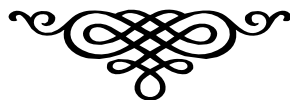


**Department of Plant, Soil & Insect Sciences  
University of Massachusetts at Amherst**



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# **Plant, Soil, and Insect Sciences**

## **Program Summary**

The Department of Plant, Soil and Insect Sciences (PSIS) offers several undergraduate program options including a Major in **Plant, Soil & Insect Sciences**, as well as Minors in **Entomology**, **Plant Pathology**, and **Plant and Soil Sciences**. Prospective students who already have a Bachelor's degree in an unrelated field may pursue a Post-graduate Second Bachelors degree within this program. In addition to our undergraduate programs, the department currently has two graduate training programs offering M.S. and Ph.D. degrees.

## **Department Summary**

Plant, Soil and Insect Sciences (PSIS) is a Department in the University of Massachusetts (UMass) College of Natural Sciences (CNS). PSIS was formed by the merger of the Departments of Plant & Soil Sciences and Entomology. Concurrent with this merger, several Plant Pathologists on campus joined PSIS, and now the department specializes in areas ranging from molecular genetics to management of whole plants and insects. With more than 30 faculty members and two graduate programs, PSIS is one of the largest science departments on the UMass campus. Accordingly, the breadth of the departmental research interests is expansive. Some of the current areas in which our faculty are pursuing research included: genetic engineering of plants to enhance their uptake of heavy metals in contaminated soils; pharmaceutical applications of herbs and other medicinal plants; integrated pest management for cultivated crops as well as minimally managed natural habitats; genomic studies of the agents of infectious diseases including malaria, eastern equine encephalitis and Lyme disease; plant breeding for disease resistance; drought tolerance in turfgrass; and sustainable agricultural practices in general.

## **The Major**

As a large and diverse department, PSIS meets the needs of a variety of students, particularly those seeking applied training in biology, including but not limited to fields of agroecology, biotechnology, entomology, horticultural sciences, molecular genetics, physiology, plant biology, sustainable agriculture, soil science, turf science and virology. Commonalities of our graduates include rigorous attention to scientific discipline and a desire to take this knowledge into the real world. Students completing a degree in Plant, Soil, and Insect Sciences will understand the workings of the biological world and its interface with the environment. Moreover, they are prepared to apply the skill sets they acquire in our program to tackle real problems of our day.

Students in our programs learn not only in the classroom, but also from their experiences in the research and teaching facilities in PSIS, including laboratories, greenhouses, and field settings. A list of the various facilities available to augment this experiential mission can be found on pages 21 and 22 of this document.

## **The Curriculum**

The undergraduate curriculum in Plant, Soil and Insect Sciences has been designed with the goal of allowing students to tailor their course work to best reflect individual academic interests and career objectives. The major encompasses a broad range of related disciplines dealing with applied biology and the environment in general. Programs of study include: Applied Biology & Biotechnology, Horticulture, Sustainable Food & Farming, and Turfgrass Science & Management.

Students begin their studies with introductory classes in the major and with general education courses required of all University students. These initial courses, which include biology, chemistry, ecology and mathematics, form the foundation for more advanced study in the major. The exact sequence of courses is determined by the student's selection of an Area of Concentration. Independent studies and internships are available under each of the concentrations, providing students with the opportunity to integrate laboratory and field work into their curriculum.

All concentrations in the major share a common core of discipline areas.

- **Biological Science** – two semesters of course work including laboratories in introductory biology, botany and/or soil science.
- **Ecosystems Studies** – a course in the fundamentals of ecosystem ecology.
- **Math, Statistics and Reasoning** – two semesters in math, statistics and/or analytic reasoning.
- **Chemistry** – a minimum of one semester of introductory chemistry with laboratory.
- **Writing** - College Writing (taken freshman year) as well as Junior Year Writing

**Total Departmental Course Requirements.** Majors will complete a minimum of 30 course credits taken within the Department of Plant, Soil and Insect Sciences. Specific course requirements vary by Concentration Area.

## **Areas of Concentration**

**Applied Biology and Biotechnology**, through theoretical and practical training, prepares students to apply biology to meet current and future needs of our society for well-trained biologists. This program includes rigorous training in biology, including genetics, physiology and laboratory methods. Students focus their work in one of two general areas: plant science or general applied biology. They may also choose to focus their advanced course work in plant biotechnology, entomology, horticulture, plant pathology, soil science or a related discipline. Successful graduates work in research or applied aspects of the biotech industries, pest management, agricultural and horticultural businesses, and environmental consulting arenas; and many go on for advanced graduate training for careers in business, the public sector, or academia.

**Horticulture** is focused on giving students the tools to work in horticultural businesses. Students receive technical training in the production of woody and herbaceous ornamentals, fruits and vegetables. Students in this concentration have the option of taking business courses to complement their horticultural training. If they choose, students can focus their course work in commercial floriculture and garden center management, landscape horticulture and nursery management, food crops, plant breeding and propagation, plant nutrition and soils, crop physiology, or pest management. The University's location in the Pioneer Valley, a major vegetable production area, affords students access to local farms and UMass' nearby orchard serves as a living laboratory where students study commercial apple production as well as learning about stone fruits, small fruits, and berry crop production. The program stresses the concepts and practices vital to the preservation of natural resources in managed plant systems. Successful graduates of this program find employment in plant conservatories and arboreta, and many manage businesses such as direct-market farms, greenhouse operations, landscaping firms and nurseries.

**Sustainable Food and Farming** allows students who are focused on social, political and scientific issues of sustainable agriculture and food systems to seek a broad exposure to this discipline in the liberal arts tradition. Students are exposed to a range of courses including the biophysical aspects of agriculture, economic aspects of food production and distribution, as well as the social elements affecting food policy and access issues. The curriculum combines a solid foundation in horticulture and pest management, and then allows customizing by the student in areas such as business administration, non-profit organization, sociology, political science, community outreach and education, among others. By combining crop production training with skills in communication, education, grant writing, nutrition, resource economics, land use planning, cultural sensitivity, community organizing, and/or policy development, students gain a broader understanding of the many socioeconomic aspects surrounding food production, access and distribution. Students can tailor their individual programs to prepare for careers in policy, advocacy, community outreach and education on topics related to crop production, food access, and hunger issues, just to name a few. Graduates will be uniquely qualified to compete successfully for a wide array of emerging careers in the growing field of food systems.

**Turfgrass Science and Management** is an applied science program that focuses on the production and maintenance of grassed areas, including home lawns, parks, golf courses and other athletic surfaces. This concentration integrates scientific theory with practical experience, and covers such topics as grass and seed identification, turfgrass culture and physiology, pest control, and equipment maintenance. Students in this concentration will have the option of selecting a business management focus. Many graduates find employment in the golf course industry, while others choose to specialize in sports turf management. The lawn care industry also employs many of our graduates in jobs as varied as research, sales, and direct lawn maintenance. Excellent career opportunities exist in turf management, and job placement of our graduates is nearly 100 percent.

## **Internships and Independent Study**

The Department of Plant, Soil, and Insect Sciences encourages students to enhance their programs of study with an Internship experience and/or an Independent Study research project. These opportunities provide students with experience and training that will be useful in career planning as well as in decision-making about fields of possible graduate study. Students must have attained at least sophomore status and be in good academic standing. Although use of Independent Study and Internship credits is restricted within the major, the University allows up to 18 credits of Internship to be applied towards graduation credit requirements. Under the Applied Biology & Biotechnology concentration students are required to conduct an independent research project as a part of their program.

**Internships**: An Internship is a summer or semester-long work experience which allows students to apprentice with professionals from their field. Internships are intended to be a learning experience, and they do not necessarily provide significant monetary compensation (if any). Instead, academic credits are earned. Usually 12 credits are earned during one semester and 3 to 9 credits are earned for a summer program. Prior to undertaking an internship, an Academic Contract must be completed by the student and his/her faculty sponsor including planned activities, a statement of objectives, as well as criteria for evaluation and grading. Note: The University will accept up to 18 practicum credits towards the 120 credits required for graduation.

**Independent Study**: Students wishing to complete a research project or independent learning project must select a faculty member within the department who will approve the project and provide guidance. An Independent Study Form must be completed which specifies the number of credits to be earned, a statement of objectives, planned activities, and criteria to be used for evaluation and grading. This form must be filed with the Department's Undergraduate Program Office before the project is initiated.

## **Career and Graduate School Opportunities**

Plant, Soil, and Insect Sciences graduates are highly employable within their field of specialization. Our graduates are employed in professions as varied as environmental consulting, agronomic and horticultural crop production, secondary school instruction, and golf course and parks management, just to name a few. Recent department graduates are employed as:

- t Scientists, research technicians, and environmental consultants
- t Growers of ornamental and edible crops
- t Regulatory officials
- t Sales representatives of agricultural products
- t Managers of golf courses, parks, garden centers, greenhouses, and nurseries
- t Teachers of vocational agricultural and high-school biology

A significant number of our graduates continue working towards advanced degrees which provide additional opportunities in research, teaching, consulting and public service in their chosen area of specialization. Recent graduates are presently enrolled in M.S. and Ph.D. programs studying organismal and evolutionary biology, developmental plant biology, plant pathology, environmental soil chemistry, and wetland science, just to name a few.



Students may self select either 'General Applied Biology' or 'Plant Science' Focus

**General Applied Biology –select at least 15 credits**

<input type="checkbox"/> Botany	PLSOILIN 102	4 cr.
<input type="checkbox"/> Soil Science	PLSOILIN 105	4 cr.
<input type="checkbox"/> Insect Biology	PLSOILIN 326	3 cr.
<input type="checkbox"/> Plant Physiology	BIOLOGY 510	3 cr.
<input type="checkbox"/> General Plant Pathology	PLNTSOIL 505	4 cr.
<input type="checkbox"/> Elementary Biochemistry	BIOCHEM 420	3 cr.
<input type="checkbox"/> General Physics	PHYSICS 131 or 151	3 cr.
<input type="checkbox"/> General Physics Lab	PHYSICS 133 or 153	1 cr.
<input type="checkbox"/> Organic Chemistry II	CHEM 262	3 cr.
<input type="checkbox"/> General Microbiology	MICBIO 310	3 cr.
<input type="checkbox"/> General Microbiology Lab	MICBIO 312	3 cr.

**Plant Science (all courses required)**

<input type="checkbox"/> Botany	PLSOILIN 102	4 cr.
<input type="checkbox"/> Soil Science	PLSOILIN 105	4 cr.
<input type="checkbox"/> Plant Physiology	BIOLOGY 510	3 cr.
<input type="checkbox"/> General Plant Pathology	PLNTSOIL 505	4 cr.

***B. Experimental Techniques Course***

Students are required to take at least one course that will introduce them to experimental techniques used in Plant, Soil and Insect Sciences. Choose one from the list below.

Intro Biotech Laboratory	PLSOILIN 385
Molecular Systematics	PLSOILIN 397T
Gene & Genome Lab	BIOLOGY 397A
Genetics Lab	BIOLOGY 284
Tissue Culture	PLNTSOIL 500
Geographic Info Systems	NRC 592G
Intro to GIS	GEO-SCI 594A
Intro Digital Remote Sensing	W&FCONSV 587
Organic Chemistry Lab	CHEM 269
Organic Chemistry Lab I or II	CHEM 263 or 264
Analytic Chemistry	CHEM 312

***C. Research***

Students are required to conduct an Independent Study Research project. This can be combined with a Senior Honors Thesis.

Total credits for Research (a minimum of 3 cr. must be taken) **(3 cr.)**

***D. Restricted Electives (15 cr.)***

Students are required to take advanced course work in a specific area within Plant, Soil and Insect Sciences, specifically 15 credits at or above 300-level, with at least 6 cr. at 500-level. Those courses which are taken to fulfill the requirements above cannot be used to fulfill the Focus requirement. Courses are grouped into sub-discipline areas for guidance only. Students may mix and match course selections across more than one subject area.

### **Plant Biotechnology**

Gene and Genome Analysis	BIOLOGY 321
Biotechnology Lab	PLSOILIN 385
Plant Cell Biology	BIOLOGY 497C
Phyto/bioremediation	PLNTSOIL 597A
Plant Biotechnology	PLNTSOIL 597G
Tissue Culture	PLNTSOIL 500
Plant Breeding	PLNTSOIL 540
Plant Nutrition	PLNTSOIL 530
Diagnostic Plant Pathology	PLNTSOIL 535
Plant Genetics	BIOLOGY 597J
Plant Physiology	BIOLOGY 510

### **Entomology**

Insect Biology	PLSOILIN 326
Insect Ecology & Management	PLSOILIN 397K
Insect Behavior	ENTOMOL 511
Biologic Control	ENTOMOL 523
Medical Entomology	ENTOMOL 574
Insect-Plant Interactions	ENTOMOL 597A
Systematic Entomology	ENTOMOL 655
Insect Structure & Function	ENTOMOL 657
Molecular & Cellular Entomol	ENTOMOL 666
Insect Ecology	ENTOMOL 683

### **Plant Pathology**

General Plant Pathology	PLNTSOIL 505
Mgmt. and Ecology of Plant Disease	PLNTSOIL 510
Diagnostic Plant Pathology	PLNTSOIL 535
Post-harvest Physiology	PLNTSOIL 545
Nematology	PLNTSOIL 572
Plant Stress Physiology	PLNTSOIL 590A
Urban Environment and Plant Growth	PLNTSOIL 555
General Microbiology/Lab	MICROBIO 310/312

### **Horticultural Science**

Deciduous Orch Sci	PLSOILIN 300
Small Fruit Production	PLSOILIN 305
Weed Management	PLSOILIN 310
Greenhouse Management	PLSOILIN 315
Greenhouse Crop Prod I	PLSOILIN 321
Vegetable Crop Production	PLSOILIN 325
Greenhouse Crop Prod II	PLSOILIN 335
Soil and Crop Mgt	PLSOILIN 350
Hydroponics	PLSOILIN 365
General Plant Pathology	PLNTSOIL 505
Mgmt. and Ecology of Plant Diseases	PLNTSOIL 510
Plant Nutrition	PLNTSOIL 530

Diagnostic Plant Pathology	PLNTSOIL 535
Plant Breeding	PLNTSOIL 540
Post-harvest Physiology	PLNTSOIL 545
Plant Growth Regulators	PLNTSOIL 550
Advanced Weed Science	PLNTSOIL 560
Environmental Soil Chemistry	PLNTSOIL 575
Soil Fertility	PLNTSOIL 580

### **Soil Science**

Soil & Crop Management	PLSOILIN 350
Soil & Water Conservation	PLSOILIN 375
Microbiology of Soil	PLNTSOIL 515
Soil Form & Classification	PLNTSOIL 565
Soil Physics	PLNTSOIL 570
Environmental Soil Chemistry	PLNTSOIL 575
Soil Fertility	PLNTSOIL 580
Phyto/Bioremediation	PLNTSOIL 597A
Wetland Delineation	PLNTSOIL 597L
Organic Contaminants in Soil	PLNTSOIL 597O
Inorganic Contaminants in Soil	PLNTSOIL 597X
Intro Geochemistry	GEO-SCI 415
Applied Environ. Geology	GEO-SCI 485
Aqueous Env. Geochemistry	GEO-SCI 519
Hydrogeology	GEO-SCI 587

**Total for Concentration Specific Requirements** **48 - 50 cr.**

### ***E. Minimum Required Credits in the Department***

Note that students must take a minimum of 30 credits from within the Department of Plant, Soil and Insect Sciences.

**Total for the Applied Biology and Biotechnology Concentration** **72 - 75 cr.**

## Department of Plant, Soil, and Insect Sciences: Concentration Requirements Horticulture

### *I. Core Requirements of the Major*

#### **A. Biological Science**

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Botany            | PLSOILIN 102 | 4 cr. |
| <input type="checkbox"/> Soil Science (BS) | PLSOILIN 105 | 4 cr. |

#### **B. Ecosystems Studies** – select **one** of the following courses 3 cr.

- |   |              |  |
|---|--------------|--|
| <input type="checkbox"/> Intro Environmental Biology (BS)       | ENVIRSCI 101 |  |
| <input type="checkbox"/> Plants, Soils and the Environment (SI) | PLSOILIN 115 |  |
| <input type="checkbox"/> Principles of Environmental Biology    | ENVIRSCI 214 |  |
| <input type="checkbox"/> Society and Environment (SI)           | NRC 100      |  |
| <input type="checkbox"/> Introductory Ecology                   | BIOLOGY 287  |  |

#### **C. Math, Statistics and Reasoning**

- |   |                |         |
|---|----------------|---------|
| <input type="checkbox"/> Algebra/Anal. Geom/Trig (R1) | MATH 104       |         |
| or Pre-CalcAlgebra/Anal. Geom/Trig                    | MATH 101/102   | 3-4 cr. |
| <input type="checkbox"/> Statistics (R2)              | RES-ECON 211   |         |
| or Elementary Statistics                              | STATISTICS 111 |         |
| or Intro to Statistics                                | STATISTICS 240 | 3 cr.   |

#### **D. Chemistry**

- |   |                        |       |
|---|------------------------|-------|
| <input type="checkbox"/> General Chemistry (PS) | CHEM 110 <b>or</b> 111 | 4 cr. |
|---|------------------------|-------|
- (Note: students selecting 'Science Focus' should complete CHEM 111)

#### **E. Junior Year Writing**

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Technical Writing | PLSOILIN 380 | 3 cr. |
|--|--------------|-------|

**TOTAL CORE** **24 – 25 cr.**

### *II. Concentration Specific Requirements*

#### **A. Required Department Courses**

1. Select **two** horticulture courses

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Plant Propagation     | PLSOILIN 200 | 3 cr. |
| <input type="checkbox"/> Intro Turf Mgt        | PLSOILIN 230 | 3 cr. |
| <input type="checkbox"/> Greenhouse Management | PLSOILIN 315 | 4 cr. |
| <input type="checkbox"/> Advanced Turf Mgt     | PLSOILIN 340 | 3 cr. |

2. Plant Physiology

- |   |               |       |
|---|---------------|-------|
| <input type="checkbox"/> Intro Plant Physiology | PLSOILIN 397P | 3 cr. |
|---|---------------|-------|

### 3. Plant Nutrition

Select **one** course

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Plant Nutrition | PLNTSOIL 530 | 4 cr. |
| <input type="checkbox"/> Soil Fertility  | PLNTSOIL 580 | 3 cr. |

### 4. Pest Management

Select General Plant Pathology and at least 3 cr. in Entomology.

- |  |               |       |
|--|---------------|-------|
| <input type="checkbox"/> General Plant Pathology | PLNTSOIL 505  | 4 cr. |
| <input type="checkbox"/> Insects & Related Forms | PLSOILIN 101  | 2 cr. |
| or Insects of Ornamentals                        | PLSOILIN 109  | 3 cr. |
| or Insect Biology                                | PLSOILIN 326  | 3 cr. |
| or Pest Mgt. Greenhouse Crops                    | PLSOILIN 397F | 2 cr. |
| or Insect Ecology and Mgt.                       | PLSOILIN 397K | 3 cr. |
| and/or Turf Insects                              | PLSOILIN 107  | 2 cr. |

### ***B. Restricted Electives (15 cr.)***

Students in the Horticulture Concentration must select at least 15 credits from those listed below. Of the 15 credits, 6 must be at or above the 500 level, and no more than 6 can be taken outside the Department. The courses are listed in specialty areas for guidance, but students are not required to take Restricted Electives from any one area. Credits taken to satisfy concentration requirements in other areas of the Core and for other Concentration Requirements cannot be counted as Restricted Electives.

#### **Turf**

- |                                |              |       |
|--------------------------------|--------------|-------|
| Intro Turf Mgt                 | PLSOILIN 230 | 3 cr. |
| Irrigation & Drainage          | PLSOILIN 234 | 2 cr. |
| Turf Calculations              | PLSOILIN 240 | 2 cr. |
| Turfgrass Physiology & Ecology | PLSOILIN 275 | 3 cr. |
| Weed Mgt                       | PLSOILIN 310 | 3 cr. |

#### **Commercial Floriculture & Garden Center Management**

- |                         |              |       |
|-------------------------|--------------|-------|
| Herbaceous Plants       | PLSOILIN 255 | 3 cr. |
| Greenhouse Management   | PLSOILIN 315 | 4 cr. |
| Greenhouse Crop Prod. I | PLSOILIN 321 | 3 cr. |
| Greenhouse Crop Prod II | PLSOILIN 335 | 4 cr. |
| Plants in Landscape I   | ENVIRDES 335 | 4 cr. |
| New England Flora       | BIOLOGY 426  | 3 cr. |

#### **Landscape Horticulture & Nursery Management**

- |                             |              |       |
|-----------------------------|--------------|-------|
| Herbaceous Plants           | PLSOILIN 255 | 3 cr. |
| Weed Mgt                    | PLSOILIN 310 | 3 cr. |
| Nursery Mgt.                | PLSOILIN 360 | 4 cr. |
| Plants in Landscape I       | ENVIRDES 335 | 4 cr. |
| Principles of Arboriculture | FOREST 332   | 3 cr. |

New England Flora	BIOLOGY 426	3 cr.
<b><u>Food Crops</u></b>		
Deciduous Orch Sci	PLSOILIN 300	3 cr.
Small Fruit Production	PLSOILIN 305	3 cr.
Weed Mgt	PLSOILIN 310	3 cr.
Vegetable Crop Production	PLSOILIN 325	4 cr.
Soil & Crop Management	PLSOILIN 350	3 cr.
<b><u>Breeding and Propagation</u></b>		
Plant Propagation	PLSOILIN 200	3 cr.
Genetics	BIOLOGY 283	3 cr.
Tissue Culture	PLNTSOIL 500	3 cr.
Plant Breeding	PLNTSOIL 540	3 cr.
Plant Biotechnology	PLNTSOIL 597G	3 cr.
<b><u>Crop Physiology</u></b>		
Plant Physiology	BIOLOGY 510	3 cr.
Physiology of Crop Yield	PLNTSOIL 520	3 cr.
Post-harvest Physiology	PLNTSOIL 545	4 cr.
Plant Growth Regulators	PLNTSOIL 550	3 cr.
Plant Stress Physiology	PLNTSOIL 590A	3 cr.
<b><u>Plant Nutrition and Soils</u></b>		
Microbiology of the Soil	PLNTSOIL 515	3 cr.
Plant Nutrition	PLNTSOIL 530	4 cr.
Soil Formation & Classification	PLNTSOIL 565	4 cr.
Soil Physics	PLNTSOIL 570	3 cr.
Environmental Soil Chemistry	PLNTSOIL 575	4 cr.
Soil Fertility	PLNTSOIL 580	3 cr.
<b><u>Pest Management</u></b>		
Turf Insects	PLSOILIN 107	2 cr.
Insects of Ornamentals	PLSOILIN 109	3 cr.
Greenhouse IPM	PLSOILIN 397F	2 cr.
Insect Ecology & Mgt.	PLSOILIN 397K	3 cr.
Mgmt. and Ecology of Plant Diseases	PLNTSOIL 510	3 cr.
Biological Control	ENTOMOL 523	3 cr.
Diagnostic Plant Pathology	PLNTSOIL 535	4 cr.
Urban Environment & Plant Growth	PLNTSOIL 555	3 cr.
Weed Science	PLNTSOIL 560	3 cr.
Forest & Shade Tree Entomology	ENTOMOL 572	3 cr.
Integrated Pest Management	ENTOMOL 581	4 cr.
Phyto/bioremediation	PLNTSOIL 597A	3 cr.
Integrated Turf Management	PLNTSOIL 597V	3 cr.

### **C. Focus in Science or Business**

A focus area is not a formal designation in the University, but students in Horticulture must complete a focus area of either Science or Business.

#### **1. Science**

Students completing the Science Focus must select four courses in science, one from each of the four categories (A through D) listed below.

A. <input type="checkbox"/> General Chemistry II (PS)	CHEM 112	4 cr.
B. <input type="checkbox"/> Organic Chemistry	CHEM 250	
or Organic Chemistry I	CHEM 261	
or Cell & Molecular Bio	BIOCHEM 285	3 cr.
C. <input type="checkbox"/> General Biology	BIOLOGY 100	
or Plant Biology	BIOLOGY 103	4 cr.
D. <input type="checkbox"/> Calculus I	MATH 127 or 131	3 cr.
<i>Total credits for Science Focus</i>		<b>(14 cr.)</b>

#### **2. Business**

Students completing the Business Focus must select **four** courses in business. These should be distributed across four of the five categories (A through E) listed below.

A. <input type="checkbox"/> Business Mgt.	MANAGMNT 301	3 cr.
B. <input type="checkbox"/> Personnel Mgt.	MANAGMNT 314	
or People in Orgs.	RESECON 142	3 cr.
C. <input type="checkbox"/> Marketing	MARKETNG 301	
or Marketing for Green Industries	PLSOILIN 397M	
or Intro Food Marketing	RESECON 241	3 cr.
D. <input type="checkbox"/> Small Business Finance	RESECON 324	
or Accounting I	ACCOUNTG 221	3 cr.
E. <input type="checkbox"/> Intro. Resource Econ. (SB)	RESECON 102	
or Microeconomics	ECON 103	
or Macroeconomics	ECON 104	3 cr.
<i>Total credits for Business Focus</i>		<b>(12 cr.)</b>

**Total for Concentration Specific Requirements** 47 - 50 cr.

**Total for the Horticulture Concentration** 71 - 75 cr.

## Department of Plant, Soil, and Insect Sciences: Concentration Requirements

### Sustainable Food & Farming

#### *I. Core Requirements*

##### **A. Biological Science**

- Botany PLSOILIN 102
- or Plant Biology BIOLOGY 103 4 cr.
- Soil Science PLSOILIN 105 4 cr.

##### **B. Ecosystems Studies**

- Select one of the following courses. 3 cr.
- Intro Environmental Biology (BS) ENVIRSCI 101
- Plants, Soils and the Environment PLSOILIN 115
- Principles of Environmental Biology ENVIRSCI 214
- Society and Environment (SI) NRC 100
- Introductory Ecology BIOLOGY 287

##### **C. Math, Statistics and Reasoning**

- Algebra/Anal. Geom/Trig (R1) MATH 104
- or Pre-CalcAlgebra/Anal. Geom/Trig MATH 101/ 102 3-4 cr.
- Analytical Reasoning (R2) (approval of advisor) 3 cr.

##### **D. Chemistry**

- General Chemistry CHEM 110 or 111 4 cr.

##### **E. Junior Writing**

- Technical Writing PLSOILIN 380
- or Writing for Sustainability PLSOILIN 382 3 cr.

#### **TOTAL CORE**

**24 - 25 cr.**

#### *II. Concentration Specific Requirements*

##### **A. Food Systems Course**

- Community Food Systems PLSOILIN 397C 3 cr.

##### **B. Crop Production and Pest Management 18+ credits**

Students must select **six** courses in this area, with at least five at or above the 300 level. At least two courses must come from the Pest Management area.

##### **Crop Science**

- Organic Farming and Gardening (BS) PLSOILIN 120
- Plant Propagation PLSOILIN 200
- Sustainable Agriculture PLSOILIN 265
- Herbs, Spices, & Medic. Plants (BS) PLSOILIN 280

<input type="checkbox"/> Deciduous Orchard Science	PLSOILIN 300
<input type="checkbox"/> Small Fruit Production	PLSOILIN 305
<input type="checkbox"/> Greenhouse Management	PLSOILIN 315
<input type="checkbox"/> Vegetable Crop Production	PLSOILIN 325
<input type="checkbox"/> Soil and Crop Management	PLSOILIN 350
<input type="checkbox"/> Hydroponics	PLSOILIN 365
<input type="checkbox"/> Tropical Agriculture	PLSOILIN 370
<input type="checkbox"/> Intro Plant Physiology	PLSOILIN 397P
<input type="checkbox"/> Plant Nutrition	PLNTSOIL 530
<input type="checkbox"/> Soil Fertility	PLNTSOIL 580

**Pest Management** – *select at least two pest mgt courses below*

<input type="checkbox"/> Weed Management	PLSOILIN 310
<input type="checkbox"/> Insect Biology	PLSOILIN 326
<input type="checkbox"/> Pesticides, Environ. & Public Policy	PLSOILIN 342
<input type="checkbox"/> Insect Ecology & Management	PLSOILIN 397K
<input type="checkbox"/> Disease Ecology & Management	PLSOILIN 510
<input type="checkbox"/> General Plant Pathology	PLNTSOIL 505
<input type="checkbox"/> Biological Control	ENTOMOL 523
<input type="checkbox"/> Insect-Plant Interactions	ENTOMOL 597A

**C. Restricted Electives**

(24 cr.)

Students in Sustainable Food and Farming must select at least 24 credits across three categories: Biophysical Systems, Economic Systems and Social Systems. Select at least one course from each category, and a minimum of 18 credits from courses at or above the 300-level. **Note:** *Courses may also be used to meet a General Education requirement.* Courses may be selected from other academic departments at the University of Massachusetts or from one of the other Five Colleges when they add value to the area of study. Examples of courses are listed below.

Up to 12 credits of these requirements may be satisfied by an internship or independent study (such as PLSOILIN 396/496 or 398/498) with approval of the Academic Advisor and the Undergraduate Director.

**Examples of Restricted Electives for Sustainable Food and Farming**

Students may use other courses with advisor's approval.

**1. Biophysical Systems**

Additional courses in PLSOILIN/PLNTSOIL/ENTOMOL	
Plant Ecology	BIOLOGY 421
Sustainable Cities	ENVIRDES 591B
Economic Geography	GEO-SCI 360
Land Use and Society	GEO-SCI 362
Human Impact on the Natural Env.	GEO-SCI 420
Sense of Place and Environ. Perception	GEO-SCI 444
Human Dimensions in Natural Res. Mgmt.	NRC 382

**2. Economic Systems**

Political Economy of the Environment	ECON 308
--------------------------------------	----------

Economic Development	ECON 366
Economic Geography	GEO-SCI 360
Principles of Management	MANAGT 301
Human Resource Management	MANAGTMT 314
Fundamentals of Marketing	MARKETNG 301
Environmental Economics	RESECON 262
Non-profit and Social Marketing	MKTG 460
Intro Statistics	RESECON 211 or 212
Natural Resource Economics	RESECON 263
Small Business Finance	RESECON 324
Food Marketing	RESECON 241

### **3. Social Systems;**

Farm Animal Care and Welfare	ANIMLSCI 360
Political Anthropology	ANTHRO 336
Grassroots Community Development	ANTHRO 397H
Introduction to Multicultural Education	EDUCATION 377
Education for Community Development	EDUCATION 556
Ecological Cities	GEO-SCI 697P
American Environmental History	HISTORY 383
Sustainable Living	PLSOILIN 285
Pesticides, the Environ. & Public Policy	PLSOILIN 342
Environmental Policy	POLISCI 382
Land and Resource Policy	POLISCI 383
Community Development	PUBHLTH 602
Principles of Group Dynamics	PUBHLTH 603
Social Change	SOCIOL 327
Social Movements	SOCIOL 329
Sociology and Ecology of Community	SOCIOL 565
Natural Resource Policy & Admin.	NRC 409

### ***D. Advanced Courses in Plant, Soil and Insect Sciences***

Students must select any two additional courses at the 500-level or higher adding up to six (6) credits from PLNTSOIL or ENTOMOL course listing that are not being used to satisfy a previously listed requirement.

**(6 cr.)**

**Total for Concentration Specific Requirements**

**51 cr.**

### ***E. Minimum Required Credits in the Department***

Note that students must take a minimum of 30 credits from within the Department of Plant, Soil and Insect Sciences.

**Total for the Sustainable Food and Farming Concentration**

**75-76 cr.**

**Department of Plant, Soil, and Insect Sciences: Concentration Requirements**

**Turfgrass Science & Management**

## ***I. Core Requirements of the Major***

### **A. Biological Science**

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Botany            | PLSOILIN 102 | 4 cr. |
| <input type="checkbox"/> Soil Science (BS) | PLSOILIN 105 | 4 cr. |

### **B. Ecosystems Studies**

- |   |  |       |
|---|--|-------|
| <input type="checkbox"/> Select one of the following courses. |  | 3 cr. |
|---|--|-------|

Intro Environmental Biology (BS)	ENVIRSCI 101
Plants, Soils and the Environment	PLSOILIN 115
Principles of Environmental Biology	ENVIRSCI 214
Society and Environment (SI)	NRC 100
Introductory Ecology	BIOLOGY 287

### **C. Math, Statistics and Reasoning**

- |  |                |         |
|--|----------------|---------|
| <input type="checkbox"/> Algebra/Anal. Geom/Trig (R1)              | MATH 104       |         |
| <input type="checkbox"/> <b>or</b> Pre-CalcAlgebra/Anal. Geom/Trig | MATH 101/ 102  | 3-4 cr. |
| <input type="checkbox"/> Statistics                                | RESECON 211    |         |
| <input type="checkbox"/> <b>or</b> Elementary Statistics           | STATISTICS 111 |         |
| <input type="checkbox"/> <b>or</b> Intro to Statistics             | STATISTICS 240 | 3 cr.   |

### **D. Chemistry**

- |   |                        |       |
|---|------------------------|-------|
| <input type="checkbox"/> General Chemistry (PS) | CHEM 110 <b>or</b> 111 | 4 cr. |
|---|------------------------|-------|
- (Note: students selecting 'Science Focus' should complete CHEM 111)

### **E. Junior Writing**

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Technical Writing | PLSOILIN 380 | 3 cr. |
|--|--------------|-------|

**TOTAL CORE** **24 - 25 cr.**

## ***II. Concentration Specific Requirements***

### **A. Required Department Courses**

#### **1. Turf**

- |  |              |       |
|--|--------------|-------|
| <input type="checkbox"/> Intro Turf Mgt            | PLSOILIN 230 | 3 cr. |
| <input type="checkbox"/> Turf Physiology & Ecology | PLSOILIN 275 | 3 cr. |
| <input type="checkbox"/> Weed Management           | PLSOILIN 310 | 3 cr. |
| <input type="checkbox"/> Advanced Turf Mgt         | PLSOILIN 340 | 3 cr. |

#### **2. Plant Physiology**

- |   |               |       |
|---|---------------|-------|
| <input type="checkbox"/> Intro Plant Physiology | PLSOILIN 397P | 3 cr. |
|---|---------------|-------|

### 3. Plant Nutrition

- Select one course

Plant Nutrition	PLNTSOIL 530	4 cr.
Soil Fertility	PLNTSOIL 580	3 cr.

### 4. Pest Management

□ General Plant Pathology	PLNTSOIL 505	4 cr.
□ Insects & Related Forms	PLSOILIN 101	2 cr.
<b>or</b> Insect Biology	PLSOILIN 326	3 cr.
<b>or</b> Insect Ecology and Mgt.	PLSOILIN 397K	3 cr.
□ Turf Insects	PLSOILIN 107	2 cr.

### B. Restricted Electives

Students in the Turfgrass Science and Management Concentration must select at least 12 credits from those listed below. Of the 12 credits, 6 must be at or above the 500 level, and no more than 6 can be taken outside the Department. Credits taken to satisfy concentration requirements in other areas of the Core and for other Concentration Requirements cannot be counted as Restricted Electives.

Restricted electives

**(12 cr.)**

#### List of Restricted Electives in Turf Science and Management

Irrigation & Drainage	PLSOILIN 234
Turf Calculations	PLSOILIN 240
Plant Propagation	PLSOILIN 200
Plants in Landscape I	ENVIRDES 335
Herbaceous Plants	PLSOILIN 255
Intro Biotech Lab	PLSOILIN 385
Genetics	BIOLOGY 283
Principles of Arboriculture	FOREST 332
Mgmt. and Ecology of Plant Diseases	PLNTSOIL 510
Microbiology of the Soil	PLNTSOIL 515
Plant Nutrition	PLNTSOIL 530
Diagnostic Plant Pathology	PLNTSOIL 535
Plant Breeding	PLNTSOIL 540
Plant Growth Regulators	PLNTSOIL 550
Urban Environment & Plant Growth	PLNTSOIL 555
Weed Science	PLNTSOIL 560
Soil Formation & Classification	PLNTSOIL 565
Soil Physics	PLNTSOIL 570
Environmental Soil Chemistry	PLNTSOIL 575
Soil Fertility	PLNTSOIL 580
Integrated Pest Management	ENTOMOL 581
Plant Stress Physiology	PLNTSOIL 590A
Phyto/bioremediation	PLNTSOIL 597A
Plant Biotechnology	PLNTSOIL 597G

### **C. Focus in Science or Business**

A focus area is not a formal designation in the University, but students in Turf Sci. & Mgmt. must complete a focus area of either Science or Business.

#### **1. Science**

Students completing the Science Focus must select four courses in science, one from each of the four categories (A through D) listed below.

A. <input type="checkbox"/> General Chemistry II (PS)	CHEM 112	4 cr.
B. <input type="checkbox"/> Organic Chemistry	CHEM 250	
<b>or</b> Organic Chemistry I	CHEM 261	
<b>or</b> Cell & Molecular Bio	BIOCHEM 285	3 cr.
C. <input type="checkbox"/> General Biology	BIOLOGY 100	
<b>or</b> Plant Biology	BIOLOGY 103	4 cr.
D. <input type="checkbox"/> Calculus I	MATH 127 or 131	3 cr.

#### **2. Business**

Students completing the Business Focus must select four courses in business. These should be distributed across four of the five categories (A through E) listed below.

A. <input type="checkbox"/> Business Mgt.	MANAGMNT 301	3 cr.
B. <input type="checkbox"/> Personnel Mgt.	MANAGMNT 314	
<b>or</b> People in Orgs.	RESECON 142	3 cr.
C. <input type="checkbox"/> Marketing	MARKETNG 301	
<b>or</b> Marketing for Green Industries	PLSOILIN 397M	
<b>or</b> Intro Food Marketing	RESECON 241	3 cr.
D. <input type="checkbox"/> Small Business Finance	RESECON 324	
<b>or</b> Accounting I	ACCOUNTG 221	3 cr.
E. <input type="checkbox"/> Intro. Resource Econ. (SB)	RESECON 102	
<b>or</b> Microeconomics	ECON 103	
<b>or</b> Macroeconomics	ECON 104	3 cr.
<i>Total credits for Business Focus</i>		<b>(12 cr.)</b>

**Total for Concentration Specific Requirements** **47 - 51 cr.**

**Total for the Turf Science and Management Concentration** **74 - 79 cr.**

# University Requirements

University requirements for graduation include the following:

## Total Credits

A minimum of 120 credits must be obtained, 45 of which must be earned in residence. Residence credits are defined as credits earned for work done while registered at the UMass-Amherst campus or while enrolled in one of the University's formal exchange programs.

## Minimum Overall GPA

A cumulative average of at least a C (2.0 grade point average) is required. The official grading system runs from A (4.0) to F (0.0).

## Minimum Major GPA

A minimum cumulative average of 2.0 is required for those courses comprising the major.

## University General Education Requirements

**Writing:** College Writing (CW) taken during the freshman year and completion of the Junior Year Writing Requirement taken within the major (PLSOILIN 380 or PLSOILIN 382).

**Social World:** Six to eight courses including the following categories:

\*Historical Studies (**HS**), \*Social and Behavioral Sciences (**SB**), \*Literature (**AL**), \*Visual or performing arts (**AT**), (**I**) Interdisciplinary, and (**SI**) Science Interdisciplinary. In addition, two of the courses in the Social World area must also have a Social and Cultural Diversity designation: one must be a (U) course which addresses diversity issues within the United States; and one course must be coded (G) which covers global diversity issues. Note: The diversity designation can be combined with another social category (for example: HSU), reducing the total required courses from eight to six.

- |   |  |
|---|--|
| <input type="checkbox"/> AL _____         | <input type="checkbox"/> HS _____                |
| <input type="checkbox"/> AL/AT/I/SI _____ | <input type="checkbox"/> AL/AT/SB/HS/I /SI _____ |
| <input type="checkbox"/> SB _____         | <input type="checkbox"/> >U= Diversity _____     |
| <input type="checkbox"/> SB/I/SI _____    | <input type="checkbox"/> >G= Diversity _____     |

**Biological and Physical World:** Three courses with at least one course in the Biological Sciences (BS) and at least one course in a Physical Science (PS).

- |  |   |
|--|---|
| <input type="checkbox"/> BS <u>Filled by BIOLOGY 100 or PLSOILIN 105</u> | <input type="checkbox"/> BS/PS/SI - can be filled by additional |
| <input type="checkbox"/> PS <u>Filled by CHEM 110 or 111</u>             | biology, chemistry, or ecosystems course                        |

**Tier I and Tier II - Analytical Reasoning:** The Tier I requirement may be fulfilled by achieving a sufficiently passing score on the Math Placement Exam which is offered during summer orientation and at the beginning of each semester, or by completing MATH 104 (Pre-calculus), which is a department requirement. The Tier II requirement is typically fulfilled by completion of a statistics course.

## *Department Facilities*

### *Buildings*

The Department of Plant, Soil, and Insect Sciences is housed in several buildings on campus. The major buildings are Fernald Hall (where the primary administrative offices are located), French Hall, Stockbridge Hall, Bowditch Hall, Clark Hall, and the Agricultural Engineering Building.

***Fernald Hall*** is located on the eastern side of campus. The main administrative offices of the department are located here. The building contains numerous classrooms, offices, and research laboratories. Faculty in Fernald Hall are those with interests in entomology, ecology, insect physiology, insect genetics and molecular biology, and plant pathology.

***French Hall*** is also located on the eastern side of campus. The office of the Undergraduate Program Director is located here in room 103. The building contains numerous classrooms, offices, research laboratories, and attached greenhouse facilities. Faculty in French Hall are those with interests in floriculture, plant genetics and disease resistance, applications of biotechnology in phytoremediation to clean contaminated soils.

***Stockbridge Hall*** is located on the northwestern side of campus, near the Campus Center. The building contains the administrative offices of the College of Natural Sciences in addition to classrooms and research laboratories. PSIS faculty in Stockbridge Hall have interests in soil science, medicinal and aromatic plants, weed science, and turfgrass management.

***Bowditch Hall*** is located on the northwestern side of campus. The building includes several classrooms and research laboratories in addition to attached greenhouse facilities. Faculty in Bowditch Hall have interests in agronomy, pomology, vegetable crops, and sustainability studies.

***Agricultural Engineering Building*** is located on the northwestern side of campus (in the vicinity of Stockbridge and Bowditch Halls). This building includes several classrooms, offices, and research facilities. Faculty housed in this building have interests in insect biology and ecology, integrated pest management, and extension outreach in entomology.

### *Research & Teaching Facilities*

The Department has numerous **greenhouses** on campus which include more than 11,000 square feet of bench space. These facilities are located adjacent to French Hall and Bowditch Hall, and they are utilized extensively for classroom exercises and student research activities. Students enrolled in such courses as plant propagation, greenhouse management, horticultural crop production, herbaceous plants, organic farming, plant nutrition, as well as herbs, spices and medicinal plants receive hands-on training within the greenhouse facilities.

The UMass-Amherst **Genomics Resource Laboratory (GRL)** is housed in the department, and facilitates genome research for Five-campus faculty as well as some off-campus contractors. The GRL provides nucleotide sequencing service and a variety of genotyping platforms (including fragment analyses, gradient gel electrophoresis, and SNP detection). The GRL also has realtime

PCR instruments available for use. The GRL is staffed with a full time Research Faculty member who can assist in experimental design and implementation. GRL staff also provide training for laboratory personnel seeking to incorporate these services into their research. More information can be found on the GRL web page.

PSIS faculty have facilities in their laboratories for insect cell and tissue culture, as well as equipment and expertise necessary for gene cloning and DNA amplification using polymerase chain reaction technology. Through the campus-wide Biotechnology Program, faculty and staff also provide access to facilities for amino acid analysis, protein sequencing, and peptide synthesis as well as oligo-nucleotide synthesis, and cell sorting.

**Off-campus research facilities** include over 300 acres of farm land utilized for studies in turf, ornamental, vegetable, agronomic, small fruits, and orchard crops.

The **South Deerfield Farm**, in South Deerfield, Massachusetts, encompasses more than 100 acres dedicated to the study of agronomic crop production, including integrated pest management practices, nutrient management, and organic crop production (just to name a few). Students are able to actively participate in several on-going research projects at the farm during the spring, summer, and fall months.

The **Joseph Troll Turf Teaching and Research Facility** in South Deerfield, Massachusetts, encompasses 14 acres dedicated to the study of turfgrass culture and management. A state-of-the-art building was erected on the property in the Spring of 2005 which is used for teaching and research activities and various outreach functions.

The **Horticultural Research Center** in nearby Belchertown, Massachusetts, encompasses more than 200 acres and includes an experimental orchard as well as a controlled-atmosphere storage facility for post-harvest studies. With over 80 planted acres of land, the Horticultural Research Center orchard is a living laboratory where students learn pruning, tree training, cultivar identification, post harvest handling, integrated pest management, and other production practices.

UMASS Extension also maintains and manages the **Durfee Conservatory**, a University plant resource located adjacent to French Hall. This arboretum, which dates back to the mid 1800's, contains many rare plants and collections including a small Arain forest. Amid the hustle and bustle of campus, the Conservatory and its many gardens offer students and visitors a treat for the senses. Several departmental courses utilize the Conservatory as a living laboratory to examine the unique collection of tropical and foliage plants.



**Appendix A**  
**List of Course Offerings**

## **Plant, Soil, and Insect Sciences Current Course Offerings**

### **PLSOILIN**

#### **100 -- Botany for Gardeners (Fall & Spring)**

(BS) 3 cr, Gerber (Fall) / Autio (Spring), 308 Bowditch/205 Bowditch.

Lecture. A holistic view of plants including ecology, plant form and function, inheritance and evolution, and the relationship between plants and human life. The class is taught using world food crops, agricultural and gardening examples. No prerequisites.

#### **101 B Insects & Related Forms (Spring, first seven weeks)**

2 cr, Childs, 204 Ag. Eng.

Lecture, lab. Introduction to insect recognition, development, damage, and control.

Prerequisite: none.

#### **102 -- Introductory Botany (Fall)**

4 cr, Han, 204-B French

Lecture, lab. Structure, function, and reproduction of economic crop plants. Emphasis on the flowering plants. Lab quizzes, hour exams, final. Prerequisite: none. Stockbridge and PLSOIL majors only.

#### **103 B Plant Science (Spring, first seven weeks)**

1.5 cr, Lecture. For Stockbridge students only. This class is an introduction to basic plant physiology.

The objective of the course is to examine primary means by which environmental factors influence plant growth and development. Three exams. Prerequisite: PLSOILIN 102

#### **104 B Plant Nutrients (Spring, first seven weeks)**

1.5 cr, Barker, 202 Bowditch

Lecture. For Stockbridge students only. Functions of mineral nutrients in plants, effects of mineral deficiencies, and sources of these nutrients to prevent or alleviate deficiencies in crop production.

Three one hour exams. Prerequisite: PLSOILIN 105.

#### **105 -- Soils (Fall - Stockbridge only / Spring open enrollment)**

(BS) 4 cr, Picking, 103 French (Fall version) // Simkins, 12A Stockbridge (Spring version)

Lecture, lab, discussion. Interrelationship of soils and higher plants. Physical, chemical, and biological properties of soils. Practical approach to current problems through basic soil principles.

Three hour-exams. Prerequisite: high school chemistry or equivalent recommended.

#### **106 B Soils (Spring)**

(BS) 3 cr, Simkins, 12A Stockbridge

Lecture only. Same as PLSOILIN 105 described above.

#### **107 -- Turfgrass Insects (Spring)**

2 cr, Vittum, 316 Ag. Eng.

Lecture. Principles and practical methods of controlling turf insect pests. Prerequisite: PLSOILIN 101.

**109 -- Insects of Ornamentals (Fall)**

3 cr, Childs, 204 Ag. Eng.

Lecture and lab. The recognition, biology and control of major insect and mite pests attacking shade trees and woody ornamentals in the northeastern U.S. Emphasis on techniques and knowledge useful to the professional in tree care. Prerequisite: PLSOILIN 101, or consent of instructor.

**111 B Horticultural Plant Pathology (Spring, first seven weeks)**

2 cr, Jung, 206 French

Lecture. Stockbridge Students only. Applied Introduction to plant pathology in horticultural crops. Identification, description, and management of diseases in modern horticultural production. Chemical, biological, cultural, and genetic controls and their integration. Prerequisite: PLSOILIN 102.

**112 B Lab Plant Pathology B Turf (Spring, last seven weeks)**

2 cr, Jung, 206 French

Lab. Stockbridge Turfgrass students only. Diagnosis and management of turfgrass diseases. Diagnosis techniques and appropriate cultural, chemical, genetic, and biological management strategies. Co-requisite: PLSOILIN 111.

**113 B Horticultural Plant Pathology Lab (Fall)**

2 cr, Lab. Stockbridge students only. A field laboratory on the diagnosis and management of the health problems of horticultural plants (both woody and nonwoody). Students learn to recognize the major plant diseases of trees and shrubs using materials on campus. Disease management options presented on an individual basis in a clinical context. Prerequisite: PLSOILIN 111.

**115 -- Plants, Soils, and the Environment (Spring)**

**(SI)** 3 cr, Picking, 103 French

Lecture, discussion. Introduction to understanding the biological and physical relationships among plants, soils and the environment. Exploring how various human activities impact the environment with specific attention to plant and soil resources. Topics include: ecosystem sustainability, ecosystem structure and function; agriculture and the impacts of biotechnology; pest control and food access; soil conservation; wetlands; water pollution and treatment technologies; and resource conservation. Three hour exams, class discussions, and three short writing assignments.

**120 -- Organic Farming and Gardening (Fall & Spring)**

**(BSL)** 3 cr, Barker, 202 Bowditch

Lecture, lab/discussion. Introduction to principles of soil fertility and crop management by organic procedures which are contrasted and evaluated against conventional chemical methods of farming. A science course. Exams or quizzes, lab reports, essays.

**126B Insects & Human Society (Fall & Spring)**

**(BS)** 3 cr, various entomology faculty

Lecture. Survey with emphasis on the successful design of insects and their innovative features. Aspects of insect biology, including communication, defense, feeding, and mating behaviors. Social behavior with a focus on termite, ant, and honey bee societies. Beneficial uses of insect such as silk and pollination, and negative interactions with humans, including disease vectors, parasites, and crop pests. Slides, videos, and live insects used extensively. Not for biological science majors.

**140 B Plagues: The Ecology of Disease (Spring)**

(BS) 3 cr, Cooley/Manning

Lecture. Plant diseases and their effects on food supplies and human history. Biology of pathogens that cause plant diseases, pesticide use, disease resistance, biologic control, and diseases that threaten important world crops.

**182-- Principles of Pesticide Management (Spring)**

2 cr, Childs, 204 Ag. Engin.

Lecture. Topics include state and federal pesticide laws and regulations, pesticides and the environment, handling and storage of pesticides, classes and formulations of pesticides, safety and application equipment, understanding the pesticide label, toxicity, proper calculation and mixing of pesticides, and history of pesticide use. Includes preparation for the Massachusetts Pesticide Core Examination. Prerequisite: none.

**185 B Sustainable Living (Spring)**

(I) 3 cr, Gerber, 308 Bowditch

Lecture. This course will be offered to anyone wanting to learn how to live more lightly on the planet. Global issues of sustainability will be discussed including energy, food, land, waste, housing, personal health, and community. Discussions focus on holistic personal decision-making.

**190C – Cultural Entomology (Fall)**

(G) 3 cr, Stoffolano, 204A Fernald

Lecture. Since their origin, insects have always been and will remain the dominant life-form on earth. Because of this, they have permeated the lives and minds of humans ever since they encountered one another. Cultural Entomology will explore these encounters from both a historical and a global cultural standpoint. The role of insects in history, art, music, astronomy, literature, theater, medicine, religion, myths, agriculture, trade, biology, etc., of various world cultures will be explored. Course will have an interactive website containing video clip concepts, interactive programs, etc.

**190E - Evolution Explained (Fall)**

3 cr, Porter, 13 Hatch Lab

Lecture, discussion. This course examines evolutionary biology with an emphasis on the scientific basis of evolution, and attention to the implications of evolutionary thought in contemporary society. Not intended for life-science majors. No prerequisite.

**200 -- Plant Propagation (Fall)**

3 cr, Cox, 210 French

Lecture, lab. The basic principles and techniques for propagating plants by both sexual and asexual means, including seeds, cuttings, bulbs, and tissue culture. The hormonal and physiological factors affecting rooting, seed dormancy, grafting, budding, and layering. Lab quizzes, hour exams, final. Prerequisite: PLSOILIN 102 or equivalent.

**230 -- Introductory Turfgrass Management (Fall)**

4 cr, Ebdon, 12F Stockbridge

Lecture, lab. Basic principles of selecting and managing turfgrass for home lawns, parks, golf courses, and other turf areas. Topics include climatic adaption, grass identification, establishment practices, pest control, fertility, environmental stresses, mowing, etc. Lab quizzes, two one-hour exams, final. Prerequisites: PLSOILIN 102 and 105 (may be taken concurrently) or consent of instructor.

**232 -- Turf Machinery (Spring, last seven weeks)**

1 cr, Griffin, 12-D Stockbridge

Lecture. Preventative maintenance, small engine operation, carburetors, fuels, electrical systems, and hydraulic systems. Must have web access to take class.

**234 -- Irrigation and Drainage (Spring)**

2 cr, Griffin, 12-D Stockbridge

Lecture, discussion. Principles of hydraulics and system design for turf and landscapes with an emphasis on golf courses. Irrigation systems; equipment performance; installation practices, operation procedures and troubleshooting. Drainage of sports turf is also covered.

**235 -- Pruning Fruit Crops (Spring)**

2 cr, Autio, 205 Bowditch

Lecture, lab. Theory and practice of pruning deciduous fruit plants/trees. Practical, hands-on experience is the focus of the class. Grades will be based on several quizzes and class participation.

**240 B Applied Calculations in Turfgrass Mgt (Spring)**

2 cr, Ebdon, 12F Stockbridge

Lecture. Calculations involving area and volume measurements, fertilizer and pesticide requirements, cost analysis, seed calculations, irrigation calculations, and calculations relating to spreader and sprayer calibrations. Prerequisite: PLSOILIN 230.

**255 -- Herbaceous Plants (Spring)**

3 cr, Cox, 210 French

Lecture, lab. Study and identification of herbaceous plants; their uses as ornamental plants for home, park, and business. Weekly quizzes, two exams, one lab final, and a term project.

**265 -- Sustainable Agriculture (Fall)**

3 cr, Gerber, 308 Bowditch

Lecture, discussion. This course is designed for both agriculture and non-agriculture students who want to explore ethical, practical, and scientific aspects related to the quest for long-term agricultural sustainability. Students will evaluate specific farming, food systems, and lifestyle practices from economic, social, and environmental perspectives. The course includes field trips, lectures, readings, discussion of current topics, and individual research. No prerequisites.

**271B Using Insects in the Classroom (Fall)**

(BS) 3 cr, Stoffolano, 204A Fernald

On-line. Development of integrated educational units that use insects but focus on art, history, music, and mathematics. Experiences in using microscope, raising live insects, collecting and observing insects, making an insect collection. The biology of the insect compared to the human system.

**275 -- Turfgrass Physiology and Ecology (Spring)**

3 cr, DaCosta, 11 Stockbridge

Lecture. An introduction to basic concepts in agricultural chemistry as related to the growth and culture of turfgrasses for the first half of the semester. The second half of the semester details the overall growth and development of grasses including such areas as soil fertility and mineral nutrition. Prerequisite: PLSOILIN 230 (with minimum grade of AC@).

**280 -- Herbs, Spices, and Medicinal Plants (Spring)**

**(BS)** 3 cr, Craker, 12A Stockbridge

Lecture, lab. Introduction to the growth, culture, and science related to the production and use of herbs, spices, and medicinal plants. Emphasis on plants used in the home with discussions on bioactivity of plant extracts. Laboratory practice in seeding, growing, oil extraction, and utilization of these plants. Examinations, project and identification of selected herbs. No prerequisite.

**290A – Intro to Modern Biotechnology (Fall)**

3 cr, Burand/Parkash, 202A Fernald/202 French

Lecture. This course will focus on the fundamental principles of modern biotechnology at the cellular, molecular level and at the level of whole organisms. The methods and approaches used in modern biotechnology process will be discussed, as well as current and future applications of these methods. Prerequisites: BIOLOGY 100 and CHEM 111.

**297C/D B Traditional Herbal Medicine Systems I & II (Fall & Spring)**

1 cr, Mamedov, adjunct/off-campus

Lecture. An examination of indigenous medicinal systems from around the world to understand the choices of herbal medicines used by traditional healers and the similarities and differences in the approach of treatments. Students will be exposed to a wide range of cultures including Ayurvedic, Chinese, African, Middle Eastern, European, Central Asian, Native American, and Amazonian.

No prerequisites. Both sections can be taken in any sequence.

**297J/K B Clinical Herbalism I & II (Fall & Spring)**

1 cr, Marano, adjunct/off-campus

Lecture. Part I includes an introduction to herbology through a survey of clinical herbalism, covering major aspects of herbalism history and an explanation and comparison of health models, medicinal plants, and materia medica. Part II includes a study of herbalism in human health through discussions on clinical theory, ethics, and politics associated with herbalism. Sections can be taken in any sequence.

**300 -- Deciduous Orchard Science (Fall, odd years)**

3 cr, Greene, 304 Bowditch

Lecture, lab. Principles and practices involved in the establishment and management of deciduous orchards. Prerequisites: PLSOILIN 102 (may be taken concurrently).

**305 B Small Fruit Production (Fall, even years)**

3 cr, Greene, 304 Bowditch

Lecture, lab. Principles and practices governing the establishment and management of small fruit plantings. Prerequisites: PLSOILIN 102 (may be taken concurrently).

**310 -- Principles of Weed Management (Fall)**

3 cr, Bhowmik, 10 Stockbridge

Lecture, lab. History of weed control; importance of weeds and their relationship to people and the environment; ecology of weeds, competition, persistence and survival mechanisms; reproduction, seed germination, and dormancy; methods of weed control--cultural, biological, chemical, and integrated pest management strategies; classification of herbicides and their selectivity; soil factors affecting herbicide performance, persistence and degradation; application equipment and calibration of sprayers; weed management systems for various crops and non-crop areas. Prerequisite: PLSOILIN 102.

**315 -- Greenhouse Management (Fall)**

4 cr, Cox, 210 French

Lecture, lab. An introduction to the greenhouse environment and the technology used in production of greenhouse crops. Lab includes greenhouse experiments in seed propagation and crop production; exercises on greenhouse structures, heating and cooling, growing media, crop nutrition, photoperiod control and lighting, and crop scheduling. Field trip to local greenhouses. Four one-hour exams, take-home problem sets. Prerequisite: PLSOILIN 102 or equivalent (may be taken concurrently).

### **321 -- Greenhouse Crop Production I (Fall)**

3 cr, Han, 204B French

Lecture, lab. Greenhouse culture of seasonal crops, stressing modern concepts of production and management. Prerequisite: PLSOILIN 102 or equivalent and PLSOILIN 315.

### **325 -- Vegetable Crop Production (Spring)**

4 cr, Mangan, 201 French

Lecture, lab. This course focuses on sustainable practices used to produce vegetable crops. This course is for students who want to grow vegetable crops or work in the vegetable industry. Topics include specific practices used for the major vegetable crops grown in New England, water and soil fertility management, season extenders, and crop rotation. Prerequisite: PLSOILIN 102 or equivalent.

### **326 B Insect Biology (Fall)**

3 cr, Stoffolano, 204A Fernald

Lecture. How insects solve their problems of maintenance, survival, reproduction, etc., and how entomologists apply this knowledge in managing various pests. Other topics include insect evolution, plant and insect interactions, biodiversity and conservation of insects, insect behavior, forensic entomology, medical entomology, insects of wildlife and domestic animals, and insect pest management. Field trips and demonstrations are scheduled during the lecture period. Prerequisite: none, but basic biology helpful.

### **335 -- Greenhouse Crop Production II (Spring)**

4 cr, Han, 204-B French

Lecture, lab. Greenhouse culture of spring greenhouse crops. Project, two exams and a final. Prerequisites: PLSOILIN 315 and PLSOILIN 321.

### **340 B Advanced Turfgrass Management (Spring)**

3 cr, Ebdon, 12F Stockbridge

Lecture. Management of environmental stress in turfgrass. Special practices in managing high quality turfgrass areas such as golf courses, athletic fields, and ornamental areas. Prerequisites: PLSOILIN 230 and 275.

### **342 B Pesticides, Public Policy and the Environment (Fall)**

3 cr, Vittum, 316 Ag. Engin.

Lecture. Current issues associated with pesticide use; includes discussion of role of pesticides in agriculture, public health, and other related areas; fate of pesticides in the environment; and public perception of pesticides. Case studies examine benefits and risks of pesticide use; environmental cancer; and role of media and public interest groups in pesticide decisions. Alternatives to current heavy reliance on chemical technology in pest control. Current and pending federal, state, and local legislation. Prerequisite: none. Same as: ENVIRSCI 342.

### **350 B Soil and Crop Management (Fall)**

3 cr, Lecture, lab. An examination of crop management and farming systems for forage and field crop production. Cultural requirements and physiological responses of crops. Illustrations of concepts, discussions of topics and examination of distinguishing morphological characteristics of selected crop species during laboratory sessions. Quizzes, mid-term, final. Prerequisites: PLSOILIN 100 or 102.

**360 -- Nursery Management (*not available 2009-2010*)**

4 cr, Lecture, lab. This is a comprehensive course in nursery crops production, covering administrative and cultural practices used in the production of both field-grown and container-grown ornamental plants. Topics include site selection, organization, inventory control, nutrient management, irrigation, plant growth and development, alternative production systems, overwintering, and pest control with an emphasis on integrated pest management.

**370 -- Tropical Agriculture (Spring)**

3 cr, Lecture. Tropical regions of the world, their environment and classification; influence of climate, population, and socio-economic conditions on agriculture; major crops and cropping systems of sub-humid tropics; introduction to dry land agriculture; importance of rainfall and irrigation on productivity; green revolution; desertification; present and future research needs of region and state of agricultural technology. SPARK page with crop images and written materials. No pre-requisites.

**375 -- Soil and Water Conservation (Fall, even years)**

3 cr, Veneman, 19 Stockbridge

Lecture, lab. Soil management related to water and wind erosion control. Environmental aspects of erosion. Cropping, tilling and management effects on erosion and water quality. Landscape and soil sustainability. Principles of soil drainage. Midterm and final exams, term paper, class presentations. Prerequisite: PLSOILIN 105 or equivalent.

**380 -- Technical Writing (Fall and Spring)**

3 cr, Lecture. Satisfies the junior year writing requirement for PLSOIL majors, through a series of writing exercises based on the types of written materials commonly used in agricultural sciences. Exercises include developing and writing professional correspondence, resumes, reports, and bibliographies. Oral presentation required. Prerequisite: ENGLWRIT 112 or equivalent.

**382 -- Writing for Sustainability (Spring)**

3 cr, Gerber, 308 Bowditch

Satisfies Junior Year Writing Requirement for PLSOILIN majors concentrating in Sustainable Agriculture and related fields. Practice and improve writing while clarifying career goals and improving professional communication skills. Prerequisites: PLSOILIN 265 and CW requirement.

**385 B Intro. Biotechnology Laboratory (Spring)**

4 cr, Burand/Parkash/Rich, 202A Fernald/202 French/209B Fernald

An introduction to the methodology fundamental to the practice of modern agricultural biotechnology. Techniques covered include establishment and manipulation of plant and animal cell cultures, preparation and analysis of DNA and RNA, production of recombinant protein expression vectors, isolation and characterization of proteins, and use of immunoassays. Major emphasis on the student's performance of laboratory exercises which provide direct experience with each of the techniques mentioned. Prerequisites: BIOLOGY 101 and CHEM 112, or Consent of Instructor.

**391A B Sustainability Dialogue (Fall and Spring)**

1 cr, Gerber, 308 Bowditch

A classroom dialogue and web-based course intended to introduce students to controversial agricultural issues; explore diverse perspectives; and develop an individual and community-based understanding of current issues affecting American agriculture. Course includes weekly readings, exploratory dialogue, and reflective writings. Some knowledge of agriculture is helpful but not required. Mandatory Pass/Fail grading. May be taken twice for credit.

**397A B Ethnobotany I: The Shaman=s Pharmacy (Fall- *not available in 2009-2010*)**

1 cr, Kilham, adjunct/off-campus

Explores traditional, plant-derived medicines among various world cultures, backed by first-hand knowledge from field research. Learn about beneficial compounds in plants, and about medicinal plant preparation. In The Shaman=s Pharmacy, you will see, touch, smell, and taste herbal potions. You will view extraordinary slides from the Amazon, India, China, and other cultures, and learn about environmental preservation, shamans, medicine men and women, and nature=s bounty of beneficial plants. No prerequisites.

**397B - Turf Challenge Prep (Fall)**

1 cr, DaCosta, 11 Stockbridge

A practical review of key subjects in turfgrass science and management. The course is specifically designed to prepare students for National Collegiate Turf Bowl competitions in the areas of golf course and sports turf management. Students from across the country participate in these annual competitions to gain recognition for their university turf programs and to network with industry professionals. Prerequisites: PLSOILIN 105, 107, 230, 240, and 275.

**397C -- Community Food Systems (Fall)**

3 cr, Sands, adjunct/off-campus

Lecture, discussion. This class will explore the movement of food from the grower to the consumer. Emphasis will be on how consumers get access to food from emergency and non-emergency sources. Direct marketing, Community-Supported Agriculture, farmers= markets, and small-scale farming will be discussed. Outside speakers from area community food banks, CSA=s, non-profit organizations, faith communities, soup kitchens, and farmers= markets will lead discussions on various topics related to food access. Two one-hour lectures and a two-hour lab/discussion. Service Learning Course.

**397F B Integrated Pest Mgt for Greenhouse Crops (Spring, first seven weeks)**

2 cr, Smith, 203 French

Integrated pest management (IPM) is the prevention or suppression of pests (insects, mites, diseases, weeds, and algae) by use of multiple management strategies that are effective, economically feasible, and safe for growers, consumers, and the environment. Course emphasis will be placed on major greenhouse pests including identification, life cycles, monitoring and management strategies. Students will participate in greenhouse IPM scouting exercises.

**397K B Insect Ecology & Management (Spring)**

3 cr, Averill, 204G Fernald.

Lecture. Understanding insect life cycles and the role of insects in natural and managed ecosystems. Introduction to the basic insect orders. Discussion of integrated pest management strategies in horticultural, agriculture, and landscape settings. No prerequisites.

**397M - Applied Marketing for the Green Industry (Fall)**

3 cr, Barstow, 4 Stockbridge Hall.

Lecture/Discussion. Sustainable marketing introduction for students in the green industries with special attention to turfgrass, horticulture and natural products. Two lectures and one discussion period weekly. Development of marketing plans required. No prerequisites.

### **397P -- Introduction to Plant Physiology (Spring)**

3 cr, Jeranyama, adjunct/off-campus

Lecture. Provides background on organic compounds and their functions, the structure and function of cell components, examines the processes of respiration and photosynthesis, the genetic manipulation of plants, water relations and solute transport, and environmental effects on plant development. Prerequisites: PLSOILIN 102 or Biology 103; and one semester college Chemistry.

### **397T B Molecular Systematics Lab (Spring, even years)**

3 cr, Normark, 204B Fernald.

Understand the diversity and evolutionary history of organisms by analyzing DNA sequences. Learn all the basic lab techniques (such as specimen curation, DNA preparation, PCR, and gel electrophoresis) in this intensive laboratory course. Gain analytical and software skills necessary for using DNA sequencing data to infer phylogenetic trees and explore evolutionary questions. Prerequisites: BIOLOGY 100 and 101. Capacity limited to 10 students.

### **398E -- Farm Enterprise Practicum (Spring)**

3 cr, Hazzard, 301 Ag. Engineering

Guided practicum experience providing students with practical experience in growing crops, as well as managing and marketing these crops in support of their educational goals. Students will develop, use and evaluate crop plans including all aspects of production and marketing. Students will gain practical experience in management of soil fertility, water, and pests using IPM and organic methods. Weekly seminar and field work participation required. Prerequisites: PLSOILIN 105 and 325; and Junior standing. Enrollment limited.

### **398G -- Greenhouse Practicum**

1 cr, Joyner, French Hall Greenhouses

Students will receive individualized instruction from the greenhouse staff. Greenhouse practicum will focus on teaching the following skills: venting and temperature control, maintaining outdoor gardens, harvesting of floricultural crops, post-harvest handling of floricultural crops, fertilization, propagation (by seed, cuttings, division), greenhouse maintenance, operation of greenhouse equipment (fertilizer injector).

### **498E- Farm Enterprise Practicum II (Fall)**

3 cr, Hazzard, 301 Ag. Engineering

Continuation of guided practicum experience (PLSOILIN 398E), with students maintaining crops planted in the Spring semester and preparing fields for winter. Students will harvest, clean, store and market their crops. Participation in weekly seminar required. Students will prepare written report covering all aspects of the production and marketing components of their target crops and present results/recommendations to the group. Pre-requisite: PLSOILIN 398E.

## **PLNTSOIL**

### **505 B General Plant Pathology (Fall)**

4 cr, Wick, 109 Fernald.

Lecture, lab. Causes, nature, and control of plant diseases. Diagnosis of plant diseases. Mechanisms, biochemistry, and genetics of plant disease induction, development, and control. Prerequisite: course in plant biology.

**510 B Management & Ecology of Plant Diseases (Spring)**

3 cr, Cooley, Clark Hall

Lecture. The ecology of plant, microbe and human interactions in plant diseases, from wilderness to industrial farms. Epidemics, traditional farming, environmental impacts and sustainability issues. Ways in which agriculture, particularly plant production and plant disease management, change ecosystems. Independent project. Prerequisite: Introductory course in biology.

**515 -- Microbiology of Soil (Spring)**

3 cr, Simkins, 12A Stockbridge

Lecture. Microbial processes in the soil and sediment environment. The ecology of the various microbial communities; the decomposition of organic matter, carbon transformation, nitrogen, sulfur, phosphorus and other mineral transformations; chemistry of these reactions and their biogeochemical implications; biological equilibrium, the rhizosphere, and microbial associations. Midterms, final. Prerequisites: Biology and organic chemistry, or instructor permission. Same as ENVIRSCI 515.

**520 -- Crop Physiology (*not available 2009-2010*)**

3 cr, Lecture. Physiology of crop plants, carbon fixation, partitioning, growth and development, competition in crops, environmental factors and yield relationships of crops. Prerequisite: PLSOILIN 325 or 350 or consent of instructor.

**525 -- Mycology (Fall, odd years)**

4 cr, Wick, 109 Fernald

Lecture/Lab. Biology, ecology, physiology, and taxonomy of fungi. Includes consideration of fungi as causes of diseases in animals, humans, and plants, and their uses in biotechnology applications such as bioremediation. Prerequisite: Introductory biology or botany strongly recommended.

**530 -- Plant Nutrition (Fall)**

4 cr, Barker, 202 Bowditch

Lecture, discussion, lab. The acquisition, translocation, distribution, and function of the essential inorganic elements in plants. Genetic control of plant nutrition and ecological adaptation of plants to nutritional variables. Diagnosis of plant nutritional disorders. Quizzes, lab reports, problems, final. Prerequisite: PLSOILIN 102 and 105, and CHEM 110 or equivalent courses.

**535 B Diagnostic Plant Pathology (Spring, odd years)**

4 cr, Wick, 109 Fernald

Lecture, lab. Methods of diagnosing plant diseases caused by fungi, bacteria, viruses, nematodes, and abiotic agents considered using specimens collected by students. Prerequisite: PLNTSOIL 505.

**540 -- Plant Breeding (Spring, even years)**

3 cr, Lecture. Introduction to the principles of plant breeding. Basic breeding methods and the new techniques of genetic engineering, reproductive systems of crop plants, inbreeding depression

and hybrid vigor, interspecific hybridization, use of genetic markers for crop improvement, breeding for disease resistance, and conservation of germplasm. Hour exams, project, and final. Prerequisite: BIOL 283 or similar course in introductory genetics.

**545 -- Postharvest Physiology (Spring, alternate years – *not available 2009-2010*)**

4 cr, Han, 204B French

Lecture. The basic biochemical and physiological processes occurring in fruits, vegetables, and flowers after harvest; postharvest treatments to modify these processes. Text and reading of periodicals required. Hour exams, final. Prerequisite: Plant Biology course and CHEM 110 or 111, or permission of instructor.

**550 -- Plant Growth Regulators in Agriculture (Spring)**

3 cr, Greene, 304 Bowditch

Lecture. Lectures focus on the influence that naturally occurring plant hormones have on regulating physiology, growth and development in plants. Also discussed are the uses and potential uses of synthetic plant growth regulators, cultural techniques, and horticultural practices to improve the production of food, fiber, and ornamental plants. Prerequisite: PLSOILIN 397P

**555 Urban Environment & Plant Growth (Fall)**

3 cr, Manning, 207 Fernald

Lecture. Identification and discussion of environmental stress factors that affect growth and success of plants. Emphasis will be placed on woody plants and turfgrass in urban/suburban environments. Plant response to light, temperature, water, salt and other soil pollutants, soil compaction, and air pollutants will be considered as well as mechanisms of tolerance or avoidance. Lectures plus one field trip. Three written exams, student paper, no final exam. Prerequisites: Introductory plant science course, plant physiology preferred, or consent of instructor.

**560 -- Advanced Weed Science (Spring- odd years)**

3 cr, Bhowmik, 10 Stockbridge

Lecture. Ecological concepts in weed management; historical and ecological perspectives. Weed-crop competition and allelopathy; reproductive strategy; seed dormancy, seed production, allocation of resources in perennial weeds. The physiology and biochemistry of herbicides in plants and their relationships with the soil environment. Prerequisite: PLSOILIN 310 or consent of instructor.

**565 -- Soil Formation, Classification and Land Use (Spring)**

4 cr, Veneman, 19A Stockbridge

Lecture, lab, field trips. Effect of environmental factors on soil formation and land use. Relationship between soil morphology, classification and use interpretations. Application of soils information to

on-site sewage disposal, wetland identification and other environmentally significant problem areas. Hour exams, final, term paper, lab reports, some full day field trips. Prerequisite: Introductory course in chemistry, geology, soil or environmental science; or consent of instructor.

**570 B Soil Physics (*not available 2009-2010*)**

3 cr, Lecture. Physical properties of soils and how they relate to water and solute movement in hydrologic systems, energy exchange, plant-soil relations, environmental problems, and soil-water management. Text: Introduction to Soil Physics, Hillel. Two hour exams, final. Prerequisites: Introductory course in chemistry, geology, soil or environmental science; or consent of instructor.

**572 B Nematology (*not available in 2009-2010*)**

4 cr, Wick, 109 Fernald

Lecture, lab. Biology and identification of soil nematodes. Parasitism of plants and management practices stressed. Prerequisite: PLNTSOIL 505.

**575 -- Environmental Soil Chemistry (Fall)**

4 cr, Xing, 12B Stockbridge

Lecture, lab. The course describes fundamental chemical concepts/processes in soils such as precipitation/dissolution, ion exchange, redox reactions, partitioning and absorption, and solution speciation and nature of soil minerals and organic matter. These concepts and computer models are used to examine some current environmental, agricultural, and engineering problems. Also covered: fate, transport, and availability, remediation of heavy metals and organic contaminants in soils and other related terrestrial environments. Problem sets, quizzes, midterm, and final. Prerequisites: CHEM 110 or 111, and PLSOILIN 105. Also listed as ENVIRSCI 575.

**580 -- Soil Fertility (Spring)**

3 cr, Barker, 202 Bowditch

Lecture. Mineral elements in the growth of plants; plant response to fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities; environmental impact of soil fertility management practices. Text to be determined. Four hour-exams, final. Prerequisites: PLSOILIN 102 and 105, introductory chemistry.

**590A Plant Stress Physiology (Fall)**

3 cr, DaCosta, 11 Stockbridge Hall

Lecture. This advanced course addresses major topics and recent advances in plant stress physiology. Discussion of environmental stresses will include instrumentation utilized for stress tolerance evaluation and assessment of current research areas in plant stress physiology. Quizzes, Midterm and Final exams, research paper and presentation. Prerequisite: PLSOILIN 397P or other intro plant physiology class.

**597A - Phyto/Bioremediation (Fall, even years)**

3 cr, Parkash, 202 French

Lecture. This course will cover the various aspects of phytoremediation - the use of plants (both natural hyper-accumulators and transgenic) and their associated microbes with the purpose of environmental clean-up of contaminated soil, sediments and water. Various strategies for

phytoremediation of a wide range of toxic pollutants, both organic and elemental, with a special emphasis on toxic metals will be discussed. Prerequisites: BIOLOGY 100, or 103, or PLSOILIN 397P or equivalent course.

**597D B Wetland Plant Identification & Ecology (Fall, even years)**

3 cr, Tiner, adjunct/off-campus

Lecture, lab. This course will introduce students to the ecology and characteristics vegetation of the variety of wetland types found in the eastern United States (including salt marshes, freshwater marshes, wet meadows, fens, shrub bogs and swamps, hardwood swamps, evergreen swamps, floodplain wetlands, and seasonally saturated flatwoods). Lectures will address the ecology of each type emphasizing their plant communities, and laboratory exercises will be largely devoted to visiting local wetlands for the purpose of identifying characteristic plants in the field.

Prerequisite: Course in basic biology or botany

**597G B Plant Biotechnology (*not available 2009-2010*)**

3 cr, Parkash, 202 French

Lecture. This course will familiarize students with concepts and current status of plant genetic engineering for crop improvement and health applications, covering with wide range of topics for engineering plants for abiotic and biotic stresses, metabolic engineering for nutrient enhancement, and risk assessment of engineered crops.

**597L -- Wetland Delineation (Fall, odd years)**

3 cr, Veneman/Tiner, 19 Stockbridge

Lecture, lab. Wetland delineation using vegetation, hydrology and soils. Vegetation identification and herbarium collection, hydric soil identification, wetland hydrology indicators. Text. Various titles, class handouts. One final exam, paper, field projects, class presentation. Prerequisite: knowledge of chemistry.

**597M - Topics in Turf Pathology (Spring)**

2 cr, Jung, 206 French

Lecture/seminar. Review and discussion of concepts and issues related with turfgrass diseases.

Reading of scientific papers and trade journals required each week. Guest speakers from turfgrass industry present many of the topics and lead subsequent class discussion. One written paper/essay and one class presentation required. Prerequisite: PLNTSOIL 505.

**597O -- Organic Contaminants in Soils, Waters, and Sediments (Fall, even years)**

3 cr, Simkins, 12A Stockbridge

Lecture. Transport and fate of manmade compounds in natural and managed environments: abiotic and biotic effects including partitioning, interfaces, concentration, biodegradation and biotransformation. Examination of specific examples of compounds and classes of contaminants in affected environments, such as pesticides and petroleum products in soil and ground water. Prerequisites: basic biology and organic chemistry; knowledge of biochemistry helpful.

**597V B Integrated Turf Management (Spring)**

3 cr, Vittum/Ebdon, 316 Ag. Engineering

Lecture. This capstone course will stress concepts of Integrated Pest Management and review stress management and pest management strategies. Each student will develop an IPM plan for a turf setting. Prerequisites: PLSOILIN 107, 310, 340, and PLNTSOIL 505. Enrollment restricted to Seniors.

**597W -- Artificial Treatment Wetlands (Fall, even years)**

3 cr, Spokas/Lavigne, 19 Stockbridge

Lecture. Aquatic plant selection, sizing, and design techniques. Pollution parameters of primary concern are BOD, suspended solids, nutrients, heavy metals, pathogens, organics. Treatment applications include primary and secondary effluents and sludges; storm water and agricultural runoff; solid and hazardous waste leachates, liquids, industrial wastes. Field trips, weekly homework assignments, student projects. Hourly and final exams. Prerequisites: college algebra, introductory chemistry, introductory physics, biology; or consent of instructor.

**597X -- Inorganic Contaminants in Soil, Water, and Sediment (Spring- alternate years)**

3 cr, Xing, 12B Stockbridge

Lecture. The course discusses physical, chemical, and biological factors affecting the fate and transport of heavy metals and other inorganic contaminants in soil, water, and sediment. The course also provides an introduction to the heavy metals chemistry, sources, pedogenic and geochemical behavior, and methods used for their analysis. Additionally, remediation technologies, options, and goals are also presented. Short reports, midterm and final, term paper, and class presentation. Prerequisites: CHEM 111 & 112, college algebra, knowledge of transition metal chemistry, or permission from instructor.

**ENTOMOL**

**511 B Insect Behavior (Fall, odd years)**

3 cr, Averill, 204G Fernald

Lecture. Specific behaviors of insects analyzed from physiological, ecological, and evolutionary perspectives. Topics include communication, defense, learning, competition, spacing patterns, orientation mechanisms, dispersal and migration, host and mate finding, food selection, feeding, courtship, production of young, and social behavior. Prerequisite: PLSOILIN 326 recommended but not required.

**523 B Biological Control (Spring, even years)**

3 cr, Van Driesche, 320 Ag. Engin.

Lecture. Ecological principles of pest suppression via conservation, augmentation or introduction of natural enemies of insects, plants, and other pests. Biological control presented as foundation of sustainable agriculture and integrated pest management. Applications discussed for biological control in both production systems (farming, forestry) and for protection of natural ecosystems and rare species from damage caused by invasive, exotic pests. Prerequisite: none

**572 B Insects and Diseases of Forests and Shade Trees (Spring, odd years)**

3 cr, Elkinton/Wick, 310 Ag. Engin./109 Fernald

Lecture. Ecology, biology and control of insects and diseases which attack shade trees, forests and forest products. A brief introduction to insects and pathogens, with attention given to the more important forest and shade tree pests. Prerequisite: course in biology

**574 B Medical Entomology (Spring, even years)**

3 cr, Rich, 209B Fernald

This course is an in depth analysis of the role of arthropods as disease vectors (taxonomy, life history, epidemiology and vector control), with particular focus on the major diseases transmitted by mosquitoes and ticks. In addition to the classical topics of Medical Entomology, we will examine how modern advances in molecular biology, immunology, genomics and theoretical population biology has improved our understanding of these systems and may lead to new intervention strategies. Prerequisite: Introductory biology sequence.

**581 B Integrated Pest Management (*not available in 2009-2010*)**

4 cr, Various department faculty

Lecture, lab. Theory and application of the principles of insect, disease, and weed pest management; emphasis on insects. Focus on pest and natural enemy sampling techniques, properties of available control strategies, underlying ecological and behavioral principles, model pest management systems and societal concerns. Prerequisite: PLSOILIN 326 or 397K, and PLNTSOIL 505, or consent of instructor.

**597A B Insect-Plant Interactions (Fall, even years)**

3 cr, Adler, 204C Fernald

Lecture. This course covers the ecology and evolution of insect-plant interactions in basic and applied contexts. Lectures, discussions, and readings will examine insect-plant interactions and the consequences at multiple levels. Prerequisites: suggested that students have taken an introductory ecology class, and a statistics course.