

# AGRICULTURAL SCIENCE AND TECHNOLOGY MAJOR

## College of Agriculture and Natural Resources

2139 Plant Sciences Building

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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 & CHEM132	Chemistry I - Fundamentals of General Chemistry and General Chemistry I Laboratory	
Select one of the following:		
CHEM231 & CHEM232	Organic Chemistry I and Organic Chemistry Laboratory I	
	or PLSC275	
<b>Foundational Agricultural Courses</b>		
PLSC201	Plant Structure and Function	3

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	4
& BSCI161	and Principles of Ecology and Evolution Lab	
PLSC112	Introductory Crop Science	4
& PLSC113	and Introductory Crop Science Laboratory	
ANSC101	Principles of Animal Science	4
& ANSC103	and Principles of Animal Science Laboratory	
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	Livestock Management	
ANSC232	Horse Management	
ANSC242	Dairy Cattle Management	
ANSC245	Sheep Management	
ANSC255	Introduction to Aquaculture	
ANSC262	Commercial 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	Principles of Animal Science	
& ANSC103	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	Intensive Elementary Spanish	
<b>Biological Sciences</b>		<b>4</b>
Complete the following courses:		
BSCI170	Principles of Molecular & Cellular Biology	
& BSCI171	and Principles of Molecular & Cellular Biology Laboratory	
<b>Foundational Horticulture Courses</b>		<b>7</b>
Complete all listed courses		

PLSC110 & PLSC111	Introduction to Horticulture 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 & 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 <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>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	Livestock Management	
ANSC232	Horse Management	
ANSC242	Dairy Cattle Management	
ANSC245	Sheep Management	
ANSC255	Introduction to Aquaculture	
ANSC262	Commercial 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 & BSCI161	Principles of Ecology and Evolution and Principles of Ecology and Evolution Lab	4
<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	(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

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

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	Principles of Animal Science	4
& ANSC103	and Principles of Animal Science Laboratory	
One of the following animal management courses:		3
ANSC220	Livestock Management	
ANSC232	Horse Management	
ANSC242	Dairy Cattle Management	
ANSC245	Sheep Management	
ANSC262	Commercial 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	4
& BSCI161	and 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	Introduction to Horticulture	4
& PLSC111	and Introduction to Horticulture Laboratory	
or PLSC112	Introductory Crop Science	
& PLSC113	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	

### Leadership & Career Development

AGST442	(Developing Leadership in Youth and Volunteers)	3
AGST440	Exploring Maryland Agriculture, Agricultural Industry, and Agricultural Literacy (Exploring Maryland Agriculture, Agricultural Industries & Agricultural Literacy)	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

TLPL488	Special Topics in Education (TLPL488P: Project Based Instruction)	
TLPL401	Student-Centered Curriculum and Instruction	
TLPL414	Knowing and Learning in Mathematics and Science	3

### Industry/Extension

<b>Agricultural Expanded</b>		
ANSC255	Introduction to Aquaculture	3
BSCI121		2
INAG252	Agricultural Public Relations	3
<b>AREC/PLSC/LARC Restricted Elective</b>		
AREC/PLSC/LARC: Restricted Elective		
<b>AGST Internship or Elective <sup>1</sup></b>		
<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

**Total Credits 74**

<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, Director and Assistant Clinical Professor, Agricultural and Extension Education Advisor, drmwelsh@umd.edu
Agronomy	Dr. Bill Phillips, Assistant Clinical Professor, Agronomy Advisor, billii@umd.edu
Environmental Horticulture	Dr. Diana Cochran, Assistant Clinical Professor, Environmental Horticulture Advisor, cochrand@umd.edu
General Questions	Diana Cortez, Academic Advisor & Lecturer, 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>.