPTION: 20-25 credits

ENVIRONMENTAL SCIENCE OPTION: (25 credits)

PRESCRIBED COURSES (7 credits)
AGRO 28(3), ANSC 201(4) (Sem: 1-2)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 3 credits in biological, physical ecosystems (Sem: 1-7)
Select 6 credits in environmental impact management (Sem: 1-7)
Select 6 credits in environmental learning (Sem: 1-7)
Select 3 credits in social, political, and legal aspects of environmental science (Sem: 1-7)

PRODUCTION OPTION: (20 credits)

SUPPORTING COURSES AND RELATED AREAS (20 credits)
Select 8 credits in agriculture (Sem: 1-7)
Select 6 credits in animal science (Sem: 1-7)
Select 6 credits in plant/soil science (Sem: 1-7)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-04-004

Review Date: 01/10/2017

R & T: 01/14/2014

UCA Revision #1: 8/2/06

AG

Agricultural Science

University Park, College of Agricultural Sciences (AG SC)

PROFESSOR JOHN C. EWING, *Program Coordinator*

This major enables students to develop programs of study to serve their individual needs by assembling courses selected from various departments within the College of Agricultural Sciences. The student develops either a broad background in agriculture or a special program of study not currently offered within departments of the college. Students are expected to focus study on one or more disciplines of the agricultural sciences by selecting a minor from the approved list of minors offered by the College of Agricultural Sciences. The student, in consultation with an adviser, is given considerable flexibility for selecting courses to satisfy individual interests and aspirations.

Students can prepare themselves for careers in agricultural and natural resource related sales, and /or public relations; food, agricultural and natural resource commodity groups, agricultural finance; governmental and conservation agencies; the Cooperative Extension

Service; land use and appraisal; and international agriculture agencies.

For the B.S. degree in Agricultural Science, a minimum of 123 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18-30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-26 credits

REQUIREMENTS FOR THE MAJOR: 82-90 credits

(This includes 18-30 credits of General Education courses: 0-3 credits of GA courses; 0-3 credits of GHA courses; 9 credits of GN courses; 0-6 credits of GS courses; 9 credits of GWS courses.)

PRESCRIBED COURSES (12 credits)

CAS 100 GWS(3), ENGL 015 GWS(3) (Sem: 1-2)

AEE 360(3), AEE 460(3) (Sem: 5-8)

ADDITIONAL COURSES (43-48 credits)

BIOL 011 GN(3) and BIOL 012 GN(1), or BIOL 110 GN(4) or BISC 003 GN(3) (Sem: 1-2)

CHEM 101 GN(3) or CHEM 110 GN(3) (Sem: 1-4)

Select 3 credits from ENGL 202C GWS(3), ENGL 202D GWS(3) (Sem: 3-4)

Select 3 credits from AEE 330(3), AEE 440(3) (Sem: 4-7)

Select 3-4 credits in Crop Management: Any AGEKO except X95 and X96, Any AGRO except X95, X96, Any ENT except X95, X96 (Sem: 5-6)

Select 3 credits in any HORT except X95, X96 (Sem: 5-6)

Select 3 credits in Agricultural Economics and Rural Sociology: Any AGBM except X95 and X96, Any CED except X95, X96, Any RSOC (Sem: 5-6)

Select 3 credits in International Agriculture: AEE 400(3), CED 450 IL(3), INTAG 100 GS;IL(3), INTAG 481(3), RSOC 420 US;IL(3), Any College of Agricultural Sciences international course (Sem: 5-6)

Take 1-2 credits in Careers in Agriculture: AEE 100(2), AG 100(1), AG 113(1), ANSC 290(1), ERM 151(1) (Sem: 5-6)

Select 3-4 credits in any ANSC except 291, X95, X96 (Sem: 5-6)

Select 3 credits in Technology in Agriculture: ASM 217(3), AGEKO 144 GN(3), AGEKO 457(3); ANSC 207(2) and ANSC 208(1); , ERM 210 GN(3), FDSC 200(3) (Sem: 5-6)

Select 6 credits in Natural Resources/Ecology: from AGEKO 122 GN(3), AGEKO 201(3), EGEE 101 GN(3), FOR 470(3), RSOC 327(3), SOILS 071 GN;IL(3), SOILS 101 GN(3), SOILS 412W(3), WFS 209 GN(3) (Sem: 5-6)

Select 3 credits from AEE 311(3) or AEE 465(3) (Sem: 5-8)

Select 3 credits in Agricultural and Environmental Policy; AG 160 GH(3), AGEKO 134 GN(3), CED 201(3), FDSC 105 GHA(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (27-30 credits)

Select 9 credits in Agriculture (Sem: 5-8)

Select 18-21 credits for College of Agricultural Sciences Minor **[1]** (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2011

Blue Sheet Item #: 39-06-002

Review Date: 04/12/2011

UCA Revision #1: 8/2/06

AG

Animal Science

University Park, College of Agricultural Sciences (AN SC)

Not all options are available at every campus. Contact the campus you are interested in attending to determine which options are offered.

DR. ROBERT MIKESELL, *Program Coordinator*

Animal Science may be defined as the study and integration of all disciplines that relate to the function and care of animals for the benefit of society by providing companionship, food, fiber, performance, and research. The Animal Science major includes references to all types of animals.

The educational experiences included in this major should prepare the student for a wide range of entry-level positions in production agriculture agribusiness, and related industries, and provide preparation for the pursuit of post-baccalaureate studies leading to professional or advanced degrees. The student is expected to develop a comprehensive understanding of the biological and physical sciences underlying the functioning of all types of animals.

Realizing the wide range of career possibilities requiring diverse types of academic preparation, two options of study are available: the Business/Management Option and the Science Option.

For the B. S. degree in Animal Science, a minimum of 124 credits is required.

BUSINESS/MANAGEMENT OPTION: The primary objective of this option is to prepare the student for entry-level positions in agribusiness organizations and in the animal and food industries. The student may develop a program with specie specialization or diversity. The student may develop a foundation in accounting, economics, finance, marketing, and other business-related areas. Graduates seek entry-level employment opportunities as loan officers with financial institutions; technical service and sales representatives for pharmaceutical, agri-chemical, feed or food producing companies; field representatives for breed organizations or producer cooperatives; public relations and human resources personnel for agribusiness companies; management trainees for numerous agribusiness firms; management trainees or assistant managers of animal production units, and roles in government agencies.

SCIENCE OPTION: The primary objective of this option is to prepare the student for entry into post-baccalaureate study programs in animal and related biological sciences. Graduates who have obtained the proper qualifications may pursue advanced studies in a wide variety of disciplines, including animal science, biotechnology, genetics,

microbiology, nutrition, physiology, molecular biology, pharmaceutical research, and veterinary medicine. Graduates not desiring to pursue advanced studies seek entry-level employment opportunities as research technicians, technical service representatives for various industrial companies, food inspectors, laboratory animal caretakers, and public relations personnel.

TO VIEW THE [Animal Science Minor \(AN SC\)](#)

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18-24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-13 credits

REQUIREMENTS FOR THE MAJOR: 90-100 credits

(This includes 18-24 credits of General Education courses; 0-3 credits of GA courses; 9 credits of GN courses; 3-6 credits of GS courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 42-47 credits

(Courses taken as common requirements can not be used to meet requirements within the option)

PRESCRIBED COURSES (24 credits)

ANSC 100 GN(3) (Sem: 1-2)

BIOL 110 GN(4) (Sem: 1-4)

ANSC 201(4)[\[1\]](#), ANSC 207(2)[\[1\]](#), ANSC 208(1)[\[1\]](#), ANSC 290(1), ANSC 300 GN(3)[\[1\]](#) (Sem: 3-4)

ANSC 301(3)[\[1\]](#), BMB 211(3) (Sem: 3-6)

ADDITIONAL COURSES (15-18 credits)

AGBM 101 GS(3) or ECON 102 GS(3) (Sem: 1-2)

Select 6-8 credits from:

-- select 3-4 from MATH 021 GQ(3), MATH 022 GQ(3), MATH 110 GQ(4), or MATH 140 GQ(4) (Sem: 1-2)

-- select 2-4 from CMPSC 101 GQ(3), CMPSC 203 GQ(4), MATH 022 GQ(3), MATH 111 GQ(2), MATH 141 GQ(4), STAT 100 GQ(3), STAT 200 GQ(4), or STAT 250 GQ(3) (Sem: 1-2)
CHEM 202(3) or CHEM 210(3)

Select 3-4 credits [\[1\]](#) from ANSC 305(3), ANSC 306(3), ANSC 308(4), ANSC 309(4), ANSC 310(3), ANSC 311(4), ANSC 315(3), ANSC 324(3), or ANSC 327(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (3-5 credits)

Select 3-5 credits in communication skills courses from department list. Certain courses may double count as general education courses; consult with your adviser. (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 48-53 credits

BUSINESS/MANAGEMENT OPTION: (49-52 credits)

PRESCRIBED COURSES (7 credits)

ACCTG 211(4) (Sem: 3-4)

ANSC 322(3) (Sem: 5-6)

ADDITIONAL COURSES (19-22 credits)

CHEM 101 GN(3) or CHEM 110 GN(3) (Sem: 1-2)

AGBM 102(3) or MKTG 221(3) (Sem: 3-4)

AGBM 200(3) or MGMT 100(3) (Sem: 3-4)

MICRB 106 GN(3) and MICRB 107 GN(1); or MICRB 201(3) and MICRB 202(2) (Sem: 5-6)

Select 3-4 credits from ANSC 305(3), ANSC 306(3), ANSC 308(4), ANSC 309(4), ANSC 310(3), ANSC 311(4), ANSC 315(3), ANSC 324(3), ANSC 327(3), ANSC 405(3), ANSC 407(3), or ANSC 410(4) (Sem: 5-8)

Select 3-4 credits from ANSC 420(4), ANSC 423(3), ANSC 427(3), or ANSC 431(4) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (23 credits)Select 23 credits (at least 9 credits of business and 9 credits of production courses; 12 credits must be 400-level courses) from department list (Sem: 5-8)
(Students may apply 6 credits of ROTC.)**SCIENCE OPTION: (48-53 credits)****PRESCRIBED COURSES (27 credits)**

CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1) (Sem: 1-2)

BMB 212(1), BMB 221(2) (Sem: 5-6)

MICRB 201(3), MICRB 202(2), PHYS 250 GN(4) (Sem: 5-6)

ANSC 423(3), ANSC 431(4) (Sem: 7-8)

ADDITIONAL COURSES (16-19 credits)

CHEM 203(3) or CHEM 212(3) and CHEM 213(2) (Sem: 3-4)

Select 4 credits from BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4) (Sem: 3-4)

Select 3 credits from AGRO 028(3), ANSC 211(3), ANSC 213(3), or SOILS 101 GN(3) (Sem: 5-6)

Select 3 credits from ANSC 322(3), BIOL 133 GN(3), or BIOL 222(3) (Sem: 5-6)

Select 3-4 credits from ANSC 305(3), ANSC 306(3), ANSC 308(4), ANSC 309(4), ANSC 310(3), ANSC 311(4), ANSC 315(3), ANSC 324(3), ANSC 327(3), ANSC 405(3), ANSC 407(3), ANSC 410(4), or ANSC 413(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (5-7 credits)Select 5-7 credits of 400-level courses from department list
(Students may apply 6 credits of ROTC.) (Sem: 7-8)**Integrated B.S. in Animal Science and Master of Biotechnology in Biotechnology**

Qualified students should formally apply to the Master of Biotechnology degree when they have earned a minimum of 75 credits in their B.S. curriculum. To make sure students finish within the shortest time-to-degree, students intending to apply to the integrated program will be closely mentored by their respective undergraduate program coordinators to guide their progress through their B.S. curriculum. The undergraduate program coordinators will be directly consulted by the Director of the Master of Biotechnology in Biotechnology program regarding admission of a student applicant to the Master of Biotechnology in Biotechnology program.

Students admitted to the integrated program will follow their undergraduate curriculum until the beginning of their fourth year, at which time, they start taking courses required for the Master of Biotechnology degree. In the summer following the Spring semester of their fourth year, students will participate in off-campus internships and have the option

of either continuing at their off-campus location for their research project in the following Fall semester, or coming back to campus to do a research project. The final Spring semester will be devoted to completing the course and credit requirements for the Master of Biotechnology degree. As designed, students can opt to graduate with a B.S. degree at the end of the Spring semester of their 4th year, when they should have completed the credit requirements of the B.S. degree program (124 credits). The following table outlines the program of study for students in this program:

Year	Semester	B.S. Animal Science (124 credits required) credits completed
I	Fall	15
	Spring	16
II	Fall	15.5
	Spring	16
III	Fall	15
	Spring	15.5
IV	Fall	15*
	Spring	16*
Total credits for B.S.		124

* The following courses to be taken in these semesters will be cross-counted towards the B.S. and Master of Biotechnology. degrees:

BIOTC 479. Methods in Biofermentation OR CH E 409 (3 credits)

BMB 400. Molecular Biology of the Gene (2-3 credits)

IBIOS 571. Current Issues in Biotechnology (2 credits)

IBIOS 591. Ethics in the Life Sciences (1 credit)

IBIOS 593. Molecular Biology Laboratory (3 credits)

**Total credits cross-counted
in B.S. and Master of
Biotechnology degrees**

12 credits, 6 of which are 500-level credits

Master of Biotechnology in Biotechnology (30 credits required, 18 of which must be 500-level)

IV	Summer	IBIOS 595 or equivalent in AN SC (2 credits) Internship
V	Fall	IBIOS 594. Research Project (3-6 credits)
	Spring	IBIOS 590. Colloquium (1 credit) Electives, 500-level (3-6 credits) Other graduate level electives (6 credits)

Minimum total credits earned for Summer and 5th year	18 credits, at least 12 of which are 500-level credits
---	---

Admission Requirements

Students must have a GPA of 3.5 at the time of application to the integrated degree program when they have completed at least 75 credits of their B.S. curriculum. The GRE scores normally required in the Master of Biotechnology in Biotechnology program will be waived for applicants to the integrated B.S.-Master of Biotechnology degree.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2013 (ANSCI); Summer Session 2006 (Integrated B.S./Master of Biotechnology in Biotechnology-Grad. Degree Name Change)

Blue Sheet Item #: 41-04-001 (ANSC); 34-06-001 (Integrated B.S./Master of Biotechnology in Biotechnology)

Last Revised by the Department: Fall Semester 2012

Review Date: 01/15/2013

AG

Biological Engineering

University Park, College of Agricultural Sciences
University Park, College of Engineering (B E)

PROFESSOR PAUL H. HEINEMANN, *Head of the Department of Agricultural and Biological Engineering*

This major helps prepare students for careers involving the application of engineering principles to agricultural and biological production systems, processing systems, and conservation of land and water resources. Education in mathematics, physics, and engineering sciences common to all engineering disciplines is provided along with specialized training in biological and agricultural sciences. The curriculum covers all areas of biological engineering, including development of machines for biological processing and agriculture, postharvest handling and processing, natural resource management and utilization, biological processes, food engineering, and structures and their environmental modifications. A student must select the Agricultural Engineering option, Food and Biological Processing Engineering option or the Natural Resources Engineering option.

Program Educational Objectives:

Early career Biological Engineering graduates will be expected to:

1. Demonstrate proficiency in basic and engineering sciences related to biological processing, natural resource, and agricultural engineering fields;
2. Effectively identify, analyze and design sustainable solutions to address issues and opportunities throughout the world;
3. Work in teams and effectively communicate within and outside the profession;
4. Demonstrate strong leadership skills, ethical integrity, and professional engagement

Program Outcomes (Student Outcomes):

Upon graduation Biological Engineering students will have:

- a. an ability to apply knowledge of mathematics, science, and engineering
- b. an ability to design and conduct experiments, as well as to analyze and interpret data
- c. an ability to design a system, component, or process to meet desired needs
- d. an ability to function on multi-disciplinary teams
- e. an ability to identify, formulate, and solve engineering problems
- f. an understanding of professional and ethical responsibility
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of engineering solutions in a global and societal context
- i. a recognition of the need for an ability to engage in life-long learning
- j. a knowledge of contemporary issues
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Principles of engineering design experiences are integrated throughout the junior-year curriculum by having students solve problems typical of those encountered in the agricultural and biological engineering profession. A year-long major design experience in the senior year emphasizes that biological engineers must learn not only how to develop engineering solutions to unique, practical problems using the newest technology, but also to assess and integrate the social and ethical implications of their solutions.

Careers for graduates include design, development, and research engineering positions involving biological processes, machinery development, natural resources management, materials handling, biological product development, and structural systems for animals, plants, and crop storage. Biological engineers are employed in industry, consulting firms, and governmental agencies in the United States and abroad. Graduates deal with the various engineering aspects associated with production and processing of food, fiber, and other biological materials, within the constraints of environmental protection and natural resource conservation.

ENTRANCE TO MAJOR -- In addition to the minimum grade point average (GPA) requirements* described in the University Policies, all College of Engineering entrance to major course requirements must also be completed with a minimum grade of C: CHEM 110 (GN), MATH 140 (GQ), MATH 141 (GQ), MATH 250 or MATH 251, PHYS 211 (GN) and PHYS 212 (GN). All of these courses must be completed by the end of the semester during which the admission to major process is carried out.

*In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

For the B.S. degree in Biological Engineering, a minimum of 129 credits is required. The baccalaureate program in Biological Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, Inc., www.abet.org.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(27-28.5 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of *Bulletin*.)

FIRST-YEAR SEMINAR:

(Included in REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 111-112.5 credits

(This includes 27-28.5 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses; and 1.5 credits of GHA courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 75 credits

PRESCRIBED COURSES (68 credits)

CHEM 110 GN(3)[11], CHEM 111 GN(1), EMCH 211(3)[11], EDSGN 100(3), ENGL 015 GWS(3), MATH 140 GQ(4)[11], MATH 141 GQ(4)[11], PHYS 211 GN(4)[11] (Sem: 1-2)
EMCH 212(3)[11], EMCH 213(3)[11], ME 300(3)[11], MATH 231(2), MATH 251(4)[11], PHYS 212 GN(4)[11] (Sem: 3-4)
BE 301(3)[11], BE 302(4)[11], BE 304(3)[11], BE 305(3)[11], BE 308(3)[11], BE 391 GWS(2) (Sem: 5-6)
BE 392 GWS(2), BE 460(1), BE 466(3) (Sem: 7-8)

ADDITIONAL COURSES (7 credits)

CAS 100A GWS(3) or CAS 100B GWS(3)
Select 1 credit of First-Year Seminar (Sem: 1-2)
AGBM 101 GS(3) or ECON 102 GS(3), or ECON 104 GS(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTIONS: 36-37.5 credits

AGRICULTURAL ENGINEERING OPTION: (36 credits)

ADDITIONAL COURSES (6 credits)

CE 360(3)[11] or ME 320(3) [11] (Sem: 5-6)
IE 424(3) or STAT 401(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (30 credits)

Select 3 credits in math/basic science[26] (Sem: 3-6)
Select 6 credits from BE 303(3)[11], BE 306(3)[11], BE 307(3)[11] (Sem: 5-6)
Select 6 credits in engineering science/design[26] (Sem: 5-8)
Select 3 credits in agricultural/biological science[26] (Sem: 7-8)
Select 6 credits in biological engineering[26] (Sem: 7-8)
Select 6 credits in technical selection[26] (Sem: 7-8)
(Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHA category upon completion of the ROTC program.)

FOOD AND BIOLOGICAL PROCESSING ENGINEERING OPTION: (37.5 credits)

PRESCRIBED COURSES (16.5 credits)

BMB 211(3), CHEM 202(3), NUTR 100 GHA(1.5) (Sem: 5-6)
BE 465(3), BE 468(3), IE 424(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)

CE 360(3)[11] or ME 320(3)[11] (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

Select 6 credits in emphasis technical elective[26] (Sem: 7-8)
Select 6 credits in any engineering science/design[26] (Sem: 7-8)
Select 6 credits in technical selection[26] (Sem: 7-8)
(Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHA category upon completion of the ROTC program.)

NATURAL RESOURCES ENGINEERING OPTION: (36 credits)

PRESCRIBED COURSES (21 credits)

SOILS 101 GN(3) (Sem: 1-4)

ASM 309 (3)[11], BE 307(3)[11], CE 360(3)[11] (Sem: 5-6)

BE 467(3), BE 477(3), BE 487(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits)

IE 424(3) or STAT 401(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 6 credits in engineering science/design[26] (Sem: 5-8)

Select 3 credits in biological/environmental sciences[26] (Sem: 7-8)

Select 3 credits in technical selection[26] (Sem: 7-8)

(Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHA category upon completion of the ROTC program.)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[26] Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that the engineering design and engineering science requirements for the major are met.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

R & T: Approved 5/24/2013

UCA Revision #1: 8/2/06

UCA Revision #2: 7/26/07

Comments

EN

BioRenewable Systems

University Park, College of Agricultural Sciences (BRS)

PROFESSOR NICOLE BROWN, *Program Coordinator*

The BioRenewable Systems Major is an applied major that intertwines the study of engineering technology, natural resources, and agriculture with fundamentals of business, entrepreneurship, and management. Administered through the Department of Agricultural and Biological Engineering, the BioRenewable Systems (BRS) program uniquely prepares students to solve 21st century problems and attain careers in both traditional sectors and those relating to the emerging bioeconomy. Students in this program will secure: (1) knowledge of fundamental sciences related to resources, processes, and products in biorenewable systems; (2) communication and managerial skills relevant to careers in product development, technology, sales, marketing and management; and (3) the ability to apply systems analysis skills, positioning them for effective problem solving and leadership in the agricultural and bioproducts industries.

Graduates are typically employed as sales and field representatives, financial and technical consultants, and technical service or quality assurance personnel in renewable bioproducts or related agricultural sectors such as: power and machinery systems, forest products, food production, bioprocessing, environmental systems, wood structures, bioenergy, co-product development, and agrochemicals. Graduates may continue their education in a graduate program with a science, engineering, or business orientation.

The BRS major has two options: Agricultural Systems Management (ASM) and BioProducts (BP).

Agricultural Systems Management Option

This option applies a technological approach to understanding and managing agricultural production systems to meet economical and sustainable needs. Basic study is emphasized in the agricultural and business management sciences, along with the application of the technical results of engineering research, design, and manufacturing. Graduates of this option apply their technology and management training to the diverse areas of food and fiber production; bioprocessing; and land, water, and air resources.

BioProducts Option

The scientific nature of biobased resources—their unique design, sustainability, and renewability—constitutes the core of this option. Building upon that foundation, students will learn techniques for converting and efficiently utilizing these materials to maximize product life cycles, while simultaneously exploring relevant marketing and management strategies. Technical electives for this option emphasize material sciences, engineering, and/or business. Career tracks are broad, ranging from traditional forest products companies to emerging sectors, including bioenergy co-products.

For the B.S. degree in BioRenewable Systems, a minimum of 120 credits is required for the BioProducts Option and minimum of 121 credits is required for the Agricultural Systems Management Option.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in REQUIREMENTS FOR THE MAJOR course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 105-109 credits

(This includes 30 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 9 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 73-75 credits

PRESCRIBED COURSES (45 credits)

ACCTG 211(4), CHEM 110 GN(3), CHEM 111 GN(1), EDSGN 100(3)[1], ENGL 015 GWS(3)
(Sem: 1-2)

AGBM 106(3)[1], BRS 221(3)[1], BRS 300(3)[1], BRS 391 GWS(2), BRS 437(4)[1] (Sem: 5-6)
BRS 392 GWS(2), BRS 393(1), BRS 422(3), BRS 426(3), BRS 428(3), BRS 429(3), BRS 490(1)
(Sem: 7-8)

ADDITIONAL COURSES (28-30 credits)

Select 1 credit of First-Year Seminar (Sem: 1-2)

EBF 200 GS(3) or ECON 104 GS(3) (Sem: 1-2)

MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)

PHYS 211 GN(4) or PHYS 250 GN(4) (Sem: 1-2)

AGBM 101 GS(3) or ECON 102 GS(3) (Sem: 3-4)

BIOL 110 GN(4) or BIOL 011 GN(3) and BIOL 012 GN(1) (Sem: 3-4)

CAS 100A GWS(3) or CAS 100B GWS(3) (Sem: 3-4)

STAT 200 GQ(4) or STAT 240 GQ(3) (Sem: 3-4)

BA 241(2) and BA 242(2); or BA 243(4) or BLAW 243(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTIONS: 32-34 credits

AGRICULTURAL SYSTEMS MANAGEMENT OPTION: 33-34 credits

PRESCRIBED COURSES (9 credits)

SOILS 101 GN(3) (Sem: 3-4)

ASM 310(3)[1], ASM 327(3)[1] (Sem: 5-6)

ADDITIONAL COURSES (6-7 credits)

AGRO 028(3) or HORT 101 GN(3) (Sem: 3-4)

ANSC 100 GN(3); ANSC 201(4); ANSC 207/FDSC 207(2), ANSC 208/FDSC 208(1) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

Select 18 credits of specialization courses in consultation with an advisor. At least 12 credits must be at 200-400 level. (Sem: 5-8)

BIOPRODUCTS OPTION: 32 credits

PRESCRIBED COURSES (14 credits)

BRS 411(4), BRS 417(4) (Sem: 5-6)

BRS 402(3)[1], BRS 423(3),(Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

Select 3 credits in leadership/entrepreneurship. (Sem: 5-6)

Select 15 credits of specialization courses in consultation with an advisor. At least 9 credits must be at 200-400 level. (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2016

Blue Sheet Item #: 44-06-001

Review Date: 04/5/2016

Community, Environment, and Development

University Park, College of Agricultural Sciences (CED)

PROFESSOR LELAND GLENNA, *Program Coordinator*

The principal goal of the Community, Environment, and Development (CED) major is to develop the knowledge and skills of undergraduate students to enable them to assist local people, their communities, and institutions effectively understand, respond to and ultimately shape economic and social changes, including those that pose risks to the environment. The CED major focuses on the fields of community and economic development, environment and natural resources, and the critically important interactions between these fields, both locally and globally. Building skills and knowledge to tackle important environment and development issues facing communities today requires a multidisciplinary or transdisciplinary program; the major bridges the disciplines of agricultural, environmental and regional economics on the one hand and rural sociology on the other. Foundation (Level I) courses introduce students to key concepts in economics and sociology, and examine how these disciplines contribute to the basic content knowledge encompassing community and economic development and environmental economics and sociology. Level II courses build on the Foundation courses by extending the content knowledge to address the interrelationship between environment and natural resources and community and economic development. Coursework in Methods, Quantification and Communication is also required, including methods and techniques such as Geographical Information Systems and Geographical Information Analysis, statistics and survey research methods. Finally, students select among three options: (1) Community and Economic Development, (2) Environmental Economics and Policy, and (3) International Development. Students specialize in an option that further allows them to develop skills and competencies matching their specific education and career goals. It is expected that some students completing the program will choose to attend graduate school or law school, while others will choose employment after graduation.

For the B.S. degree in Community, Environment, and Development, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of *Bulletin*.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selections)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES, GENERAL EDUCATION, or REQUIREMENTS FOR THE MAJOR course selections)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 6-8 credits

REQUIREMENTS FOR THE MAJOR: 88-90 credits

(This includes 21 credits of General Education courses: 6 credits of GQ courses, 6 credits of GS courses, 9 credits of GWS.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 58-60 credits

PRESCRIBED COURSES (40 credits)

CED 152(3)[1], CED 201(3)[1], CED 230(3)[1], ENGL 015 GWS(3) (Sem: 2)

ECON 104 GS(3), GEOG 160 GS(3) (Sem: 3)

CAS 100 GWS(3), CED 309(3)[1], CED 427(3)[1], STAT 200 GQ(4) (Sem: 4)

CED 417(3) (Sem: 5)

CED 404(3) (Sem: 6)
CED 475(3) (Sem: 8)

ADDITIONAL COURSES (18-20 credits)

AGBM 101 GS(3) or ECON 102 GS(3) (Sem: 1)
RSOC 011 GS;US(3) or SOC 001 GS(3) (Sem: 1)
MATH 022 GQ(3) or MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1)
CMPSC 101 GQ(3) or CMPSC 203 GQ(4) (Sem: 3)
PLSC 001 GS(3) or PLSC 003 GS (3) or PLSC 014 GS(3) (Sem: 3)
ENGL 202A GWS(3), ENGL 202B GWS;IL(3), ENGL 202C GWS;IL(3), or ENGL 202D GWS(3)
(Sem: 5)

REQUIREMENTS FOR THE OPTION: 30 credits

COMMUNITY AND ECONOMIC DEVELOPMENT OPTION (30 credits)

PRESCRIBED COURSES (9 credits)

SOC 023 GS(3) (Sem:5)
AEE 460(3) (Sem:7)
CED 409(3) (Sem: 8)

ADDITIONAL COURSES (9 credits)

CED 430(3) or CEDEV 430(3) (Sem: 5)
CEDEV 452(3) or RSOC 452(3) (Sem:6)
ERM 411(3) or BLAW 425(3) (Sem: 7)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 12 credit in specialization (Sem: 5-8)

ENVIRONMENTAL ECONOMICS AND POLICY (30 credits)

PRESCRIBED COURSES (12 credits)

ECON 302 GS(3) (Sem:5)
CED 431(3), ECON 428(3) (Sem:7)
CED 429(3) (Sem: 8)

ADDITIONAL COURSES (3 credits)

ERM 411(3) or BLAW 425(3) (Sem:7)

SUPPORTING COURSES AND RELATED AREAS (15 credits)

Select 3 credits of Environmental Science from approved department list.
Select 12 credits in specialization (Sem: 5-8)

INTERNATIONAL DEVELOPMENT OPTION (30 credits)

PRESCRIBED COURSES (18 credits)

SOC 023 GS(3), RSOC 470(3) (Sem: 5)
CED 410(3) (Sem: 6)
CED 425(3), CED 450 IL(3) (Sem: 7)
CED 420 US;IL(3) (Sem: 8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 12 credit in specialization (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2013

Blue Sheet Item #: 42-01-001

Review Date: 08/20/13

Comments

AG

Publications updated coordinator: 3/1/12

Environmental Resource Management

University Park, College of Agricultural Sciences (E R M)

PROFESSOR ROBERT D. SHANNON, *Program Coordinator*

Environmental Resource Management (E R M) is an interdisciplinary, science-based major designed to prepare students to understand and critically analyze environmental problems ranging from local to global in scale, identify solutions, and communicate ideas related to environmental and natural resource issues. The E R M major also focuses on human interactions with the environment by emphasizing the management of environmental resources. The E R M curriculum begins with foundation course work in the biological, physical and social sciences. Later courses apply these principles to the management and sustainability of the environment, and include environmental problem-solving, ecosystem management and environmental law. The third tier, offered through three options, affords considerable flexibility and the opportunity to specialize.

The major prepares students for employment in a variety of environmental positions, including environmental consulting, public agencies, and nonprofit organizations. Students are also prepared for graduate school or law school upon graduation. Realizing the wide range of career possibilities requiring diverse types of academic preparation, three options of study are available: the Environmental Science Option, the Soil Science Option and the Water Science Option.

In the Environmental Science Option, students select a minor or choose a group of courses (totaling at least 18 credits) that focus on a particular aspect of the environment. Examples include watersheds and water resources, climate change impacts, geographic information systems, energy and air pollution, sustainability leadership, ecology, environmental engineering, wildlife and fisheries science, and others. Courses and minors from across the University can be selected to develop a student's area of specialization in the Environmental Sciences Option.

In the Soil Science Option, students take courses in soil composition and properties, conservation, nutrient management, soil ecology, GIS and mapping. This option also allows the student to choose courses that support their strengths and interests. The option prepares students for positions with private, public, and non-profit firms that evaluate soils for various uses, delineate wetlands, perform environmental assessments, and identify and remediate contaminated soils.

In the Water Science Option, students take courses in hydrologic measurements, wetland conservation, stream restoration, stream and lake ecology, watershed management, and land use practices to control runoff and erosion. The option also prepares students for positions with private, public, and non-profit firms that evaluate water quality and quantity issues, delineate wetlands, perform environmental and hydrological assessments, and identify and remediate contaminated aquatic resources.

For the B.S. degree in Environmental Resource Management, a minimum of 121 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(27-30 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR: 1-3 credits

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-8 credits

REQUIREMENTS FOR THE MAJOR: 93-108 credits

(This includes 27-30 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GS courses; 9 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 47-48 credits

PRESCRIBED COURSES (33 credits)

CAS 100 GWS(3), ENGL 015 GWS(3), ERM 151(1)[1] (Sem: 1-2)

CHEM 110 GN(3)[1], CHEM 111 GN(1)[1], CHEM 112 GN(3), CHEM 202(3) (Sem: 1-4)

SOILS 101 GN(3)[1], SOILS 102(1) (Sem: 3-4)

ASM 327(3)[1], ENGL 202C GWS(3), ERM 300(3)[1], ERM 411(3) (Sem: 5-8)

ADDITIONAL COURSES (14-15 credits)

MATH 110 GQ(4) or MATH 140 GQ(4) (Sem: 1-2)

AGBM 101 GS(3) or ECON 102 GS(3) (Sem: 1-2)

PHYS 211 GN(4) or PHYS 250 GN(4); STAT 200 GQ(4) or STAT 240 GQ(3) or STAT 250 GQ(3) (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 48-60 credits

ENVIRONMENTAL SCIENCE OPTION: (58-60 credits)

PRESCRIBED COURSES (20 credits)

BIOL 110 GN(4)[1], BIOL 220W GN(4), GEOG 160 GS(3) (Sem: 3-4)

CED 201(3) (Sem: 5-6)

ERM 412(3)[1], ERM 413(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (14-16 credits)

MATH 111 GQ(2) or MATH 141 GQ(4) (Sem: 1-2)

AGBM 200(3) or ERM 402(3) or MGMT 215(3) (Sem: 3-8)

GEOC 001(3) or GEOC 303(3) (Sem: 5-6)

Select 6 credits from any 400-level ERM courses (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (24 credits)

Select 3 credits in communications/entrepreneurship/leadership (Sem: 3-8)

Select 3 credits in ecology (Sem: 5-6)

Select 18 credits of specialization/minor courses in consultation with adviser (Sem: 5-8)

SOIL SCIENCE OPTION: (48-50 credits)

PRESCRIBED COURSES (12 credits)

SOILS 403(2), SOILS 412(3), SOILS 416(4)[1] (Sem:3-6)

SOILS 450(3) (Sem: 5-8)

ADDITIONAL COURSES (18-20 credits)

BIOL 110 GN(4) or BIOL 127 GN(3) (Sem:1-4)

GEO SC 001(3) or GEO SC 020 GN(3) (Sem: 1-4)

Select 3-4 credits from AGRO 028(3), BIOL 220W GN(4), FOR 203(3), HORT 101 GN(3), TURF 235(3) (Sem: 3-6)

Select 3 credits from ERM 433(3), ERM 440(3), SOILS 402(3), SOILS 419(3), SOILS 420(3) (Sem: 3-8)

Select 3 credits from SOILS 401(3), SOILS 405(3), GEO SC 452(3) (Sem: 3-8)

Select 3 credits from ERM 444(3), FOR 475(3), SOILS 404(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

Select 18 credits of supporting courses in consultation with adviser. (Sem: 5-8)

WATER SCIENCE OPTION: (58-60 credits)**PRESCRIBED COURSES** (35 credits)

BIOL 110 GN(4)[1], BIOL 220W GN(4), GEOG 160 GS(3) (Sem: 3-4)

CED 201(3), ERM/ASM 309(3) (Sem: 5-6)

ERM 412(3)[1], ERM 413(3)[1], ERM/WFS 435(3), ERM 447(3), ERM 450(3), FOR 470(3) (Sem: 5-8)

ADDITIONAL COURSES (8-10 credits)

MATH 111 GQ(2) or MATH 141 GQ(4) (Sem: 1-2)

SOILS 401(3), SOILS 405(3) or GEO SC 452(3) (Sem: 5-8)

CE 370(3), ERM 440(3), ENT 425(3), FOR 303(3), FOR 403(3), WFS 410(3), or WFS 422(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)

Select 3 credits in communications/entrepreneurship/leadership (Sem: 3-8)

Select 12 credits of supporting courses in consultation with adviser (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Lasted Revised by the Department: Spring Semester 2014

Blue Sheet Item #: 42-06-004

Review Date: 04/08/2014

UCA Revision #1: 8/4/06

AG

Food Science

University Park, College of Agricultural Sciences (FD SC)

PROFESSOR SARA R. MILILLO, *Program Coordinator*

Food science involves the application of science and technology to food product manufacture, storage, and distribution to consumers. Food scientists are especially concerned with food safety, nutritional values, managing food quality, food plant management, and development of new products and processes. They are employed by manufacturers and distributors of food products; by chemical, packaging, and other industries that supply goods and services; by colleges and universities in teaching and research; and by government agencies concerned with food regulations and the health

and well-being of the general public.

For the B.S. degree in Food Science, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(19 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 5 credits

REQUIREMENTS FOR THE MAJOR: 87 - 91 credits

(This includes 19 credits of General Education courses: 9 credits of GN courses; 7 credits of GQ courses; 3 credits of GWS courses.)

PRESCRIBED COURSES (62 credits)

BIOL 110 GN(4), BMB 211(3), BMB 212(1), CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3)[1], CHEM 113 GN(1), FDSC 200(3)[1], FDSC 201(1)[1], FDSC 400(4), FDSC 405(3)[1], FDSC 406(3), FDSC 408(3), FDSC 409(2), FDSC 410(3), FDSC 411(3), FDSC 413(3), FDSC 414(3), FDSC 415(3), MICRB 201(3), MICRB 202(2)[1], PHYS 250 GN(4), STAT 250 GQ(3)
(Sem: 5-6)

ADDITIONAL COURSES (13-15 credits)

CHEM 202(3)[1], CHEM 203(3); or CHEM 210(3)[1], CHEM 212(3), CHEM 213(2)
ENGL 202C GWS(3) or ENGL 202D GWS(3)
MATH 110 GQ(4) or MATH 140 GQ(4)

SUPPORTING COURSES AND RELATED AREAS (12-14 credits)

To reflect the student's career interests, select 12-14 credits (depending on the organic chem series taken, a total of 6 credits or 8 credits) from department list or in consultation with adviser (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2016

Blue Sheet Item #: 46-02-001

Review Date: 10/3/2017

01/19/00 (General Education information updated)

UCA Revision #1: 8/4/06

AG

PROGRAM COORDINATOR UPDATED: 9/2/14

Forest Ecosystem Management

University Park, College of Agricultural Sciences (FOREM)

PROFESSOR ELLEN MANNO, *Program Coordinator*

The mission of the B.S. program in Forest Ecosystem Management is to help students develop the knowledge, skills, and professional ethics for understanding and managing forest ecosystems and living as responsible members of society.

The Forest Ecosystem Management major provides for the education necessary for students to pursue professional careers in one of the following options: (1) Forest Biology, (2) Forest Management, (3) Community and Urban Forest Management, and (4) Watershed Management. These options also will prepare students for graduate studies in continuing professional education.

FOREST BIOLOGY OPTION: This option provides a strong background in the biological and ecological aspects of contemporary forestry and establishes a sound foundation for professional employment and graduate-level study in forest and environmental sciences.

FOREST MANAGEMENT OPTION: This option provides professional training in the management of forest lands consistent with the needs of ownership objectives. Employment opportunities include forest management positions with public agencies, industry, and private consulting.

COMMUNITY AND URBAN FOREST MANAGEMENT OPTION: This option helps prepare students to manage community trees and green spaces. It emphasizes technical expertise, communication abilities, and skills for working with diverse people. Employment opportunities include municipalities, arboricultural companies, utilities, and government agencies.

WATERSHED MANAGEMENT OPTION: This option focuses on water resources and the integrated management of natural resources with emphasis on water. Graduates qualify for federal employment as hydrologists and for water-related careers in municipal watershed management, state and local government, and environmental/engineering consulting.

For the B.S. degree in Forest Ecosystem Management, a minimum of 120 credits is required for the Forest Biology, Forest Management, and Watershed Management options, and a minimum of 123 credits for the Community and Urban Forest Management option. Students should be aware that, in most cases, completion of the Forest Ecosystem Management degree in four years requires enrollment at the University Park Campus beginning the fall semester of the sophomore year.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(21-27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 2-12 credits

REQUIREMENTS FOR THE MAJOR: 88-100 credits

(This includes 21-27 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3-6 credits of GS courses; 0-3 credits of GA courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 33-34 credits

PRESCRIBED COURSES (27 credits)

CHEM 110 GN(3), CHEM 111 GN(1), ECON 102 GS(3) (Sem: 1-2)

FOR 200(1)[1], FOR 203(3)[1], FOR 255(3)[1], FOR 266(4)[1], SOILS 101 GN(3) (Sem: 3-4)

FOR 308(3)[1] (Sem: 5-6)

FOR 421(3)[1] (Sem:7-8)

ADDITIONAL COURSES (6-7 credits)

STAT 200 GQ(4)[1], STAT 240 GQ(3)[1], or STAT 250 GQ(3)[1] (Sem: 1-2)

ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 55-66 credits

FOREST BIOLOGY OPTION: (57-58 credits)

PRESCRIBED COURSES (34 credits)

BIOL 110 GN(4), BIOL 220W GN(4) (Sem: 1-2)

CHEM 202(3) (Sem: 3-4)

FOR 204(2)[1], FOR 350(3)[1], FOR 409(2)[1], SOILS 102(1) (Sem: 3-6)

FOR 410(3)[1], FOR 430(3)[1], FOR 450(3)[1], HORT 445(3), WFS 209(3) (Sem: 5-8)

ADDITIONAL COURSES (8-9 credits)

MATH 110 GQ(4) or MATH 140 GQ(4)[1] (Sem: 1-2)

Select 4-5 credits from ENT 313(2), FOR 403(3), PPEM 318(2) (Sem: 4-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)

Select 15 credits from department list in consultation with adviser (Sem: 5-8)

FOREST MANAGEMENT OPTION: (56-60 credits)

PRESCRIBED COURSES (32 credits)

FOR 204(2)[1], FOR 320(2)[1], FOR 350(3)[1] (Sem: 3-6)

ENT 313(2), PPEM 318(2), WFS 209 GN(3) (Sem: 5-6)

FOR/WFS 430(3)[1], FOR 440(3)[1], FOR 455(3)[1], FOR 466(3)[1], FOR 470(3)[1], FOR 480(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (12-16 credits)

BIOL 110 GN(4) or BIOL 127 GN(3) (Sem: 1-2)

MATH 22 GQ(3)[1] and MATH 26 GQ(3)[1]; or MATH 40 GQ(5)[1]; or MATH 41 GQ(3)[1]; or

MATH 110 GQ(4)[1]; or MATH 140 GQ(4)[1] (Sem: 1-2)

FOR 409(2)[1] and SOILS 102(1) or FOR 475(3)[1]; (Sem: 3-8)

FOR 401(3)[1] or FOR 450(3)[1] (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

In consultation with adviser, select 12 credits from department list approved for the option. Six credits must be 300-to 400-level. (Sem: 5-8)

COMMUNITY AND URBAN FOREST MANAGEMENT OPTION: (61-66 credits)

PRESCRIBED COURSES (32 credits)

ASM 217(3), ENT 313(2), ENT 314(1), FOR 204(2), PPEM 318(2) (Sem: 3-6)

FOR 401(3)[1], FOR 450(3)[1], FOR 480(3)[1], GEOG 430(3), HORT 138(3), HORT 301(3),

HORT 408(4) (Sem: 5-8)

ADDITIONAL COURSES (21-25 credits)

BIOL 110 GN(4) or BIOL 127 GN(3) (Sem: 1-2)

MATH 22 GQ(3)[1] and MATH 26 GQ(3)[1]; or MATH 40 GQ(5)[1]; or MATH 41 GQ(3)[1]; or MATH 110 GQ(4)[1]; or MATH 140 GQ(4)[1] (Sem: 1-2)

ARCH 316 GA(3) or LARCH 60 GA(3) or LARCH 65 GA(3) (Sem: 3-4)

FOR 409(2)[1] and SOILS 102(1) or FOR 475(3)[1] (Sem: 3-8)

FOR 495(3)[1] or FOR 496(3)[1] (Sem: 5-6)

RPTM 320(3) or RPTM 325(3) or RPTM 435(3) or RPTM 470(3) (Sem: 5-6)

FOR 455(3) or GEOG 363(3) or SOILS 450(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (8-9 credits)

Select 8-9 credits from department list in consultation with adviser (Sem: 5-8)

WATERSHED MANAGEMENT OPTION: (55-59 credits)

PRESCRIBED COURSES (7 credits)

FOR 450(3)[1], FOR 470(3)[1], FOR 471(1)[1] (Sem: 6-8)

ADDITIONAL COURSES (9-11 credits)

MATH 110 GQ(4)[1] or MATH 140 GQ(4)[1] (Sem: 1-2)

MATH 111 GQ(2) or MATH 141 GQ(4) (Sem: 3-4)

FOR 409(2)[1] and SOILS 102(1); or FOR 475(3)[1] (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (39-41 credits)

Select 6 credits of GS social sciences from EBF 200 GS(3), ECON 302 GS(3), EGEE 211 GS(3), ENVST 100 GS(3), GEOG 20 GS(3), GEOG 30 GS(3), GEOG 130 GS(3), GEOG 160 GS(3), PLSC 1 GS(3), PLSC 135 GS(3) (Sem: 1-5)

Select 6 credits of physical sciences from EARTH 100 GN(3), EARTH 103 GN(3), EARTH 111 GN(3), GEOG 10 GN(3), GEOG 110 GN(3), GEOSC 1(3), GEOSC 10 GN(3), GEOSC 40 GN(3), METEO 3 GN(3), METEO 122 GN(3), MICRIB 106 GN(3), MICRIB 201(3) (Sem: 1-5)

Select 6-8 credits of GN from PHYS 1 GN(3), PHYS 150 GN(3), PHYS 151 GN(3), PHYS 211 GN(4), PHYS 213 GN(2), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-4)

Select 3 credits in geospatial analysis from FOR 455(3), GEOG 362(3), GEOG 363(3), GEOG 364(3) or SOILS 450(3) (Sem: 5-6)

Select 6 credits of resources management from ASM 327(3), CED 201(3), CED 427(3), CED 429(3), CED 431(3), CED 450 IL(3), ERM 411(3), ERM 412(3), ERM 413(3), FOR 410(3), FOR 440(3), GEOG 411W(3), GEOG 430(3), GEOG 431(3), SOILS 422(3) (Sem: 5-8)

Select 9 credits from water sciences from ASM 309(3), CE 360(3), CE 370(3), CE 371(3), ERM 435(3), ERM 447(3), ERM 450(3), ENVE 411(3), ENVE 415(3), ENVSE 408(3), GEOG 310(3), GEOG 311(3), GEOG 412(3), GEOSC 412(3), GEOSC 413(3), GEOSC 440(3), GEOSC 452(3), METEO 451(3), METEO 454(3), SOILS 405(3), WFS 422(3) Three credits must be at the 400-level. (Sem: 5-8)

Select 3 additional credits at the 300-to 400-level from the lists above (Sem:7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2017

Blue Sheet Item #: 46-02-002

Review Date: 10/3/2017

UCA Revision #1: 8/4/06

AG

Immunology and Infectious Disease

University Park, College of Agricultural Sciences (IID)

PROFESSOR PAMELA HANKEY, *Program Coordinator*

Immunology is the study of how animals and humans protect themselves from pathogens. Understanding basic mechanisms of immunity provides insights into how blood cells develop and how pathogens are recognized and attacked. Furthermore, understanding the concepts behind immunology is necessary for drug and vaccine design. Dysregulation of the processes that regulate immunity can contribute to uncontrolled inflammation, tissue destruction, autoimmunity, immunodeficiencies, leukemia and related cancers. Immunology includes a broad range of disciplines including but not limited to microbiology, virology, animal health, genetics, biochemistry, molecular and cell biology. Students enrolled in the Immunology and Infectious Disease Major will develop and understanding of normal immune responses to bacterial, fungal, and viral agents and appreciate the potential pathological outcomes of these responses. Students will learn about events that shape the immune response; the general biology of pathogens and the mechanisms by which they cause disease. In addition, basic skills in microbiology, molecular biology and biochemistry will be acquired. Students completing a B.S. degree in Immunology and Infectious Disease will be well prepared for veterinary, medical or other professional schools, Ph.D. graduate training in a wide variety of areas including immunology, microbiology, virology, molecular medicine, animal science, molecular biology and biochemistry or highly competitive jobs as research technicians, laboratory assistants or sales representatives with a pharmaceutical company.

In order to be eligible for entrance to the Immunology and Infectious Disease major, a student must have: (1) attained at least a 2.00 cumulative grade point average and (2) completed BIOL 110 GN(4) [1], BIOL 230W GN(4)[1], BIOL 220W GN(4)[1] or BIOL 240W GN(4)[1], CHEM 110 GN(3)[1], CHEM 111 GN(1)[1], CHEM 112 GN(3)[1], CHEM 113 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] and earned a grade of C or better in each of these courses

For the B.S. degree in Immunology and Infectious Disease, a minimum of 124 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 7-10 credits

REQUIREMENTS FOR THE MAJOR: 89-91 credits

(This includes 15 credits of GENERAL EDUCATION courses: 9 credits of GN courses; 6 credits of GQ courses)

PRESCRIBED COURSES (60 credits)

B M B 401(3)[1], B M B 402(3)[1], BIOL 110 GN(4)[1], BIOL 230W GN(4)[1], CHEM 110 GN(3)[1], CHEM 111 GN(1)[1], CHEM 112 GN(3)[1], CHEM 113 GN(1)[1], CHEM 210(3), CHEM 212(3), CHEM 213(2), MATH 140 GQ(4)[1], MATH 141 GQ(4)[1], MICRB 201(3)[1], MICRB 202(2)[1], MICRB 410(3) [1], PHYS 250 GN(4), PHYS 251 GN(4), VBSC 211 GN(3)[1], VBSC 448(3) (Sem: 1-8)

ADDITIONAL COURSES (20-22 credits)

Select 4 credits from BIOL 220W GN(4)[1] or BIOL 240W GN(4)[1] (Sem: 2-3)
Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), STAT 250 GQ(3) (Sem: 3-4)
Select 3 credits from VBSC 444(3)[1] or BBH/HPA 440(3)[1] (Sem: 5-8)
Select 10-11 credits from VBSC 418(2)[1], VBSC/MICRB/BMB 432(3)[1], VBSC/MICRB 435(2)[1], VBSC 445(3)[1], VBSC 451(3)[1] (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)

Select 9 credits of 400-level courses from departmental list[1] (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2014

Blue Sheet Item #: 42-06-006

Review Date: 04/08/2014

UCA Revision #1: 8/8/06

HH

Program Coordinator updated: 6/19/12

Landscape Contracting

University Park, College of Agricultural Sciences (LSCPE)

PROFESSOR DAN T. STEARNS, Program Coordinator

Landscape contracting involves constructing, establishing, and maintaining landscapes from small residential projects to large commercial and industrial projects, as well as producing plans for small-scale residential and commercial sites. Students develop skills in construction, site design, plant material usage, plant establishment, and landscape maintenance. Students are also educated in areas such as graphics, surveying, soils, turfgrass management, weed and pest management, and in business operations.

Students are encouraged to obtain on-the-job experience in landscape contracting by working with a landscape maintenance or construction firm, or other related business. Credits for this experience are available for those who choose to enroll in an internship.

A wide variety of opportunities exist for landscape contracting graduates. They may be employed by design/build firms, landscape management firms, nurseries, or garden centers. Others may choose to work for municipalities, golf courses, parks, or botanical gardens.

DESIGN/BUILD OPTION: This option focuses on the development of skills in the planning and implementation of landscape projects. Employment opportunities exist with landscape contracting companies, irrigation companies, and retail centers.

MANAGEMENT OPTION: This option provides professional education in the management

of landscapes. Employment opportunities include positions with landscape management companies and golf courses.

For the B.S. degree in Landscape Contracting, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-15 credits

REQUIREMENTS FOR THE MAJOR: 81-93 credits

(This includes 21-24 credits of General Education courses: 3 credits of GWS courses; 3-6 credits of GA courses; 3 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 67-68 credits

PRESCRIBED COURSES (51 credits)

HORT 410(3), HORT 468(2)[1], LARCH 60 GA;US;IL(3), MATH 26 GQ(3) (Sem: 1-2)
ASM 217(3), ACCTG 211(4), BA 250(3), BLAW 243(3), CHEM 101 GN(3), ENGL 202D
GWS(3), HORT 101 GN(3)[1], HORT 120(2)[1], HORT 131(3)[1], HORT 137(3)[1], HORT
138(3)[1], HORT 408(4)[1] (Sem: 5-6)
SOILS 101 GN(3) (Sem: 7-8)

ADDITIONAL COURSES (16-17 credits)

AGBM 101 GS(3), ECON 14 GS(3), ECON 102 GS(3), or ECON 104 GS(3) (Sem: 3-4)
BIOL 110 GN(4) or BIOL 127 GN(3) (Sem: 3-4)
SPAN 1(4) or SPAN 2(4) or SPAN 105(4) (Sem: 3-4)
AGBM 220(3) or MKTG 220(3) (Sem: 5-6)
TURF 100(3) or TURF 235(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 14-26 credits

DESIGN/BUILD OPTION: (25-26 credits)

PRESCRIBED COURSES (23 credits)

ART 20 GA(3), EDSGN 10(1), HORT 220(3)[1] (Sem: 3-4)
HORT 269(3)[1], HORT 464(4)[1] (Sem: 5-6)
HORT 368(4)[1], HORT 466(5)[1] (Sem: 7-8)

ADDITIONAL COURSES (2-3 credits)

Select 2-3 credits from ENT 313(2), ENT 314(1), HORT 238(3), PPEM 300(3) or PPEM
318(2) (Sem: 5-6)

MANAGEMENT OPTION: (14-15 credits)

PRESCRIBED COURSES (9 credits)

ENT 313(2), ENT 314(1), HORT 238(3)[1], HORT 250(3)[1] (Sem: 7-8)

ADDITIONAL COURSES (5-6 credits)
PPEM 300(3) or PPEM 318(2) (Sem: 7-8)
SOILS 402(3) or SOILS 404(3) (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

UCA Revision #1: 8/8/06

AG

Plant Sciences

University Park, College of Agricultural Sciences (PLANT)

PROFESSOR Erin L. Connolly, Head, *Department of Plant Science*

The Plant Sciences Major is an applied biological science program designed for students seeking careers in agronomic and horticultural crop production systems and enterprise management, agroecology, sustainable and organic managed and natural ecosystems, crop protection, applied plant physiology, plant science research, and plant biotechnology. Students will secure: (1) a working knowledge of basic plant biology, soils, pests, and pathogens with emphasis on growth, development, and physiology in an ecological and agricultural context, (2) the scientific, technical, and computational approaches to problem solving in an ecological and agricultural context, individually and in teams, (3) the ability to analyze ethical issues regarding ecosystem sustainability, business practices and plant science, and critically evaluate and respect different viewpoints in making management decisions, and (4) a high level of proficiency in written and oral communication, particularly with regard to critical evaluation of scientific issues.

There are five options in the major, providing flexibility for concentrations in areas including production and management systems related to agronomic and horticultural crops, plant biotechnology and breeding, crop physiology, ecology, agroecology, and other aspects of general plant science. Students can choose from diverse course offerings in designing a program of study suited to their needs and professional goals.

AGROECOLOGY OPTION:

This option applies an ecological approach to understanding and managing cropping systems to meet societies' needs while enhancing environmental protection and resource conservation. Students will develop skills to manage agroecosystems for sustainable productivity, profitability and environmental protection by studying plant and soil sciences, ecology, and pest management from a systems perspective. The curriculum prepares students for a wide range of careers in agricultural and ecological fields, sustainable food production, and for graduate studies.

CROP PRODUCTION OPTION:

This option provides students with practical and field-related skills in Agronomy (field crop production and soil management). Students will focus on techniques and knowledge necessary to efficiently and economically manage soils, crops and other farm resources with additional emphasis on pest management and commodity marketing. Courses stress

the skills and information needed to work with current production technologies such as seed traits, crop protection chemicals, and fertilizers to improve yield and productivity.

HORTICULTURE OPTION:

This option prepares students to enter the horticultural industry by providing a broad background in courses related to production and physiology of horticultural crops. Additional courses in pest management and business are required. Graduates may work as orchard, greenhouse, garden center, nursery or farm managers, with horticultural and landscape service providers, suppliers, and brokers, with cooperative extension and other government and non-governmental agencies and public and private gardens, or continue with graduate studies.

PLANT GENETICS AND BIOTECHNOLOGY OPTION:

This option is a combination of basic science and technology-based classes designed for students who are seeking careers in agricultural sciences, plant breeding, plant molecular genetics and plant biotechnology based industries. It provides students with maximum flexibility in selecting a program of study suited to their needs and to achieve professional goals related to advanced degrees or immediate job placement in the industry. The option provides theoretical and practical skills of plant genetic manipulation relevant to plant biotechnology, plant breeding and genome research.

PLANT SCIENCE OPTION:

This option emphasizes the application of the biological sciences to problem-solving in agronomic and horticultural ecosystems. Topic areas include plant biology, plant pathology, plant microbiology, plant biotechnology, plant-insect interactions, horticulture, crop science, plant ecology, and bioenergy. Graduates may find employment in industry, government and academic research programs as technicians and research assistants, or pursue graduate degrees.

For the B.S. Degree in Plant Sciences, a minimum of 120 credits are required.

GENERAL EDUCATION: 45 credits

(21-24 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE OPTIONS)

ELECTIVES: 0-13 credits

REQUIREMENTS FOR THE MAJOR: 83-102 credits

(This includes 21-24 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses and 3 credits of GWS courses; plus 3 GH in Crop Production.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 33-36 credits

PRESCRIBED COURSES (19 credits)

BIOL 110 GN(4), CHEM 110 GN(3), CHEM 111 GN(1) (Sem: 1-4)

SOILS 101 GN(3)[1], ENT 313(2) (Sem: 5-6)

AGECO 457(3)[1], PLANT 461(3)[1] (Sem: 5-8)

ADDITIONAL COURSES (14-17 credits)

Select 3-5 credits from MATH 22 GQ(3), MATH 26 GQ(3), MATH 40 GQ(5), MATH 41 GQ(3-4), MATH 110 GQ(4), MATH 111 GQ(2), MATH 140 GQ(4), MATH 141 GQ(4), or MATH 141B GQ(4) (Sem: 1-2)

Select 3-4 Credits from STAT 200 GQ(4), STAT 240 GQ(3) or STAT 250 GQ(3) (Sem: 1-2)

Select 3 credits from ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 1-4)

Select 3 credits from AGBM 101 GS(3), ECON 14 GS(3), ECON 102 GS(3), or ECON 104 GS(3) (Sem: 3-4)

Select 1 credit from ENT 314(1) or ENT 316(1) (Sem: 5-7)

Select 1 credit from AGECO 495(1-18), AGRO 495(1-5), HORT 495(1-13), or HORT 496(1-18) (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 50-66 credits

AGROECOLOGY OPTION: (60-61 credits)

PRESCRIBED COURSES: (18 credits)

SOILS 102(1) (Sem: 1-5)

AGECO 201(3)**[1]** (Sem: 2-6)

AGECO 295(1) (Sem: 2-8)

AGECO/AGRO 438(4) (Sem: 5-7)

SOILS 401(3), SOILS 402(3) (Sem: 6-8)

PPEM 405(3) (Sem: 6-8)

ADDITIONAL COURSES (24-25 credits)

Select 3 credits from AGECO/METEO 122 GN(3), AGECO/RSOC 134 GN(3), AGECO 144 GN(3), AGECO 154(2) or AGECO 496(1) (Sem: 1-4)

Select 3 credits from AG 160 GH(3), GEOG 30 GS;IL(3), PHIL 13 GH(3), PHIL 103 GH(3), or PHIL 132/RLST 131 GH(3) (Sem: 1-4)

Select 3 credits from AGRO 28(3)**[1]** or HORT 101 GN(3)**[1]** (Sem: 1-5)

Select 3 credits from AGECO 121 GN(3) or BIOL 127 GN(3) (Sem: 3-5)

Select 6 credits from AGRO 423(3), AGRO 425(3), HORT 202(3), HORT 315(3), HORT 431(3), HORT 432(3), HORT 433(3), HORT 450(3), or SOILS 418(3) (Sem: 5-6)

Select 3 credits from BIOL 222(3) or HORT 407(3) (Sem: 5-6)

Select 3-4 credits from AGRO 410(4), HORT 412(3), or SOILS 412(3) (Sem: 6)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

Select 18 credits of supporting courses in consultation with adviser. (Sem: 5-8)

CROP PRODUCTION OPTION: (64-66 credits)

PRESCRIBED COURSES (32 credits)

SOILS 102(1) (Sem: 2-5)

AGECO 201(3)**[1]**, AGECO 295(1) (Sem: 2-6)

PPEM 405(3) (Sem: 3-7)

AGECO 429(2), AGRO 423(3), AGRO 425(3) (Sem: 3-8)

AGECO/AGRO 438(4) (Sem: 5)

HORT 407(3) (Sem: 5-7)

SOILS 401(3), SOILS 402(3) (Sem: 6-8)

PPEM 405(3) (Sem: 6-8)

ADDITIONAL COURSES (23-25 credits)

Select 3 credits from AGRO 28(3)**[1]** or HORT 101 GN(3)**[1]** (Sem: 1-3)

Select 3 credits from AG 160 GH(3), PHIL 13 GH(3), PHIL 103 GH(3), or PHIL 132 GH(3) (Sem: 2-7)

Select 3 credits from AGECO 121 GN(3) or BIOL 127 GN(3) (Sem: 3-5)

Select 3 credits from AGBM 102(3), AGBM 106(3), AGBM 200(3) or AGBM 407(3) (Sem: 3-7)

Select 3 credits from AEE 201 GS(3), AEE 360(3), AEE 460(3), or AEE 465(3) (Sem: 3-7)
Select 2 credits from AGECO 154(2) or SOILS 403(2) (Sem: 3-8)
Select 3-4 credits from AGECO/ANSC/SOILS 418(3), ANSC 201(4), GEOG 160 GS(3), or SOILS 450(3) (Sem: 3-8)
Select 3-4 credits from AGRO 410(4), HORT 412(3), or SOILS 412(3) (Sem: 6)

SUPPORTING COURSES AND RELATED AREAS (9 credits)

Select 9 credits of supporting courses in consultation with adviser (Sem: 4-8)

HORTICULTURE OPTION: (54-57 credits)

PRESCRIBED COURSES (30 credits)

HORT 101 GN(3)[1], HORT 202(3)[1], HORT 232(3), HORT 315(3)[1], HORT 402(3), HORT 407(3), HORT 412(3)[1], HORT 420(3), HORT 445(3), HORT 455(3) (Sem: 1-8)

ADDITIONAL COURSES (24-27 credits)

Select 3 credits from HORT 131(3), HORT 137(3), HORT 138(3), HORT 431(3)*, HORT 432(3)*, or HORT 433(3)* (Sem: 3-8)

Select 3 credits from PPEM 300(3) or PPEM 405(3) (Sem: 4-8)

Select 6-7 credits from HORT 408(4), HORT 431(3), HORT 432(3), HORT 433(3), HORT 450(3), or HORT 453(3) (Sem: 5-8)

Select 3-4 credits from AGRO 438(4) or HORT 238(3) (Sem: 5-8)

Select 9-10 credits from AGBM 200(3), AGBM 407(3), BLAW 243(3), BA 301(3), BA 303(3), SPAN 1(4), SPAN 2(4), SPAN 3(4) or SPAN 105(4) (Sem: 5-8)

PLANT GENETICS AND BIOTECHNOLOGY OPTION: (59-65 credits)

PRESCRIBED COURSES (37 credits)

PHYS 250(4) (Sem: 3-4)

BIOL 127(3)[1], BIOL 222(3) (Sem: 3-5)

CHEM 112 GN(3), CHEM 210(3) (Sem: 4-5)

PPEM 405(3)[1] (Sem: 5)

CHEM 212(3) (Sem: 5-6)

HORT 407(3) (Sem: 5-7)

AGRO 410(4), HORT/BIOL/BIOTC 459(3) (Sem: 6)

BMB 400(2) (Sem: 7)

AGRO/BIOTC 460(3) (Sem: 8)

ADDITIONAL COURSES (22-28 credits)

Select 3 credits from AGRO 28(3) or HORT 101 GN(3) (Sem: 1-4)

Select 1 credit from CHEM 113 GN(1); CHEM 113B GN(1) (Sem: 2-3)

Select 4-6 credits from BIOL 230W GN(4); BIOL 240W GN(4); BMB 211(3) and BMB 212(1); MICRB 201(3) and MICRB 202(2); MICRB/BMB 251(3) and MICRB/BMB 252(3) (Sem: 4)

Select 3-4 credits from BIOL 412(3), BIOL 414(3), BIOL 427(3), BIOL 428(3), BIOL 436(3), BIOL 448(3), ENT 420(3), HORT 445(3), or PPEM/BIOL 425(4) (Sem: 7)

Select 2-3 credits from BIOL 439(3), BIOTC 479 (3), HORT 497(3), MCBIS 571(2), or MCBIS 593(3) (Sem: 7)

Select 3-4 credits from ENT/VBSC 402(3), ENT 410(3), PPEM 416(3), or PPEM/BIOL 425(4) (Sem: 8)

Select 3-4 credits from BIOL 407(3), BIOL 424(3), BIOL 441(3), HORT 402(3), HORT 412(3), HORT 420(3), MCBIS 591(1), PPEM 417(3), or PPEM/ERM 430(3) (Sem: 8)

Select 3 credits from AGRO 423(3), AGRO 425(3), HORT 202(3), HORT 315(3), HORT 431(3), HORT 432(3), HORT 433(3), HORT 450(3), or SOILS/AGECO/ANSC 418(3) (Sem: 8)

PLANT SCIENCE OPTION: (50-56 credits)

PRESCRIBED COURSES (24 credits)

CHEM 112(3) (Sem: 2-3)

BIOL 127 GN(3)**[1]**, PHYS 250(4) (Sem: 3-6)
CHEM 210(3), CHEM 212(3), CHEM 213B(2) (Sem: 4-5)
BIOL 222(3) (Sem: 5-6)
PPEM 405(3)**[1]** (Sem: 5-8)

ADDITIONAL COURSES (26-32 credits)

Select 3 credits from AGRO 28(3) or HORT 101 GN(3) (Sem: 1-4)

Select 1 credit from CHEM 113(1) or CHEM 113B(1) (Sem: 2-3)

Select 4-6 credits from BMB 211(3) and BMB 212(1), or BIOL 230W GN(4), or BIOL 240W GN(4), or MICRB 201(3) and MICRB 202(2), or MICRB 251(3), or MICRB 252(3) (Sem: 3-6)

Select 3-4 credits from BIOL 439*(3), ENT 402(3), ENT 410(3), PPEM 416(3), PPEM 417*(3), or PPEM 425*(4) (Sem: 5-8)

Select 3-4 credits from BIOL 412(3), BIOL 414(3), BIOL 427(3), BIOL 428(3), BIOL 436(3), BIOL 448(3), ENT/VBSC 402(3), ENT 420(3), HORT 445(3), PPEM 425(4) (Sem: 5-8)

Select 3 credits from AGRO 460(3), BIOL 439(3), HORT 407*(3), or HORT 459(3) (Sem: 5-8)

Select 6-7 credits from AGRO 410(4), AGRO 460(3), BIOL 407(3), BIOL 441(3), BIOL 424(3), HORT 402(3), HORT 407*(3), HORT 412(3), HORT 420(3), PPEM 417*(3), or PPEM/ERM 430(3) (Sem: 5-8)

Select 3-4 credits from AGRO 410(4), HORT 412(3), or SOILS 412(3) (Sem: 6)

*Students cannot use the same course more than once as an additional course

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2016

Blue Sheet Item #: 45-01-005

Review Date: 8/23/2016

Toxicology

University Park, College of Agricultural Sciences (TOX)

PROFESSOR JOHN VANDEN HEUVEL, *Program Coordinator*

Toxicology addresses adverse effects of chemicals on animals and humans and includes exposure assessment, hazard identification, dose-response analysis, and risk characterization. This discipline relies on cutting-edge biotechnological approaches to gain insight into drug and toxicant action at the molecular level. Students enrolled in the Toxicology program will develop an understanding of the principles by which chemicals affect the health of humans and animals either adversely, as toxic agents, or beneficially, as therapeutic agents. Students will learn about: 1) mechanisms of action of drugs and toxicants on organ systems of the body; 2) general principles for assessing the safety of chemicals and therapeutic efficacy of drugs; and 3) state-of-the-art molecular, biological, and genetic approaches to understanding drugs, toxicants, and disease through a combination of laboratory and lecture experiences. The B.S. degree in Toxicology provides a strong foundation for graduate work leading to a Ph.D. in most biomedical fields. Students may choose to pursue a Ph.D. degree in Pharmacology, Toxicology, Biochemistry, Physiology, Pathobiology, Oncology, or Molecular Biology. Alternatively, students prepare for employment as research technicians, drug/toxicant specialists, or pharmaceutical sales representatives.

Entrance to Major Requirements:

In order to be eligible for entrance to the Toxicology major, a student must have (1)

attained at least a 2.00 cumulative grade point average and (2) earned a C grade or better in: BIOL 110, BIOL 230W, CHEM 110, CHEM 111, CHEM 112, CHEM 113, MATH 140 and MATH 141.

For the B.S. degree in Toxicology, a minimum of 124 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-2 credits

REQUIREMENTS FOR THE MAJOR: 92-94 credits

(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (78 credits)

BIOL 110 GN(4)[1], CHEM 110 GN(3)[1], CHEM 111 GN(1)[1], CHEM 112 GN(3)[1], CHEM 113 GN(1)[1], MATH 140 GQ(4)[1], MATH 141 GQ(4)[1] (Sem: 1-2)

BBH/HPA 440 US;IL(3), CHEM 210(3), CHEM 212(3), CHEM 213(2), VBSC 230(3) (Sem: 3-4)
PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-6)

BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-6)

BMB 211(3), BMB 212(1), BMB 221(2), BIOL 472(3)[1], VBSC 330(3)[1] (Sem: 5-6)

ERM 431(3)[1], VBSC 430(3)[1], VBSC 433(3)[1], VBSC 451(3)[1] (Sem 7-8)

ADDITIONAL COURSES (5-7 credits)

Select 3-4 credits from STAT 200 GQ(4) or STAT 250 GQ(3) (Sem: 3-4)

Select 2-3 credits from VBSC 395(1-10) or VBSC 496(1-18) (Sem: 6-8)

SUPPORTING COURSES AND RELATED AREAS (9 credits)

Select 9 credits of 400-level courses from department list [1] (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2012

Blue Sheet Item #: 41-02-002

Review Date: 10/02/2012

UCA Revision #1: 8/14/06

AG

Program Coordinator updated: 6/19/12

Turfgrass Science

University Park, College of Agricultural Sciences (TURF)
World Campus

PROFESSOR ANDREW McNITT, *Program Coordinator*

This major provides an integrated program of study that includes basic and applied sciences, business management courses and an internship to prepare students for careers in turfgrass management and related areas. By carefully selecting supporting courses and electives, students can adapt the program to meet a variety of professional interests and educational needs.

Employment opportunities include golf course maintenance, professional lawn care, grounds maintenance, sod production, sales and service, athletic field maintenance, and research technician.

With appropriate selection of science courses, students can prepare for graduate study leading to careers in teaching, research, and extension.

Entrance Requirement: A student wishing to transfer into the Turfgrass Science program must have completed CHEM 101 GN(3) or CHEM 110 GN(3) and received a grade of C or better in each course prior to declaring the major.

For the B.S. degree in Turfgrass Science, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in SUPPORTING COURSES AND RELATED AREAS course selections)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selections)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 4 credits

REQUIREMENTS FOR THE MAJOR: 89 credits
(This includes 18 credits of General Education courses; 3 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses.)

PRESCRIBED COURSES (49 credits)
BIOL 127 GN(3), CHEM 202(3)[1], CMPSC 203 GQ(4), MATH 21 GQ(3) (Sem: 1-4)
SOILS 101 GN(3)[1], TURF 230(1)[1], TURF 235(3)[1], TURF 495(3)[1] (Sem: 3-4)
ENT 317(3)[1], PPEM 412(3)[1], TURF 238(3)[1], TURF 434(3)[1] (Sem: 5-6)
ASM 307(3), TURF 425(3)[1], TURF 435(4)[1], TURF 436(3)[1], TURF 490(1)[1] (Sem: 6-8)

ADDITIONAL COURSES (13 credits)
BIOL 11 GN(3), BIOL 12 GN(1); or BIOL 110 GN(4) (Sem: 1-4)
CHEM 101 GN(3)[1] or CHEM 110 GN(3)[1] (Sem: 1-4)
METEO 3 GN(3) or METEO 101 GN(3) (Sem: 1-4)
ENGL 202C GWS(3) or ENGL 202D GWS(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (27 credits)

Select 12 credits from department professional agriculture list (Sem: 1-8)

Select 15 credits from department professional management and economics list (Sem: 1-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2012

Blue Sheet Item #: 41-02-003

Review Date: 10/02/2012

UCA Revision #1: 8/14/06

Comments

AG

Veterinary and Biomedical Sciences

University Park, College of Agricultural Sciences (VBSC)

PROFESSOR LESTER C. GRIEL Jr., *Program Coordinator*

This major provides a strong background in those biological and physical sciences underlying contemporary veterinary science and establishes a sound foundation for graduate-level study in veterinary and related biomedical disciplines. The student has the option to focus their area of study by selecting supporting courses in a variety of areas.

The mission of the Veterinary and Biomedical Sciences major is to prepare students for admission to veterinary school and/or entry into graduate programs or employment in veterinary and biomedical research and development. Students may prepare for graduate programs in disciplines such as genetics, nutrition, microbiology, animal sciences, physiology, biochemistry, or others.

In order to be eligible for entrance to the Veterinary and Biomedical Sciences major a student must have: (1) attained a cumulative grade point average of at least a 2.0 and (2) completed BIOL 110 GN(4), CHEM 110 GN(3), CHEM 111 GN(1) and earned a grade of C or better in each of these courses.

For the B.S. degree in Veterinary and Biomedical Sciences, a minimum of 124 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in ELECTIVES, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 7-10 credits

REQUIREMENTS FOR THE MAJOR: 87-90 credits

(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses.)

PRESCRIBED COURSES (53 credits)

BIOL 110 GN(4) [1], CHEM 110 GN(3) [1], CHEM 111 GN(1) [1], CHEM 112 GN(3), CHEM 113 GN(1), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)
ANSC 201(4) [1], PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-4)
ANSC 301(3) [1], BIOL 222(3) [1], MICRB 201(3), MICRB 202(2) (Sem: 5-6)
VBSC 211 GN(3), VBSC 403(3) [1], VBSC 421(4) (Sem: 4-8)

ADDITIONAL COURSES (25-28 credits)

Select 3 credits from AGBM 101 GS(3), ECON 102 GS(3), or ECON 104 GS(3) (Sem: 1-3)
Select 4 credits from BMB 251(3), BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-4)
Select 6-8 credits from CHEM 202(3), CHEM 203(3); or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
Select 3 credits from ANSC 423(3) or BIOL 472(3) (Sem: 5-6)
Select 3-4 credits from STAT 200 GQ(4) or STAT 250 GQ(3) (Sem: 5-6)
Select 6 credits from BMB 211(3), BMB 212(1), BMB 221(2); or BMB 401(3), BMB 402(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (9 credits) [1]

Select 9 credits of 400-level courses from department list (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Lasted Revised by the Department: Spring Semester 2014

Blue Sheet Item #: 42-06-008

Review Date: 04/08/2014

UCA Revision #1: 8/2/06

AG

Wildlife and Fisheries Science

University Park, College of Agricultural Sciences (W F S)

PROFESSOR ELLEN MANNO, *Program Coordinator*

The purpose of the Wildlife and Fisheries Science major is to develop the knowledge, skills, and professional ethics of undergraduates interested in the conservation and management of fish and wildlife and their environments. The curriculum is designed to provide a broad-based science background that incorporates natural resource management principles that prepare our students for a diverse array of opportunities such as graduate school, natural resource management agencies, consulting firms, non-profits, etc. Students can choose from two options: Wildlife option and Fisheries option. Each option enables students to gain greater depth of knowledge in one area of

the discipline. Coursework required for the Wildlife option meets The Wildlife Society's requirements for professional certification, and coursework required for the Fisheries option meets the American Fisheries Society's requirements for professional certification.

For the B.S. in Wildlife and Fisheries Science, a minimum of 120 credits is required for the Wildlife option and a minimum of 122 credits is required for the Fisheries option.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(21 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 3-9 credits

REQUIREMENTS FOR THE MAJOR: 87-95 credits

(This includes 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 69-72 credits

PRESCRIBED COURSES (45 credits)

BIOL 110 GN(4), BIOL 220W GN(4)[\[1\]](#), CHEM 110 GN(3), CHEM 111 GN(1) (Sem: 1-4)
BIOL 240W GN(4), CHEM 202(3), PHYS 250 GN(4), SOILS 101 GN(3), WFS 209 GN(3)[\[1\]](#)
(Sem: 3-4)

ECON 104 GS(3), WFS 300(2)[\[1\]](#), WFS 301(2)[\[1\]](#), WFS 310(3)[\[1\]](#) (Sem: 5-6)
WFS 446(3), ENGL 202C GWS(3) (Sem: 7-8)

ADDITIONAL COURSES (18-21 credits)

MATH 110 GQ(4)[\[1\]](#) or MATH 140 GQ(4)[\[1\]](#); MATH 111 GQ(2) or MATH 141 GQ(4) (Sem: 1-2)

ANSC 322(3), BIOL 133 GN(3), BIOL 222(3), or BIOL 230W GN(4) (Sem: 3-4)

STAT 240 GQ(3) or STAT 301 GQ(3) (Sem: 3-4)

FOR 350(3) or STAT 460(3) (Sem: 5-6)

AEE 440(3), CAS 211(3), ENGL 416(3), or ENGL 418(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)

Select 6 credits in natural resource economics, policy, planning, law, administration, or human dimensions from departmental list (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 18-23 credits

FISHERIES OPTION: (22-23 credits)

PRESCRIBED COURSES (10 credits)

WFS 452(2), WFS 453(2) (Sem: 5-6)

WFS 410(3), WFS 463(3) (Sem: 5-8)

ADDITIONAL COURSES (12-13 credits)

BIOL 141 GN(3), BIOL 142(1); or BIOL 446(3), or ANSC 201(4) (Sem: 5-6)

WFS 407(3), WFS 408(3), or WFS 447(3) (Sem: 5-8)

ENT 425(3), FOR 470(3), WFS 422(3);WFS 435(3)/ERM 435(3) (Sem: 5-8)
GEOG 160 GS(3), GEOG 363(3), GEOSC 303(3), GEOSC 340(3), GEOSC 412(3), GEOSC 440(3), or GEOSC 452(3) (Sem: 7-8)

WILDLIFE OPTION: (18-19 credits)

PRESCRIBED COURSES (12 credits)

FOR 203(3) (Sem: 3-4)

WFS 407(3), W F S 408(3) (Sem: 5-6)

WFS 447(3) (Sem: 7-8)

ADDITIONAL COURSES (6-7 credits)

WFS 406(2) or WFS 409(2) (Sem: 5-6)

WFS 410(3), WFS 422(3), WFS 452(2), WFS 453(2), or WFS 463(3) (Sem: 5-8)

BIOL 414(3), FOR 308(3), HORT 101 GN(3), HORT 138(3), or HORT 445(3) (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-04-004

Review Date: 1/15/08

UCA Revision #1: 8/14/06

AG

Associate Degrees

Forest Technology

University College: Penn State Mont Alto

University Park, College of Agricultural Sciences (2 FORT)

PROFESSOR CRAIG T. HOUGHTON, *in charge*

The objectives of the major are to train forestry field personnel in the technical aspects of evaluating, managing, and protecting forest resources. Laboratories held in the Michaux State Forest, adjacent to Penn State Mont Alto, stress field applications of classroom theory. Written and oral communication skills are stressed in all courses. Graduates of the program are employed by private businesses including forestry consulting firms, sawmills, and other wood products manufacturers; public agencies including federal, state, and municipal forest resource management and recreation programs; urban tree service companies, pulp and paper manufacturers, surveying firms and landscaping firms, utility companies, and other businesses requiring personnel skilled in field inventory procedures, analysis, and presentation.

Some graduates transfer their credits to bachelor's degree programs such as forest ecosystem management, wildlife and fisheries science, recreation park and tourism management, biorenewable systems, environmental resource management, plant sciences, biology, and business management.

ENTRANCE REQUIREMENTS: Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

For the Associate in Science degree in Forest Technology, a minimum of 64 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

REQUIREMENTS FOR THE MAJOR: 58 credits

PRESCRIBED COURSES (49 credits)

ENGL 015 GWS(3), FORT 100(1), FORT 105(3)[1], FORT 150(3)[1] GEOG 160 GS(3), GEOG 161(1), MATH 021 GQ(3) (Sem: 1)

BIOL 127 GN(3), FORT 110(3)[1], FORT 140(3), FORT 160(3)[1] (Sem: 2)

FORT 170(3), FORT 175(1) (Sem: Summer)

FORT 200(1), FORT 220(4), FORT 230(2)(Sem: 3)

CAS 100 GWS(3), FORT 240(3), FORT 250(3) (Sem: 4)

ADDITIONAL COURSES (9 credits)

Select 3 credits from MGMT 100W(3) or MGMT 301W(3) (Sem 3-4)

Select 6 credits from FORT 210(3), FORT 260(3), WILDL 101(3), or WILDL 207(3) (Sem: 3-4)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-04-004A

Review Date: 1/10/17

UCA Revision #1: 8/4/06

AG

Turfgrass Science and Management

*University Park, College of Agricultural Sciences (2 TSM)
World Campus*

PROFESSOR ANDREW S. McNITT, *Program Coordinator*
445 ASI Building
814-863-1368
asm4@psu.edu

The Turfgrass Science and Management (2 TSM) major prepares graduates for the Bachelor of Science in Turfgrass Science (TURF) program or direct entry into the work place. The primary objective of this major is to train current/future turfgrass facility managers in communicative and mathematical skills, and initiate student mastery of technical aspects unique to management of turfgrass systems.

Graduates of this program are qualified to support golf course, landscape, and athletic field maintenance operations; production of sod commodities; equipment sales and service; and technical research programs. Graduates may also apply their credits to pursue completion of Baccalaureate programs such as Soil Science, Environmental

Resource Management, Recreation and Parks Management, and Turfgrass Science (TURF). Students who plan to continue in the TURF degree program should meet with their advisors regarding entrance to major and other requirements.

ENTRANCE REQUIREMENTS: Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

For the Associate in Science degree in Turfgrass Science and Management, a minimum of 61 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 21 credits
(15 of these 21 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this Bulletin.)

UNITED STATES CULTURES OR INTERNATIONAL CULTURES:
(Included in ELECTIVES or SUPPORTING COURSES AND RELATED AREAS course selections)
(Sem: 1-4)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR) (Sem:1-4)

ELECTIVES: 3 credits (Sem: 1-4)

REQUIREMENTS FOR THE MAJOR: 52 credits
(This includes 15 credits of General Education courses: 6 credits of GN courses; 3 credits of GQ courses; 3 credits of GWS courses; 3 credits of GH courses.)

PRESCRIBED COURSES (31 credits)
BIOL 011 GN(3), CHEM 202(3), ENGL 015 GWS(3), ENT 317(3)**[1]**, MATH 021 GQ(3), PHIL 103 GH(3), SOILS 101 GN(3)**[1]**, TURF 230(1)**[1]**, TURF 235(3)**[1]**, TURF 238(3)**[1]**, TURF 295(3) (Sem: 1-4)

ADDITIONAL COURSES (3 credits)
Select 3 credits from CHEM 101 GN(3) or CHEM 110 GN(3) (Sem: 1-2)

SUPPORTING COURSES AND RELATED AREAS (18 credits)
Select 9 credits from department professional agriculture list (Sem: 1-4)
Select 9 credits from department professional management and economics list, 3 of the 9 credits must be from bolded sub-list (Sem: 1-4)

[1]Classes in which students pursuing the 2 TSM degree must earn a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-04-004B

Review Date: 1/10/2017

Wildlife Technology

*University College: Penn State DuBois
University Park, College of Agricultural Sciences (2 WLT)*

PROFESSOR AARON STOTTLEMYER, *in charge*, Penn State DuBois

The Wildlife Technology major helps prepare students in the techniques of wildlife management. Personnel trained in this field are needed to assist in the applied phases of natural resource management, wildlife biology, range management, and the care, maintenance, and propagation of animals. Graduates should be able to support professionals in wildlife biology, park managers, game refuge managers, and laboratory technicians in research. The Wildlife Technology Program is accredited by the North American Wildlife Technology Association (NAWTA).

ENTRANCE REQUIREMENTS: Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

For the Associate in Science degree in Wildlife Technology, a minimum of 65 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 21 credits
(9 of these 21 credits are included in REQUIREMENTS FOR THE MAJOR.)

REQUIREMENTS FOR THE MAJOR: 53 credits
(This includes 9 credits of General Education courses: 3 credits of GN and 6 credits of GWS.)

PRESCRIBED COURSES (46 credits)
BIOL 110 GN(4), FORT 150(3), FORT 160(3), ENGL 202C GWS(3), WILDL 101(3)[1], WILDL 103(4)[1], WILDL 106(4) (Sem: 1-2)
AG 113(1), CAS 100 GWS(3), FOR 242(3), KINES 013 GHA(1), WILDL 207(3), WILDL 208(3)[1], WILDL 211(4), WILDL 213(4) (Sem: 3-4)

ADDITIONAL COURSES (7 credits)
Select 3 credits from: ENGL 015 GWS(3) or ENGL 030 GWS (3) (Sem: 1-2)
Select 4 credits from: WILDL 204(4) or STAT 200 GQ(4) (Sem: 3-4)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-04-004C

Review Date: 1/10/2017

AG

Minors

Agribusiness Management Minor

University Park, College of Agricultural Sciences (AG BM)

The Agribusiness Management minor is offered for students who wish to add business and management principles to their undergraduate major.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (12 credits)**[1]**

AGBM 101 GS(3), AGBM 102(3), AGBM 106(3), AGBM 200(3) (Sem: 2-6)

ADDITIONAL COURSES (9 credits)**[1]**

Select 9 credits (6 of which must be from 400-level) from AG 301(3), AGBM 302(3), AGBM 308(3), AGBM 320(3), AGBM 338 IL(3), AGBM 407(3), AGBM 408(3), AGBM 420(3), AGBM 440(3), AGBM 460(3), and AGBM 495A(1-3) or AGBM 495B(1-3) (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Agricultural Communications Minor

University Park, College of Agricultural Sciences (AGCOM)

Through the Department of Agricultural Economics, Sociology, and Education, this interdisciplinary program of study is designed to introduce majors in the College of Agricultural Sciences to the skills and professional practices in communications and to the interdependence between communications and society. A grade of C or better is required in every course used to satisfy the requirements for the minor.

Students are required to complete a total of 19 credits, including 6 credits at the 400 level.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (7 credits)

COMM 160(1) (Sem: 1-2)

COMM 260W(3) (Sem: 3-4)

AGCOM 462(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)

Select 3-6 credits from AEE 330(3), AEE 440(3), or AGCOM 495(1-3) (Sem: 3-8)

Select 3-6 credits from COMM 180 GS(3), COMM 283(3), COMM 401(3), COMM 403(3), COMM 405(3), COMM 409(3), COMM 411(3), COMM 413W(3), or COMM 460(3) (Sem: 3-8)

Select 3 credits from COMM 401(3), COMM 403(3), COMM 405(3), COMM 409(3), or COMM 413W(3) (Sem: 5-8)

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-02-001

Review Date: 03/12/08

AG

Agricultural Systems Management Minor

University Park, College of Agricultural Sciences (A S M)

The Agricultural System Management minor covers the mechanical, structural, natural resource, processing, and electronic technologies applied in agriculture systems. Students who graduate with this minor will have a solid understanding of how physical sciences and biological principles apply to real world problems in food and fiber industries. With industry teams often formed purposefully with many disciplines represented, this background of applied engineering basics and the focus on quantitative analysis has proven helpful to past graduates.

Integration of the applied technologies is addressed using a systems approach in each required course. Technologies addressed by courses in this minor include combustion engines, electric motors, mechanical and hydraulic power transmission systems, mobile equipment functions and operations, sensor and control systems, building structures, ventilation, drying, irrigation, drainage, food processing. The minor is targeted to students who will use these technologies or manage others who are responsible for systems utilizing these technologies. Most courses required for the minor are taught by engineering faculty, and nearly every course has a laboratory period.

Admission to the minor requires introductory calculus (MATH 110 or MATH 140) and introductory physics (PHYS 211 or PHYS 250).

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (18 credits)

Students must select from the following to account for 18 or more credits: ASM 307(3), ASM 310(3), ASM 320(3), ASM 327(3), ASM 420(3), ASM 424(3), ASM 425(3), BRS 221(3), BRS 422(3), BRS 426(3), BRS 428(3), BRS 429(3). A total of 3 credits in BRS 495(1-3), BRS 496(1-3) and/or BRS 497(1-3) may also be used.

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-04-002

Review Date: 1/18/05

AG

Agronomy Minor

University Park, College of Agricultural Sciences (AGRO)

Agronomy is concerned with the principles and practices of field crop production and the conservation of soils and land resources. Areas of emphasis include crop production and protection, plant breeding, forage management, nutrient management, and soil conservation and fertility. Education in this minor emphasizes the principles of plant and soil management and the basic sciences upon which these principles are grounded. A minor in agronomy can complement several majors, and will enhance career opportunities in farm management and the agricultural industry. Employment possibilities include farm chemical and fertilizer store managers, sales representatives, field and laboratory

technicians, crop management consultants, extension agents, soil and water conservationists, and inspectors for various state and federal regulatory agencies.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES: (6 credits)

AGRO 28(3), SOILS 101 GN(3) (Sem: 3-4)

ADDITIONAL COURSES: (6-7 credits)

Select 6 credits from AGRO 410(4), AGRO 423(3), AGRO 425(3), AGRO 438(4), or SOILS 402(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (5-6 credits)

Select 5-6 credits in consultation with an adviser (Sem: 5-8)

Last Revised by the Department: Fall Semester 2013

Blue Sheet Item #: 42-02-001

Review Date: 10/08/2013

AG

Animal Science Minor

University Park, College of Agricultural Sciences (AN SC)

The Animal Science minor is designed for students who wish to supplement their academic major with studies in animal science. Students are required to complete a minimum of 23 credits, at least 6 of which must be at the 400 level. A grade of C or better must be obtained in each course in order to complete the minor.

The core of prescribed courses develops a foundation in the various basic disciplines of animal science. Additional courses may be selected by the student to emphasize the production/management of beef cattle, companion animals, dairy cattle, horses, poultry, sheep, or swine or to emphasize genetics, nutrition, or physiology.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 23-24 credits

PRESCRIBED COURSES (11 credits)**[1]**

ANSC 201(4), ANSC 290(1), ANSC 301(3) (Sem: 3-4)

CHEM 202(3) (Sem: 3-6)

ADDITIONAL COURSES (6-7 credits)**[1]**

Select 3 credits from ANSC 207(2) and ANSC 208(1); or ANSC 300 GN(3) (Sem: 3-4)

Select 3-4 credits from ANSC 305(3), ANSC 306(3), ANSC 308(4), ANSC 309(4), ANSC 310(3), ANSC 311(4), ANSC 327(3), CHEM 210(3) (Sem:3-6)

SUPPORTING COURSES AND RELATED AREAS (6 credits)

Select 6 credits of 400-level AN SC courses (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in

Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Arboriculture Minor

College of Agricultural Sciences (ARBOR)

The Arboriculture minor has been designed to provide students with a comprehensive introduction to the principles and practices of the arboriculture profession. Combined with a major in Horticulture or Forestry, this minor will help prepare students for a career in arboriculture. The courses in the minor include arboriculture, disease and insect control, the planting and maintenance of plants in the landscape, and management of trees in urban environments. HORT 201, and many of the introductory positions available to graduates with an arboriculture minor, require physical strength and conditioning. The profession of arboriculture has many opportunities available in the application of arboricultural practices, sales, consulting, management of companies, and management of urban trees.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem:1-2)

REQUIREMENTS FOR THE MINOR: 26-28 credits

PRESCRIBED COURSES: (18 credits)

HORT 201(2), HORT/FOR 301(3), SOILS 101 GN(3) (Sem: 3-4)

ENT 313(2), ENT 314(1) (Sem: 5-6)

FOR 401(3), HORT 408(4) (Sem 7-8)

ADDITIONAL COURSES (8-10 credits)

Select 3 credits from FOR 203(3), HORT 137(3) (Sem: 3-4)

Select 2-3 credits from PPEM 300 GN(3) or PPEM 318(2) (Sem:5-6)

Select 3-4 credits from BIOL 110 GN(4) or BIOL 127 GN(3) (Sem: 5-6)

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Biological Engineering Minor

University Park, College of Agricultural Sciences

University Park, College of Engineering (B E)

This minor provides students with an opportunity to apply engineering principles to agricultural and biological production and processing systems and to the management of

our natural resources. Courses may be selected by students to gain a better understanding of soil conservation and water quality, food and biological process engineering, structures and their environments, power and machinery, or microbiological engineering.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (3 credits)

BE 300(3) (Sem: 5-6)

ADDITIONAL COURSES (15-16 credits)

Select 6 credits from BE 301(3), BE 302(4), BE 303(3), BE 304(3), BE 305(3), BE 306(3), BE 307(3), BE 308(3) (Sem: 5-8)

Select 9-10 credits from one of the following areas; one course marked with * must be selected (Sem: 5-8)

(a) Power and Machinery Systems: ASM 420(3), ASM 424(3), BE 461(3)*, ME 431(3), ME 480(3)

(b) Biological Systems: BE 468(3)*, CHE 340(3), CHE 438(3), CHE 449(3), ESC 484(3)

(c) Natural Resource Systems: ASM 309(3), BE 467(3)*, BE 477(3), BE 487(3), CE 370(3), CE 371(3), CE 461(3)

(d) Food Process Systems: BE 465(3)*, BE 468(3), CHE 410(3), FDSC 430(3), IE 312(3)

(e) Structural Systems: AE 308(4), BE 462(3)*, CE 340(3), CE 341(3), CE 342(3)

Last Revised by the Department: Fall Semester 2012

Blue Sheet Item #: 41-03-046

Review Date: 11/13/2012

UCA Revision #2: 7/26/07

EN

Entomology Minor

College of Agriculture Sciences (ENT)

Through the Department of Entomology, the minor in Entomology is primarily designed for (but not restricted to) students in the Agroecology major seeking additional studies in the entomological sciences. Successful completion of this minor area of study will help prepare students for graduate studies in entomology and related fields.

A minor in Entomology requires 22 credits in approved courses in addition to the major requirements of the student's choice. Appropriate course substitutions may be considered with minor adviser approval.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem:1-2)

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (9 credits)[\[1\]](#)

BIOL 110 GN(4)[18], ENT 313(2), ENT 457(3) (Sem: 2-4)

ADDITIONAL COURSES (13 credits)[11]

Select 1 credit from ENT 314(1) or ENT 316(1) (Sem: 2-4)

Select 3 credits from AGECO 201(3), BIOL 222(3), BIOL 427(3), PPEM 405(3) (Sem: 3-8)

Select 6 credits from ENT/VBSC 402(3), ENT 410(3), ENT 420(3), ENT 424(3), ENT 425(3), ENT 432(4), ENT 445(3) (Sem: 4-8)

Select 3 credits of ENT 496(1-18) (Sem: 4-8)

[11] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[18] A grade of C or better per course is required for teacher certification.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Environmental and Renewable Resource Economics Minor

University Park, College of Agricultural Sciences (E RRE)

This minor introduces students to how fundamental economic principles can be used to explain and seek solutions for problems related to the degradation of the environment and unsustainable use of natural resources. This program complements majors that provide a natural science-based approach to environmental issues and provides social-science majors interested in the environment with additional tools for the analysis of social decision-making, and policy objectives. A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)

CED 201(3), CED 429(3), ECON 302 GS(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)

Select 9 credits from CED 431(3), ECON 428(3), CED 450 IL(3), ERM 411 (3), RSOC 327(3), 300- or 400-level internship or independent study (3 credit max.) (Sem:5-8)

Last Revised by the Department: Summer Session 2004

Blue Sheet Item #: 30-04-001

Review Date: 01/15/02

AG

Environmental Resource Management Minor

University Park, College of Agricultural Sciences (E R M)

The Environmental Resource Management (E R M) minor is designed to provide science-based non-majors with a cohesive selection of courses related to the sustainable management of environmental resources.

The minor was developed to permit students from other majors to have their environmental interests and training formally documented on their academic records. Because so many of society's activities have an impact on environmental quality, the minor should appeal to students with majors from a wide variety of science-based disciplines.

The E R M minor includes an introduction to calculations and problem-solving skills common to managing environmental resources, and allows students to select a wide variety of other E R M courses that cater to their strengths and interests. Students may also elect to take courses in environmental law, resource allocation and economics, and soil sustainability and management. Individual programs are determined jointly by the student and the E R M Program Coordinator.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

ADDITIONAL COURSES (18 credits)[1]

Select 18 credits from ASM 327(3), SOILS 101 GN(3), or any ERM course. At least 6 credits must be at the 400-level (Sem: 3-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Environmental Soil Science Minor

University Park, College of Agricultural Sciences (ESOIL)

The Environmental Soil Science minor enables students to acquire scientific and field-related skills in preparation for environmental careers. Students learn to understand and apply soils and land use information in a wide variety of professional settings. The Environmental Soil Science minor will prepare students for jobs as professional soil scientists or for graduate studies in Soil Science and other interdisciplinary environmental sciences.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (6 credits)

SOILS 101 GN(3), SOILS 102(1), SOILS 403(2) (Sem: 1-5)

ADDITIONAL COURSES (12-13 credits)

Select 12-13 credits from SOILS courses, or ASM 327(3), CE 335(3), ERM 433(3), ERM 440(3), FOR 475(3), TURF 434(3), TURF 435(4) in consultation with an Environmental Soil Science adviser, including at least 6 credits at the 400 level. (Sem: 2-8)

Last Revised by the Department: Fall Semester 2012

Blue Sheet Item #: 41-02-001

Review Date: 10/02/2012

AG

Equine Science Minor

University Park, College of Agricultural Sciences (EQ SC)

The Equine Science minor is designed for students who wish to supplement their academic major with studies in equine science. Students are required to complete a minimum of 20 credits. The core prescribed courses develop a foundation in the basic disciplines of animal science and equine science. Additional courses may be selected by the student to allow further specialization and expertise in exercise physiology and training principles, selection and judging, business/farm management, animal genetics and breeding, nutrition, and physiology. With completion of this minor, students will have a foundation of theoretical and practical knowledge along with learning skills for adapting to changes in equine industry. Courses that make up the minor are appropriate for students with and without prior academic or practical experience with horses. The University Horse Farms and the Agricultural Arena are used extensively for supplementing classroom work with hands-on laboratories. Completion of this minor will enhance a student's ability to work directly in horse production and management and allied industries, or continue academic studies in graduate or professional school.

A grade of C or better must be obtained in each course in order to complete the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 20-22 credits

(At least 6 credits must be at the 400 level.)

PRESCRIBED COURSES (12 credits)

ANSC 201(4), ANSC 217(2) (Sem: 1-4)

ANSC 327(3) (Sem: 5-8)

ANSC 407(3) (Sem: 7-8)

ADDITIONAL COURSES (8-10 credits)

Select 2 credits from: ANSC 37(2) or ANSC 107(2) (Sem: 1-4)

Select 3-4 credits from: ANSC 300 GN(3), ANSC 301(3), ANSC 317(3), ANSC 322(3), BA 250(3), KINES 180(3), KINES 202(4), or VBSC 403(3) (Sem: 5-8)

Select 3-4 credits from: AGRO 423(3), ANSC 419(3), ANSC 420(4), ANSC 423(3), ANSC 431(4), ANSC 437(3), ANSC 457(3) or ANSC 467(3) (Sem: 5-8)

Last Revised by the Department: Spring Semester 2013

Blue Sheet Item #: 41-05-003

Review Date: 02/19/2013

AG

Forest Ecosystems Minor

University Park, College of Agricultural Sciences (FECO)

The Forest Ecosystems minor introduces students to the functions and values of forested ecosystems. After a prescribed foundation in tree and shrub identification and forest ecology, students may choose from a variety of related subjects including climate change, invasive species, tree physiology, agroforestry, fire ecology, forest soils, forest ecosystem management, forest measurements, community forestry, and global forest conservation.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES: (6 credits)
FOR 203(3), FOR 308(3) (Sem: 3-6)

ADDITIONAL COURSES: (12-14 credits)

Select a minimum of 12 credits from the following FOR courses. Six credits must be at the 400-level.

FOR 200(1), FOR 201 GN(3), FOR 204(2), FOR 255(3), FOR 266(4), FOR 303(3), FOR 320(2), FOR 350(3), FOR 401(3), FOR 403(3), FOR 409(2), FOR 410(3), FOR 418(3), FOR 421(3), FOR/WFS 430(3), FOR 439(3), FOR 440(3), FOR 450(3), FOR 455(3), FOR 466(3), FOR 470(3), FOR 471(3), FOR 475(3), FOR 480(3), FOR 488(3) (Sem: 3-8)

Lasted Revised by the Department: Spring Semester 2014

Blue Sheet Item #: 42-06-005

Review Date: 04/08/2014

AG

Horticulture Minor

University Park, College of Agricultural Sciences (HORT)

The minor in Horticulture consists of a minimum of 18 credits. A grade of C or better is required in all courses used for the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)
HORT 101(3), HORT 202(3), HORT 315(3) (Sem: 1-6)

ADDITIONAL COURSES (9 credits)

Select 3 credits in systematics from HORT 131(3), HORT 137(3), HORT 138(3), or HORT 232(3) (Sem: 3-4)

Select 6 credits in foundation and production courses from HORT 402(3), HORT 407(3), HORT 412(3), HORT 420(3), HORT 431(3), HORT 432(3), HORT 433(3), HORT 450(3), HORT 453(3), HORT 455(3), or HORT 459(3) (Sem: 7-8)

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

International Agriculture Minor

University Park, College of Agricultural Sciences (INTAG)

This minor is an interdisciplinary program of study designed to enable students to (1) gain an awareness and appreciation for the interrelationship and interdependency of the nations of the world for their food and fiber systems worldwide; (2) gain awareness of problems in international agriculture and sustainability of alternative solutions; (3) understand global impacts of technology, and (4) understand systems of learning across cultures.

This minor requires 18 credits and may be combined with any undergraduate major in the University. Some courses require prerequisites not included in the minor. Foreign language competence is highly recommended.

Students may apply for admission to the minor by completing and submitting an application for admission to Office of International Programs, College of Agricultural Sciences, 106 Administration Building, University Park campus. A signature from the student's major program adviser is required.

A grade of C or better is required for all courses in the minor. Students must have six credits of 400-level course work for the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (6 credits)

INTAG 100 GS;IL(3), INTAG 490(3) (Sem: 6-8)

ADDITIONAL COURSES (12 credits)

Select three courses from the first two categories (9 credits) and one internationally-oriented experience from the third category (3 credits):

Category 1: Social Sciences (Select up to two courses from this category; 3-6 credits)

AEE 400(3), AGBM 338 IL(3), ANTH 120 GS;IL(3), ANTH 472(3), BBH 305(3); BBH 402 II(3), BBH 407 IL(3), CED 230(3), CED 420 US;IL(3), CED 425(3), CED 450 IL(3), GEOG 3 GN;GS(3), GEOG 30 GS;IL(3), GEOG 123 GS;IL(3), GEOG 126 GS;US;IL(3), GEOG 220(3), GEOG 430(3), GEOG 444(3), NUTR 421 US;IL(3), NUTR 425 IL(3), NUTR 430 IL(3), SPAN 105(4), SPAN 106(4), WMNST 420 US;IL(3), any university language skill development course (Sem: 1-8)

Category 2: Natural Sciences (Select up to two courses from this category, 3-6 credits)

AFR 105 GN;IL(3), AGEKO 3(3), AGEKO 457(3), EARTH 2 GN(3), ENT 202 GN(3), ENT 222 GN(3), ENT 457(3), ERM 210 GN(3), FDSC 105(3), FOR 201 GN(3), FOR 418 US;IL(3), FOR 488 IL;WAC(3), GEOG 210 GN(3), GEOSC 105 GN;IL(3), INTAG 300 IL(3), PPEM 405(3), SOILS 71 GN;IL(3) (Sem: 1-8)

Select international experience (3 credits)

AGBM 470A(2.5), AGBM 470B(0.5), AGEKO 499 IL(1-2); ANSC 499 IL(1-12), CED 499 (1-12); ERM 499(1-12); FDSC 460(1), FDSC 499 IL(1-12), HORT 499 IL(1-12), INTAG 199

IL(1-12), INTAG 200(3), INTAG 470A (2.5), INTAG 470B(0.5), INTAG 499 IL(1-12), SOILS 499 IL(1-12), VBSC 499 (0.5-4)

Students are given the option of participating in a semester study abroad program that would be discussed and approved by the INTAG coordinator and the student's academic advisor. Twelve credits maximum can count toward the minor, and should normally only fulfill elective and internationally-oriented experience credits, and not replace prescribed credits for the minor. The semester study abroad program needs to focus on courses within the food, agriculture or natural resources areas.

Last Revised by the Department: Fall Semester 2017

Blue Sheet Item #: 46-02-003

Review Date: 10/3/2017

AG

Contact information updated: 1/5/12

Leadership Development Minor

University Park, College of Agricultural Sciences (L DEV)

This minor is designed for students in any major of the University wanting to supplement their program with studies in leadership development. The minor consists of 18 credits, at least 3 of which are an internship experience. Up to 9 additional credits may be required depending on the student's selection of courses under "Additional Courses". This minor provides students with a fundamental concept of leadership development and expands in three related dimensions. A grade of C or better is required in all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (12 credits)

AEE 360(3) (Sem: 5-6)

AEE 460(3), AEE 495(3) (Sem: 7-8)

AEE 465(3)

SUPPORTING COURSES AND RELATED AREAS (6 credits)

Select 6 credits in consultation with an adviser from courses on the Department approved list that focus in one of three support areas: leadership styles, ethical and moral dimensions of leadership, or global leadership (Sem: 1-8)

Last Revised by the Department: Fall Semester 2016

Blue Sheet Item #: 45-01-004

Review Date: 8/23/16

AG

Mushroom Science and Technology Minor

University Park, College Of AGRICULTURAL SCIENCES (M S T)

JOHN PECCHIA, RES ASSOC/ASST PROF PPEM

This interdisciplinary minor is designed to prepare students for a career in the mushroom industry. The minor offers practical work experience at the University's Mushroom Research Center. Students are required to complete a minimum of 22 credits. The core of prescribed courses provides a foundation in the basic fundamentals of mushroom science and technology. A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

For the MINOR in Mushroom Science and Technology Minor a minimum of 22 credits are required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (13 credits)

BIOL 110 GN(4), PPEM 405(3), PPEM 425(4), PPEM 496(1-18) (Sem: 5-8)

ADDITIONAL COURSES (9 credits)

Select 9 credits from: AGBM 200(3); ENT 202 GN(3); ENT 313(2); FDSC 408(2); FDSC 409(3); MGMT 150(3); MICRB 201(3); MICRB 202(2) (Sem: 3-8)

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

Off-Road Equipment Minor

University Park, College of Agricultural Sciences (OFFRD)

This interdisciplinary minor complements several engineering, agricultural, and mining degrees, helping students understand some specific technological aspects of mobile equipment (from lawn tractors to large excavators). The minor would strengthen the program for students with machinery interests by exposing them to several of the technical aspects of off-road equipment such as electronics, power generation, power transmission, traction, ergonomics, and safety.

The minor in Off-Road Equipment requires 18-20 credits from the approved courses. Courses in the minor have prerequisites including calculus, physics, and, depending on the student's major, at least one engineering or engineering technology type course (e.g., BRS 221). These courses should be completed prior to entering the minor.

A grade of C or better is required for all courses taken to satisfy the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES (3 credits)

ASM 420(3) (Sem: 6-8)

ADDITIONAL COURSES (15-17 credits)

Select 3 credits from ASM 320(3) or ME 431(3) (Sem: 5-8)

Select 3 credits from ASM 310(3); BE 306(3); ME 360(3) (Sem: 5-8)

Select 3-4 credits from BE 305(3), BRS 428(3), or ME 345(4) (Sem: 5-8)

Select 3-4 credits from ASM 424(3), AGRO 423(3), AGRO 425(3), HORT 408(4), or TURF 425(3) (Sem: 5-8)

Select 3 credits from BE 461(3) or BRS 426(3) (Sem: 5-8)

Last Revised by the Department: Spring Semester 2017

Blue Sheet Item #: 45-05-001

Review Date: 2/21/17

UCA Revision #2: 7/30/07

AG

Plant Pathology Minor

University Park, College of Agricultural Sciences (PPATH)

The Plant Pathology minor is designed for students who wish to learn more about the causes and control of plant diseases. These students may pursue careers in commercial crop production, industrial sales, private consulting, extension, or research. Increasing emphasis on biological control, integrated pest management, and sustainable agricultural practices requires knowledge of plant pathogen biology, host-parasite interactions, and environmental parameters influencing disease development. The Plant Pathology Minor focuses on these areas and gives students the background necessary to develop or utilize environmentally sound disease management strategies. This program is designed to supplement majors in any field of the biological sciences and also can be used to prepare students for graduate studies in Plant Pathology.

The minor in Plant Pathology requires 22 credits in approved courses in addition to the major requirements of the student's choice.

Students must receive a grade of C or better in all courses required for the minor.

Scheduling Recommendation by Semester Standing given like (Sem:1-2)

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (7 credits)**[1]**

BIOL 110 GN(4) (Sem: 1-4)

*3 credits of PPEM 496 (1-18) (Sem: 5-8)

ADDITIONAL COURSES (15 credits)**[1]**

**Select 3 credits from: PPEM 300 GN(3), PPEM 405(3) (Sem: 5-6)

Select a minimum of 12 credits from: AGEKO 121 GN(3), AGEKO/ENT 457(3), PPEM 120 GN(3), PPEM 300 GN(3), PPEM 318(2), PPEM 405(3), PPEM 412(3), PPEM 416(3), PPEM 417(3), PPEM 425(4), PPEM 430(3), PPEM 454(3), *PPEM 496(1-3), PPEM 497(1-3), and the departmental list of additional courses for the Plant Pathology Minor with the approval of

the minor adviser. (Sem: 3-8)

*Students must select, in consultation with the Plant Pathology Minor adviser, at least 3 credits of PPEM 496 (Independent Study) working with one or more faculty in the department of Plant Pathology and Environmental Microbiology. An additional three Independent Study credits may be applied to the Minor requirements as Additional Courses.

** Students may select one of these two courses for the second list of Additional Courses, but the same course cannot be counted toward both lists.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Poultry and Avian Science Minor

University Park: College of Agricultural Sciences (P A S)

The Poultry and Avian Science minor is designed for students who wish to supplement their academic major with studies focused on the biology and management of avian species, with an emphasis on domestic fowl. In recognition of the diverse career opportunities in the modern poultry and game bird industries, the minor is designed to also accommodate students with primary interests in agribusiness management, food science, and wildlife science. Students are required to complete a minimum of 18 credits (9 credits at the 400 level). AN SC 211, AN SC 311, and AN SC 425(VB SC 425) provide a foundation of knowledge pertaining to both avian sciences and the commercial poultry industry, while additional courses selected by the student will allow for further specialization in the foundation animal science disciplines, agribusiness management, food science, and wildlife and fisheries science. In addition, credits from poultry or avian internship experiences and/or independent study projects may also be applied towards meeting the requirements of the minor.

The University's Poultry Education and Research Center is used extensively for supplementing classroom work with hands-on laboratories. The flexibility of the minor permits program planning commensurate with an individual's interests and professional goals, and should enhance the student's ability to compete for related positions in industry, government, or academia (graduate or professional school).

The prerequisites for the minor's prescribed courses are BIOL 110 (for ANSC 211), ANSC 100 (for ANSC 311), and ANSC 211, ANSC 311, and MICRB 106 & 107 or MICRB 201 & 202 (for ANSC 425/VBSC 425).

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (9 credits)

ANSC 211(3) (Sem: 1-4)

ANSC 311(3) (Sem: 5-7)
ANSC/VBSC 425(3) (Sem: 6-8)

ADDITIONAL COURSES (9 credits)

Select 3 credits from: AGBM 302(3), AGBM 338 IL(3), ANSC 207(2), ANSC 208(1) (Sem: 3-6)
AN SC 300 GN(3), ANSC 301(3), ANSC 322(3), ANSC 395(1-3)[*], WFS 300(2), WFS 301(2)
(Sem: 5-8)

Select 6 credits from: AGBM 407(3), AGBM 408(3), AGBM 420(3), AGBM 460(3), ANSC
418(3), ANSC 420(4), ANSC 421(2), ANSC 423(3), ANSC 496(3)[*], ANSC 499 IL(2), FDSC
408(3), FDSC 409(2), FDSC 411(3), FDSC 415(3), VBSC 420(3), WFS 406(2), WFS 407(3),
WFS 447(3) (Sem: 7-8)

[*] AN SC 395 and AN SC 496 must have a poultry or avian biology emphasis.

Last Revised by the Department: Spring Semester 2016

Blue Sheet Item #: 44-06-002

Review Date: 04/05/2016

AG

Wildlife and Fisheries Science Minor

University Park, College of Agricultural Sciences (W F S)

The Wildlife and Fisheries Science minor provides non-majors with an introduction to the principles and practices of wildlife and fisheries conservation, research, and management. Although the minor includes both wildlife and fisheries course offerings, courses may be selected to provide a focus in one area or the other.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 22 credits

PRESCRIBED COURSES (10 credits)[1]

BIOL 110 GN(4), WFS 209(3), WFS 430(3) (Sem: 5-6)

ADDITIONAL COURSES (12 credits)[1]

Select 12 credits from WFS 300(2), WFS 407(3), WFS 408(3), WFS 410(3), WFS 422(3),
WFS/ERM 435(3), WFS 440(3), WFS 447(3), WFS 450(3), WFS 452(2), WFS 460(3), WFS
462(3), WFS 463(3) (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2015

Blue Sheet Item #: 43-06-000

Review Date: 04/14/2015

AG

Youth and Family Education Minor

University Park, College of Agricultural Sciences (YFE)

The Youth and Family Education minor is an interdisciplinary program of study designed to prepare students for work in the Penn State Cooperative Extension or other nonformal education programs.

The minor offers course work from several disciplines and addresses student needs in areas such as nonformal education methods, adult education, leadership, youth programs, and communication methods and media. A period of internship or field experience is required. To complete a bachelor's degree with a minor in Youth and Family Education, a student is required to complete 18 credits from a list of recommended courses. The core program consists of 15 credits. Students are expected to strengthen their expertise by taking at least 3 additional credits from the courses recommended.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (15 credits)

AEE 450(3), AYFCE 455(3), AYFCE 495(6), RSOC 305(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)

ADTED 460(3), AEE 440(3), AYFCE 295(1-2), AYFCE 496(1-3), or AYFCE 497(1-9) (Course selection may be influenced by experience and educational background of the student. Individual programs are set jointly by the student and the program committee chair.) (Sem: 1-8)

Last Revised by the Department: Summer Session 1999

Blue Sheet Item #: 27-05-001A

Review Date: 1/30/00

AG

| [The Pennsylvania State University](#) | ©2001-2017. All rights reserved.

- [Nondiscrimination Statement](#) |
- [Equal Opportunity Policy](#) |
- [Copyright](#) |
- [Privacy and Legal Statements](#) |
- [About the University Bulletin](#) |
- [Contact Info](#)

This is the official bulletin of The Pennsylvania State University. Programmatic expectations for General Education are those in effect at the time of admission to degree candidacy, and college and major requirements are those in effect at the time of entry to college and major. These are accurately indicated in each student's degree audit.

The University reserves the right to change the requirements and regulations listed here and to determine whether a student has satisfactorily met its requirements for admission or graduation, and to reject any applicant for any reason the University determines to be

material to the applicant's qualifications to pursue higher education. Nothing in this material should be considered a guarantee that completion of a program and graduation from the University will result in employment.

The University Faculty Senate has responsibility for and authority over all academic information contained in the Undergraduate Bulletin.