AGRICULTURAL SCIENCE AND TECHNOLOGY MAJOR

College of Agriculture and Natural Resources
2139 Plant Sciences Building
Phone: 301-405-4359
dcortez@umd.edu
http://psla.umd.edu

Program Director: Melissa Leiden Welsh, Ph.D. (https://agnr.umd.edu/about/directory/melissa-welsh/)

Agricultural Science and Technology is an interdisciplinary major focusing on sustainable production of food, feed, fiber, fuel, and ornamentals as well as developing skills to provide agricultural education for all. This major is a science-based curriculum that allows students to obtain technological skills while developing critical thinking in a broad area of agricultural studies. There are three specializations to choose from in this major: Agronomy, Environmental Horticulture (fruit, vegetable and ornamental production outdoors and in controlled environment and hydroponic systems), and Agricultural and Extension Education.

Agronomy

Agronomy students will focus on a broad range of agricultural disciplines providing them with a comprehensive education in crop, soil and animal sciences. Students will take courses in animal science, crop science, soil science, agricultural economics and plant protection. This specialization has electives that allows students to design their curriculum and develop knowledge in areas that meet their future goals. Graduates will be prepared to work in the agricultural industry in agricultural extension, management, marketing, regulatory, support services, as well as other opportunities.

Environmental Horticulture

The Environmental Horticulture specialization focuses on the science, technology and management of sustainable fruit, vegetable, flower and woody ornamental plant production as well as controlled environment agriculture and hydroponic crop production. Applied aspects of the curriculum include training in plant propagation, plant identification, field production of fruits, vegetables and ornamental crops, greenhouse crop production, containerized nursery production, and food production in controlled environment and hydroponic systems. Courses are taken in plant science, soil science, plant pathology and entomology, plant protection and food safety. Graduates of this program pursue careers in production horticulture, urban agriculture, food safety and public education programs. Some own their own businesses. Students can prepare for plant science graduate programs by taking additional courses.

Agricultural and Extension Education

The Agricultural and Extension Education specialization provides students with varying coursework in agribusiness & communications; animal, food & plant sciences; biotechnology; environmental & natural resources; leadership, youth & career development; power, structural & technical systems; and foundational pedagogical education courses. Students practice agricultural literacy techniques throughout their individualized learning experiences to develop mastery in educating using agricultural concepts with diverse audiences. Inclusion within the Terrapin Teachers program provides cross-disciplinary and interdisciplinary opportunities for learning with peers.

Graduates focused on formal education may become certified secondary high school agricultural teachers in public or private schools or specialize in an area for career technical education. Those focused as agricultural advocates may seek non-formal education jobs in non-profit agricultural literacy based foundations, become Extension youth educators, Extension agricultural specialists, or work within agricultural industry public relations areas. Proximity to federal agencies provides students with an opportunity to expand their international and regulation agency networking skills.

Undergraduates have two options.

1. The first option is to complete a double major in 4 years*: (1) Agricultural Science and Technology, Agricultural and Extension Education specialization and (2) Secondary Sciences Education. Graduates of this option are eligible to obtain teacher certification.

*With Junior status, students could opt to enroll in the Integrated Master Certificate Program (IMCP) and complete a Curriculum and Instruction, Master of Education (M.Ed.) with Certification in the 5th year. These students are able to complete additional agricultural content courses due to the majority of their educational courses being completed in the 30 credit master’s program.

2. The second option is to major in Agricultural Science and Technology, Agricultural and Extension Education specialization with no teacher certification and focus on Extension/Industry internships. Students graduating from this option could apply at a later date to complete a master’s degree through the Curriculum and Instruction, Master of Education (M.Ed.) with the teacher certification (MCERT) program.

Program Learning Outcomes

1. Students will develop technical and knowledge-based skills in the required areas of study.
2. Students will use technical and basic learned knowledge to collaborate, solve problems, and then articulate conclusions.
3. Students shall develop effective communication skills and demonstrate the ability to present ideas with clarity to an appropriate audience.
4. Students will connect and build relationships with external groups in the appropriate fields of study.

Requirements

Grading Policy: Students in the Agricultural Science & Technology program are required to earn grades of "C-" or higher in all required courses including courses used to satisfy elective requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM131 &amp; CHEM132</td>
<td>Chemistry I - Fundamentals of General Chemistry and General Chemistry I Laboratory</td>
<td>7-8</td>
</tr>
<tr>
<td>CHEM231 &amp; CHEM232 or PLSC275</td>
<td>Organic Chemistry I and Fundamentals of Agricultural and Environmental Chemistry</td>
<td></td>
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</table>

Foundational Agricultural Courses
### Agricultural Science and Technology Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLSC201</td>
<td>Plant Structure and Function</td>
<td>3</td>
</tr>
<tr>
<td>PLSC206</td>
<td>Plant Structure and Function Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>ENST200</td>
<td>Fundamentals of Soil Science</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Plant Protection Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI337</td>
<td>Biology of Insects</td>
<td>4</td>
</tr>
<tr>
<td>or BSCI487</td>
<td>IPM: Science-Based Decision Making for Sustainable Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>or BSCI497</td>
<td>Insect Pests of Ornamentals and Turf</td>
<td>4</td>
</tr>
<tr>
<td>PLSC420</td>
<td>Principles of Plant Pathology</td>
<td>4</td>
</tr>
<tr>
<td>PLSC453</td>
<td>Weed Science</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Specialization Requirements

- **54-75 credits**
- Select one of the following specializations:
  - Agronomy
  - Environmental Horticulture
  - Agricultural and Extension Education

### Specializations:

#### Agronomy

**Course** | **Title** | **Credits** |
---|---|---|
**Mathematics Course**<sup>1</sup> | Precalculus | 3 |
**Biology, agronomy and animal science courses**<sup>2</sup> | Principles of Ecology and Evolution | 4 |
| & BSCI116 | Principles of Ecology and Evolution Lab | 4 |
| PLSC112 | Introductory Crop Science | 4 |
| & PLSC113 | Introductory Crop Science Laboratory | 4 |
| ANSC101 | Principles of Animal Science | 4 |
| & ANSC103 | Principles of Animal Science Laboratory | 4 |
| AGST400 | Advanced Crop Science | 3 |
| AGST401 | Tractor and Equipment Operation, Safety and Maintenance | 1 |
| AREC306 | Farm Management and Sustainable Food Production | 3 |

**Animal Management Course (select one)**<sup>3</sup> | 3 |
| ANSC220 | Livestock Management | 3 |
| ANSC232 | Horse Management | 3 |
| ANSC242 | Dairy Cattle Management | 3 |
| ANSC245 | Sheep Management | 3 |
| ANSC255 | Introduction to Aquaculture | 3 |
| ANSC262 | Commercial Poultry Management | 3 |
| ANSC282 | Grazing Animal Management | 3 |

**Upper level (greater or equal to 300) restricted electives**<sup>4</sup> | 3 |
| AGST, PLSC or ANSC Restricted Elective | 3 |
| AREC or BMGT Restricted Elective | 3 |
| AGST or PLSC Restricted Elective | 3 |
| AGST or PLSC Restricted Elective | 3 |
| ENST Restricted Elective | 3 |

**Internship and capstone courses**<sup>5</sup> | 3 |
| PLSC389 | Internship | 3 |
| PLSC460 | Application of Knowledge in Plant Sciences | 3 |

#### General Electives<sup>6</sup> | 6 |

<table>
<thead>
<tr>
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<th>Credits</th>
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</thead>
</table>

**Total Credits** | 80-102 |

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<sup>1</sup> This course will be chosen in consultation with the academic advisor.

<sup>2</sup> This course is restricted to 300-level or above courses within the Department of Animal and Avian Sciences.

<sup>3</sup> This course is restricted to 300-level or above courses with the Department of Agricultural and Resource Economics or the Robert H. Smith School of Business.

<sup>4</sup> This course is restricted to 300-level or above courses within the Agricultural Science and Technology program or the Plant Science program.

<sup>5</sup> This course is restricted to 300 level or above courses within the Department of Environmental Science and Technology.

<sup>6</sup> This course is restricted to Education, Computer Science or Policy.

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### Environmental Horticulture

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
</table>

#### Environmental Horticulture Specialization Requirements

**Mathematics Course** | 3 |
| MATH115 | Precalculus | 3 |

**Economics Course** | 3 |

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREC250</td>
<td>Elements of Agricultural and Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>or ECON200</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Introductory Course** | 3-4 |

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC101</td>
<td>Principles of Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>&amp; ANSC103</td>
<td>Principles of Animal Science Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BMGT110</td>
<td>Introduction to the Business Value Chain</td>
<td>3</td>
</tr>
<tr>
<td>BMGT160</td>
<td>The Intentional Self</td>
<td>3</td>
</tr>
<tr>
<td>BSCI126</td>
<td>Pollinators in Crisis</td>
<td>3</td>
</tr>
<tr>
<td>GEOG110</td>
<td>The World Today: Global Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>or GEOG330</td>
<td>As the World Turns: Society and Sustainability in a Time of Great Change</td>
<td>3</td>
</tr>
</tbody>
</table>

**General Sciences** | 4 |

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI170</td>
<td>Principles of Molecular &amp; Cellular Biology</td>
<td>4</td>
</tr>
<tr>
<td>or BSCI171</td>
<td>Principles of Molecular &amp; Cellular Biology Laboratory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Foundational Horticulture Courses** | 7 |

Complete all listed courses
Agricultural Science and Technology Major

**PLSC110** Introduction to Horticulture
& **PLSC111** Introduction to Horticulture Laboratory
**PLSC271** Plant Propagation

**Lower level (greater or equal to 100) restricted electives** 6-8

Select two of the following courses:

- **AGST130** Did Yeast Create Civilization?
- **PLSC125** Feeding Ten Billion by 2050: Food Security and Crop Protection
- **PLSC203** Plants, Genes and Biotechnology
- **PLSC205** Introduction to Turf Science and Management
- **PLSC226** Plant Diversity
- **PLSC253** Woody Plants for Mid-Atlantic Landscapes I
- **PLSC254** Woody Plants for Mid-Atlantic Landscape II
- **AOSC200** & **AOSC201** Weather and Climate and Weather and Climate Laboratory

**Agriculture Business, Economics, Management or Marketing Course** 3

Select one of the following:

- **AREC306** Farm Management and Sustainable Food Production
- **AREC345** Global Poverty and Economic Development
- **AREC365** World Hunger, Population, and Food Supplies
- **BMGT Restricted Elective**
- **PLSC251** Financial Applications for the Green Industry

**Advanced Horticulture Courses**

Complete all listed courses:

- **PLSC432** Greenhouse Crop Production 3
- **PLSC433** Technology of Fruit and Vegetable Production 4

**Upper level (greater or equal to 300) restricted electives** 6-8

Select two of the following:

- **AGST333** Crafty Beverage Crops
- **AGST401** Tractor and Equipment Operation, Safety and Maintenance
- **ENST411** Principles of Soil Fertility
- **LARC461** People and the Environment
- **PLSC303** Global Food Systems
- **PLSC400** Plant Physiology
- **PLSC425** Green Roofs and Urban Sustainability
- **PLSC452** Environmental Horticulture
- **PLSC461** Cultural Management of Nursery and Greenhouse Systems: Substrates
- **PLSC462** Cultural Management of Nursery and Greenhouse Systems: Irrigation
- **PLSC464** Cultural Management of Nursery and Greenhouse Systems: Nutrients
- **PLSC471** Forest Ecology
- **AGST or PLSC Approved Elective** 1,3

**Career Preparation Courses** 6

- **PLSC389** Internship 4
  or **PLSC399** Special Problems in Plant Science
- **PLSC460** Application of Knowledge in Plant Sciences

**General Electives** 6

Total Credits 54-59

1 This course will be chosen in consultation with the academic advisor.
2 This course is restricted to the 200-level or above.
3 This course is restricted to 300-level or above courses within the Agricultural Science and Technology program or the Plant Sciences program.
4 Requires approval from advisor.

### Agricultural and Extension Education: Teaching Certificate

#### Course Title Credits

<table>
<thead>
<tr>
<th>Agriculture-Related Courses</th>
<th>Animal Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC101 Principles of Animal Science 4 &amp; ANSC103 and Principles of Animal Science Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

One of the following animal management courses: 3

- **ANSC220** Livestock Management
- **ANSC232** Horse Management
- **ANSC242** Dairy Cattle Management
- **ANSC245** Sheep Management
- **ANSC255** Introduction to Aquaculture
- **ANSC262** Commercial Poultry Management
- **ANSC282** Grazing Animal Management

#### Agribusiness

- **MATH113** College Algebra and Trigonometry 3
- **AREC250** Elements of Agricultural and Resource Economics 3

#### Biology

- **BSCI160** Principles of Ecology and Evolution 4
  & **BSCI161** Principles of Ecology and Evolution Lab

#### Power, Structural & Technical

- **INAG250** Fundamentals of Agricultural Mechanics 3
- **PLSC235** Irrigation and Drainage 3
  or **INAG235** Irrigation and Drainage

#### Environmental Sciences and Natural Resources

- **PLSC471** Forest Ecology (or elective focused on Renewable Energy) 3

#### Plant Sciences

- **PLSC110** Introduction to Horticulture 4
  & **PLSC111** Introduction to Horticulture Laboratory
  or **PLSC112** Introductory Crop Science
  & **PLSC113** Introductory Crop Science Laboratory

#### Food Science

- **NFSC112** Food: Science and Technology 3
  or **PLSC115** How Safe is Your Salad? The Microbiological Safety of Fresh produce

#### Leadership & Career Development

- **AGST440** (Exploring Maryland Agriculture, Agricultural Industries & Agricultural Literacy) 3
- **AGST442** (Developing Leadership in Youth and Volunteers) 3
- **EDHD426** Cognitive and Motivational Literacy Content 3

#### Education Pre-Professional

- **TLPL101** Inquiry Approach to Teaching STEM (Step 1) 1
- **TLPL102** Inquiry Teaching of STEM in Middle School 2

One of the following courses: 3

- **TLPL401** Student-Centered Curriculum and Instruction
Agricultural Science and Technology Major

TLPL488  Special Topics in Education (TLPL488P: Project Based Instruction)  
TLPL414  Knowing and Learning in Mathematics and Science  

Teacher Certification

Professional Courses

TLPL415  Perspectives in Science  
TLPL425  Learning and Teaching in Science  
or  AGST425 
TLPL481  Embracing Diversity in the Classroom Community  

Student Teaching

TLPL478  Professional Seminar in Education (TLPL478F: Professional Seminar in Education: Agriculture)  
TLPL479  Field Experiences in Education (TLPL479F: Field Experience in Science Education)  
TLPL489  Internship in Education (TLPL489F)  

Total Credits  75

Agricultural and Extension education: Extension/Industry

Course  Title  Credits

Agriculture-Related Courses

Animal Science

ANSC101 & ANSC103  Principles of Animal Science and Principles of Animal Science Laboratory  
One of the following animal management courses:  
ANSC220  Livestock Management  
ANSC232  Horse Management  
ANSC242  Dairy Cattle Management  
ANSC245  Sheep Management  
ANSC262  Commercial Poultry Management  
ANSC282  Grazing Animal Management

Agribusiness

MATH113  College Algebra and Trigonometry  
AREC250  Elements of Agricultural and Resource Economics

Biology

BSCI160 & BSCI161  Principles of Ecology and Evolution and Principles of Ecology and Evolution Lab

Power, Structural & Technical

INAG250  Fundamentals of Agricultural Mechanics  
PLSC235  Irrigation and Drainage  
or  INAG235  Irrigation and Drainage

Environmental Sciences and Natural Resources

PLSC471  Forest Ecology (or elective focused on Renewable Energy)

Plant Sciences

PLSC110 & PLSC111  Introduction to Horticulture and Introduction to Horticulture Laboratory  
or  PLSC112 & PLSC113  Introductory Crop Science and Introductory Crop Science Laboratory

Food Science

NFSC112  Food: Science and Technology

or PLSC115  How Safe is Your Salad? The Microbiological Safety of Fresh produce

Leadership & Career Development

AGST442  (Developing Leadership in Youth and Volunteers)  
AGST440  (Exploring Maryland Agriculture, Agricultural Industries & Agricultural Literacy)

Education Pre-Professional

TLPL101  Inquiry Approach to Teaching STEM (Step 1)  
TLPL102  Inquiry Teaching of STEM in Middle School  
One of the following courses:  
TLPL488  Special Topics in Education (TLPL488P: Project Based Instruction)

TLPL401  Student-Centered Curriculum and Instruction  
TLPL414  Knowing and Learning in Mathematics and Science

Industry/Extension

Agricultural Expanded

ANSC255  Introduction to Aquaculture  
BSCI121  Beekeeping  
INAG252  Agricultural Public Relations

AREC/PLSC/LARC Restricted Elective  
AREC/PLSC/LARC: Restricted Elective

AGST Internship or Elective  
AGST489  (Internship)  
AGST489  (Internship or Elective Course)

Total Credits  74

1  Internship requirement: Students will either do two internships for a total of 6 credits or one internship for 3 credits and take a different elective course for 3 credits.

FOUR-YEAR PLAN

Click here (https://agnr.umd.edu/academics/advising/four-year-plans/) for roadmaps for four-year plans in the College of Agricultural and Natural Resources.

Additional information on developing a four-year academic plan can be found on the following pages:

•  http://4yearplans.umd.edu
•  the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations/academic-advising/#success) section of this catalog

ADVISING

The department has mandatory faculty advising for each of its major and minor programs. Students are required to meet with their faculty advisor at least twice a year.

For additional information please see:
### OPPORTUNITIES

#### Undergraduate Research Experiences

Students are encouraged to take part in faculty mentored research. Please contact an advisor for more information.

#### Internships

Internships are a part of the required curriculum and can be in private or government sector employment. Formal (K-12 schools) and non-formal (non-profits, industry & Extension) education settings are available for students in the Agricultural & Extension Education specialization.

#### Student Clubs and Professional Organizations

Faculty in the department advise student clubs. The department also sponsors student teams that participate in regional and national contests. These teams participate in competitions in the following areas: turf and crop science.

#### Scholarships and Financial Assistance

Several scholarships and awards are available to AGST students. Contact the Associate Dean’s office at 301-405-2078 for additional information. The Department also maintains a listing of scholarships. For more information regarding these scholarships contact the Chair’s office in 2104A Plant Sciences, 301-405-4356.

The Office of Student Financial Aid (OSFA) administers all types of federal, state and institutional financial assistance programs and, in cooperation with other university offices, participates in the awarding of scholarships to deserving students. For information, visit: http://financialaid.umd.edu.

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<table>
<thead>
<tr>
<th>Concentration</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and Extension Education</td>
<td>Dr. Melissa Leiden Welsh, Director and Assistant Clinical Professor, Agricultural and Extension Education Advisor, <a href="mailto:drmwelsh@umd.edu">drmwelsh@umd.edu</a></td>
</tr>
<tr>
<td>Agronomy</td>
<td>Dr. Bill Phillips, Assistant Clinical Professor, Agronomy Advisor, <a href="mailto:billii@umd.edu">billii@umd.edu</a></td>
</tr>
<tr>
<td>Environmental Horticulture</td>
<td>Dr. Diana Cochran, Assistant Clinical Professor, Environmental Horticulture Advisor, <a href="mailto:cochrand@umd.edu">cochrand@umd.edu</a></td>
</tr>
<tr>
<td>General Questions</td>
<td>Diana Cortez, Academic Advisor &amp; Lecturer, <a href="mailto:dcortez@umd.edu">dcortez@umd.edu</a></td>
</tr>
</tbody>
</table>