

# AGRICULTURAL SCIENCE AND TECHNOLOGY MAJOR

College of Agriculture and Natural Resources (AGNR)  
Department of Plant Science & Landscape Architecture (PSLA)

2139 Plant Sciences Building

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**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.

| Course                                   | Title  | Credits    |
|--|--|------------|
| <b>Major Core Courses</b>                |  |            |
| <b>Foundational Science Courses</b>      |  |            |
|  |  | <b>7-8</b> |
| CHEM131<br>& CHEM132                     | Chemistry I - Fundamentals of General Chemistry and General Chemistry I Laboratory |            |
| Select one of the following:             |  |            |
| CHEM231<br>& CHEM232<br>or PLSC275       | Organic Chemistry I and Organic Chemistry Laboratory I                             |            |
| <b>Foundational Agricultural Courses</b> |  |            |
| PLSC201                                  | Plant Structure and Function   | <b>3</b>   |

|  |  |               |
|--|--|---------------|
| PLSC206                                      | Plant Structure and Function Laboratory                            | 1             |
| ENST200                                      | Fundamentals of Soil Science                                       | 4             |
| <b>Plant Protection Courses</b>              |  |               |
| BSCI337                                      | Biology of Insects   | 4             |
| or BSCI487                                   | IPM: Science-Based Decision Making for Sustainable Pest Management |               |
| or BSCI497                                   | Insect Pests of Ornamentals and Turf                               |               |
| PLSC420                                      | Principles of Plant Pathology                                      | 4             |
| PLSC453                                      | Weed Science   | 3             |
| <b>Specialization Requirements</b>           |  | <b>54-75</b>  |
| Select one of the following specializations: |  |               |
| Agronomy                                     |  |               |
| Environmental Horticulture                   |  |               |
| Agricultural and Extension Education         |  |               |
| <b>Total Credits</b>                         |  | <b>80-102</b> |

## Specializations:

### Agronomy

| Course  | Title  | Credits  |
|---|--|----------|
| <b>Agronomy Specialization Requirements</b>   |  |          |
| <b>Mathematics Course</b>   |  |          |
| MATH115   | Precalculus  | 3        |
| <b>Biology, agronomy and animal science courses</b>   |  |          |
| BSCI160   | Principles of Ecology and Evolution                                      | 3        |
| BSCI180   | Principles Biology Laboratory  | 1        |
| or BSCI161  | Principles of Ecology and Evolution Lab                                  |          |
| PLSC112 & PLSC113   | Introductory Crop Science and Introductory Crop Science Laboratory       | 4        |
| ANSC101 & ANSC103   | Principles of Animal Science and 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        |
| <b>Animal Management Course (select one)</b>  |  | <b>3</b> |
| ANSC220   |  |          |
| ANSC232   | Horse Management   |          |
| ANSC242   | Dairy Cattle Management  |          |
| ANSC245   | Sheep Management   |          |
| ANSC255   | Introduction to Aquaculture  |          |
| ANSC262   | Poultry Management   |          |
| ANSC282   | Grazing Animal Management  |          |
| <b>Upper level (greater or equal to 300) restricted electives</b>   |  |          |
| AGST, PLSC or ANSC Restricted Elective <sup>1,2</sup>   |  | 3        |
| AREC or BMGT Restricted Elective <sup>1,3</sup>   |  | 3        |
| AGST or PLSC Restricted Elective <sup>1,4</sup>   |  | 3        |
| AGST or PLSC Restricted Elective <sup>1,4</sup>   |  | 3        |
| AGST or PLSC Restricted Elective <sup>1,4</sup>   |  | 3        |
| ENST Restricted Elective <sup>1,5</sup>   |  | 3        |
| Multidiscipline Restricted Elective (Course is restricted to Education, Computer Application or Policy.) <sup>1,6</sup> |  | 3        |

|  |  |           |
|--|--|-----------|
| <b>Internship and capstone courses</b> |  |           |
| PLSC389                                | Internship                                 | 3         |
| PLSC460                                | Application of Knowledge in Plant Sciences | 3         |
| <b>General Electives</b>               |  | <b>6</b>  |
| <b>Total Credits</b>                   |  | <b>58</b> |

<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.

### Environmental Horticulture

| Course  | Title  | Credits    |
|---|--|------------|
| <b>Environmental Horticulture Specialization Requirements</b> |  |            |
| <b>Mathematics Course</b>                                     |  |            |
| MATH115   | Precalculus  | 3          |
| <b>Economics Course</b>                                       |  | <b>3</b>   |
| Select one of the following:                                  |  |            |
| AREC250   | Elements of Agricultural and Resource Economics or ECON200 Principles of Microeconomics                                  |            |
| <b>Introductory Course</b>                                    |  | <b>3-4</b> |
| Select one of the following:                                  |  |            |
| ANSC101 & ANSC103   | Principles of Animal Science and Principles of Animal Science Laboratory   |            |
| BMGT110   | Introduction to the Business Value Chain   |            |
| BMGT160   | The Intentional Self   |            |
| BSCI126   | Pollinators in Crisis  |            |
| GEOG110   | The World Today: Global Perspectives or GEOG330 As the World Turns: Society and Sustainability in a Time of Great Change |            |
| GEOL120   | Environmental Geology  |            |
| INAG250   | Fundamentals of Agricultural Mechanics   |            |
| LARC151   | Urban Agriculture: Designing and Assessing Edible Landscapes   |            |
| LARC152   | Greening Cities: Who Wins, Who Loses, and Who Cares?   |            |
| LARC160   | Introduction to Landscape Architecture and Environmental Design  |            |
| LARC162   | Environmental Justice: Same World, Different Built Environment   |            |
| SPAN103   | Elementary Spanish for Intercultural Communication I   |            |
| <b>Biological Sciences</b>                                    |  | <b>4</b>   |
| Complete the following courses:                               |  |            |
| BSCI170   | Principles of Molecular & Cellular Biology   |            |
| BSCI180   | Principles Biology Laboratory or BSCI171 Principles of Molecular & Cellular Biology Laboratory                           |            |

**Foundational Horticulture Courses 7**

Complete all listed courses

PLSC110 Introduction to Horticulture  
& PLSC111 and 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 Weather and Climate  
& AOSC201 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 <sup>1,2</sup>

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 <sup>1,3</sup>

**Career Preparation Courses 6**

PLSC389 Internship <sup>4</sup>  
or PLSC399 Special Problems in Plant Science

PLSC460 Application of Knowledge in Plant Sciences

**General Electives 6**

**Total Credits 54-59**

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

<sup>2</sup> This course is restricted to the 200-level or above.

<sup>3</sup> This course is restricted to 300-level or above courses within the Agricultural Science and Technology program or the Plant Sciences program.

<sup>4</sup> Requires approval from advisor.

**Agricultural and Extension Education: Teaching Certificate**

| Course  | Title  | Credits |
|---|--|---------|
| <b>Agriculture-Related Courses</b>                  |  |         |
| <b>Animal Science</b>                               |  |         |
| ANSC101 & ANSC103                                   | Principles of Animal Science and Principles of Animal Science Laboratory   | 4       |
| One of the following animal management courses:     |  | 3       |
| ANSC220   |  |         |
| ANSC232   | Horse Management   |         |
| ANSC242   | Dairy Cattle Management  |         |
| ANSC245   | Sheep Management   |         |
| ANSC255   | Introduction to Aquaculture  |         |
| ANSC262   | Poultry Management   |         |
| ANSC282   | Grazing Animal Management  |         |
| <b>Agribusiness</b>                                 |  |         |
| MATH113   | College Algebra and Trigonometry   | 3       |
| AREC250   | Elements of Agricultural and Resource Economics  | 3       |
| <b>Biology</b>                                      |  |         |
| BSCI160   | Principles of Ecology and Evolution  | 3       |
| BSCI180   | Principles Biology Laboratory  | 1       |
| or BSCI161  | Principles of Ecology and Evolution Lab  |         |
| <b>Power, Structural &amp; Technical</b>            |  |         |
| INAG250   | Fundamentals of Agricultural Mechanics   | 3       |
| PLSC235   |  | 3       |
| or INAG235  | Irrigation and Drainage  |         |
| <b>Environmental Sciences and Natural Resources</b> |  |         |
| PLSC471   | Forest Ecology (or elective focused on Renewable Energy)   | 3       |
| <b>Plant Sciences</b>                               |  |         |
| PLSC110 & PLSC111                                   | Introduction to Horticulture and Introduction to Horticulture Laboratory   | 4       |
| or PLSC112 & PLSC113                                | Introductory Crop Science and Introductory Crop Science Laboratory   |         |
| <b>Food Science</b>                                 |  |         |
| NFSC112   | Food: Science and Technology   | 3       |
| or PLSC115  | How Safe is Your Salad? The Microbiological Safety of Fresh produce  |         |
| <b>Leadership &amp; Career Development</b>          |  |         |
| AGST440   | Exploring Maryland Agriculture, Agricultural Industry, and Agricultural Literacy (Exploring Maryland Agriculture, Agricultural Industries & Agricultural Literacy) | 3       |

|                                   |  |           |
|-----------------------------------|--|-----------|
| AGST442                           | Examining Leadership in Youth and Volunteers (Developing Leadership in Youth and Volunteers) | 3         |
| EDHD426                           | Cognitive and Motivational Literacy Content  | 3         |
| <b>Education Pre-Professional</b> |  |           |
| 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  |           |
| TLPL488                           | Special Topics in Education (TLPL488P: Project Based Instruction)                            |           |
| TLPL414                           | Knowing and Learning in Mathematics and Science  | 3         |
| <b>Teacher Certification</b>      |  |           |
| <b>Professional Courses</b>       |  |           |
| TLPL415                           | Perspectives in Science  | 3         |
| TLPL425                           | Learning and Teaching in Science   | 3         |
|                                   | or AGST425   |           |
| TLPL481                           | Embracing Diversity in the Classroom Community   | 3         |
| <b>Student Teaching</b>           |  |           |
| TLPL478                           | Professional Seminar in Education (TLPL478F: Professional Seminar in Education: Agriculture) | 2         |
| TLPL479                           | Field Experiences in Education (TLPL479F: Field Experience in Science Education)             | 1         |
| TLPL489                           | Internship in Education (TLPL489F)   | 12        |
| <b>Total Credits</b>              |  | <b>75</b> |

## Agricultural and Extension education: Extension/Industry

| Course  | Title  | Credits |
|---|--|---------|
| <b>Agriculture-Related Courses</b>                  |  |         |
| <b>Animal Science</b>                               |  |         |
| ANSC101 & ANSC103                                   | Principles of Animal Science and Principles of Animal Science Laboratory | 4       |
| One of the following animal management courses:     |  | 3       |
| ANSC220   |  |         |
| ANSC232   | Horse Management   |         |
| ANSC242   | Dairy Cattle Management  |         |
| ANSC245   | Sheep Management   |         |
| ANSC262   | Poultry Management   |         |
| ANSC282   | Grazing Animal Management  |         |
| <b>Agribusiness</b>                                 |  |         |
| MATH113   | College Algebra and Trigonometry   | 3       |
| AREC250   | Elements of Agricultural and Resource Economics                          | 3       |
| <b>Biology</b>                                      |  |         |
| BSCI160   | Principles of Ecology and Evolution                                      | 3       |
| BSCI180   | Principles Biology Laboratory  | 1       |
|   | or BSCI161 Principles of Ecology and Evolution Lab                       |         |
| <b>Power, Structural &amp; Technical</b>            |  |         |
| INAG250   | Fundamentals of Agricultural Mechanics                                   | 3       |
| PLSC235   |  | 3       |
|   | or INAG235 Irrigation and Drainage                                       |         |
| <b>Environmental Sciences and Natural Resources</b> |  |         |

|   |  |           |
|---|--|-----------|
| PLSC471   | Forest Ecology (or elective focused on Renewable Energy)   | 3         |
| <b>Plant Sciences</b>                           |  |           |
| PLSC110 & PLSC111                               | Introduction to Horticulture and Introduction to Horticulture Laboratory   | 4         |
|   | or PLSC112 & PLSC113 Introductory Crop Science and Introductory Crop Science Laboratory  |           |
| <b>Food Science</b>                             |  |           |
| NFSC112   | Food: Science and Technology   | 3         |
|   | or PLSC115 How Safe is Your Salad? The Microbiological Safety of Fresh produce   |           |
| <b>Leadership &amp; Career Development</b>      |  |           |
| AGST442   | Examining Leadership in Youth and Volunteers (Developing Leadership in Youth and Volunteers)   | 3         |
| AGST440   | Exploring Maryland Agriculture, Agricultural Industry, and Agricultural Literacy (Exploring Maryland Agriculture, Agricultural Industries & Agricultural Literacy) | 3         |
| <b>Education Pre-Professional</b>               |  |           |
| TLPL101   | Inquiry Approach to Teaching STEM (Step 1)   | 1         |
| TLPL102   | Inquiry Teaching of STEM in Middle School  | 2         |
| One of the following courses:                   |  | 3         |
| TLPL488   | Special Topics in Education (TLPL488P: Project Based Instruction)  |           |
| TLPL401   | Student-Centered Curriculum and Instruction  |           |
| TLPL414   | Knowing and Learning in Mathematics and Science  | 3         |
| <b>Industry/Extension</b>                       |  |           |
| <b>Agricultural Expanded</b>                    |  |           |
| ANSC255   | Introduction to Aquaculture  | 3         |
| BSCI121   |  | 2         |
| INAG252   | Agricultural Public Relations  | 3         |
| <b>AREC/PLSC/LARC Restricted Elective</b>       |  | <b>6</b>  |
| AREC/PLSC/LARC: Restricted Elective             |  |           |
| <b>AGST Internship or Elective</b> <sup>1</sup> |  | <b>6</b>  |
| AGST489   | Special Topics in Agricultural Science and Technology (Internship)   | 3         |
| AGST489   | Special Topics in Agricultural Science and Technology (Internship or Elective Course)  | 3         |
| <b>Total Credits</b>                            |  | <b>74</b> |

<sup>1</sup> 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.

## GRADUATION PLANS

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

Additional information on developing a graduation 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:

| Concentration                        | Faculty Advisor   |
|--------------------------------------|---|
| Agricultural and Extension Education | Dr. Melissa Leiden Welsh,<br>Director and Assistant Clinical Professor, Agricultural and Extension Education Advisor,<br>drmwelsh@umd.edu |
| Agronomy                             | Dr. Samuel Olumide Daramola, Assistant Clinical Professor, Agronomy Advisor,<br>odaramo1@umd.edu  |
| Environmental Horticulture           | Dr. Diana Cochran, Assistant Clinical Professor, Environmental Horticulture Advisor,<br>cochrand@umd.edu                                  |
| General Questions                    | Diana Cortez, Faculty Specialist,<br>dcortez@umd.edu  |

## 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>.