

# ENGINEERING TECHNOLOGY & MANAGEMENT FOR AGRICULTURAL SYSTEMS: DIGITAL & PRECISION AGRICULTURE, BS

for the degree of Bachelor of Science in Engineering Technology & Management for Agricultural Systems: Digital & Precision Agriculture concentration

Students in the Digital & Precision Agriculture concentration learn the application of technology in agriculture and the larger system of production agriculture, including machinery, agronomy, and business management. Students will gain an understanding of:

1. The application of advanced technology used in agriculture with an emphasis on geospatial information systems and machinery technology;
2. The functional workings and management of agricultural machinery;
3. Crop and soil science and their interactions with advanced technologies;
4. Numerical and scientific processes to drive agricultural management decisions; and
5. Business operations and management with a focus on the agricultural industry. Graduates of the Digital & Precision Agriculture concentration are prepared for careers in industry with both small and large companies, agricultural retailers and service providers, production farming operations, government and environmental agencies, or for entrance into graduate or professional school.

for the degree of Bachelor of Science in Engineering Technology & Management for Agricultural Systems, Digital & Precision Agriculture concentration

## Concentration Requirements

### Graduation Requirements

Minimum hours required for graduation: 126 hours.

### University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300 and 400 level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (<https://studentcode.illinois.edu/article3/part8/3-801/>) (§ 3-801) and in the Academic Catalog (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

### General Education Requirements

Follows the campus General Education (Gen Ed) requirements (<https://courses.illinois.edu/gened/DEFAULT/DEFAULT/>). Some Gen Ed

requirements may be met by courses required and/or electives in the program.

| Code | Title  | Hours |
|------|--|-------|
|      | Composition I  | 4-6   |
|      | Advanced Composition   | 3     |
|      | fulfilled by AGCM 220, BADM 340, BTW 250, BTW 261, ECE 316, ESE 360, ETMA 311, NRES 419, or PLPA 200               |       |
|      | Humanities & the Arts (6 hours)  | 6     |
|      | Natural Sciences & Technology (6 hours)  | 6     |
|      | fulfilled by CHEM 102, PHYS 101, CPSC 112; and CHEM 104 or PHYS 102  |       |
|      | Social & Behavioral Sciences (6 hours)   | 6     |
|      | fulfilled by ECON 102 or ACE 100 and one other courses approved as Social and Behavioral Sciences                  |       |
|      | Cultural Studies: Non-Western Cultures (1 course)  | 3     |
|      | Cultural Studies: US Minority Cultures (1 course)  | 3     |
|      | Cultural Studies: Western/Comparative Cultures (1 course)  | 3     |
|      | Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)                           | 6-8   |
|      | fulfilled by MATH 234, PHYS 101, CS 105; and ACE 262, CPSC 241, ECON 202, or STAT 107                              |       |
|      | Language Requirement (Completion of the third semester or equivalent of a language other than English is required) | 0-15  |

| Code                         | Title   | Hours  |
|------------------------------|---|--------|
| <b>Department Foundation</b> |   |        |
|                              | ACES 101  |        |
|                              | Communication Option:   | 3 or 6 |
|                              | CMN 101 Public Speaking   |        |
|                              | ALEC 115 Let's Talk about Food, Agriculture, and the Environment    |        |
|                              | CMN 111 & CMN 112 Oral & Written Comm I and Oral & Written Comm II  |        |
|                              | Advanced ETMA Communication Option - Select one of the following:   | 3-4    |
|                              | AGCM 220 Communicating Agriculture                                  |        |
|                              | BADM 340 Ethical Dilemmas of Business                               |        |
|                              | BTW 250 Principles Bus Comm   |        |
|                              | BTW 261 Principles Tech Comm  |        |
|                              | ECE 316 Ethics and Engineering                                      |        |
|                              | ESE 360 Environmental Writing                                       |        |
|                              | ETMA 311 Humanity in the Food Web                                   |        |
|                              | NRES 419 Env and Plant Ecosystems                                   |        |
|                              | PLPA 200 Plants, Pathogens, and People                              |        |
|                              | Statistics Option - Select one of the following:                    | 3-4    |
|                              | ACE 262 Applied Statistical Methods and Data Analytics I            |        |
|                              | CPSC 241 Intro to Applied Statistics                                |        |
|                              | ECON 202 Economic Statistics I                                      |        |
|                              | STAT 107 Data Science Discovery                                     |        |
|                              | MATH 234 Calculus for Business I (or equivalent)                    | 4      |
|                              | CHEM 102 & CHEM 103 General Chemistry I and General Chemistry Lab I | 4      |
|                              | PHYS 101 College Physics: Mech & Heat                               | 5      |

Select one of the following: 4-5

|                     |   |  |
|---------------------|---|--|
| CHEM 104 & CHEM 105 | General Chemistry II and General Chemistry Lab II |  |
|---------------------|---|--|

OR

|                     |  |        |
|---------------------|--|--------|
| PHYS 102            | College Physics: E&M & Modern                                      |        |
| ECON 102 or ACE 100 | Microeconomic Principles<br>Introduction to Applied Microeconomics | 3 or 4 |

**Major Core**

|                      |   |   |
|----------------------|---|---|
| CS 105               | Intro Computing: Non-Tech   | 3 |
| ETMA 100             | Technical Systems in Agr  | 3 |
| ETMA 339             | Optimization in Engineering Technology and Management   | 3 |
| ETMA 421 or ETMA 422 | Industrial and Agricultural Safety-Injury Prevention<br>Industrial and Agricultural Occupational Illness Prevention | 3 |
| ETMA 430             | Project Management  | 2 |
| ETMA 439             | Capstone Experience   | 4 |

**Business Electives 6**

A total of six hours from the Business Electives list, which do not satisfy any other requirements.

|          |  |        |
|----------|--|--------|
| ACCY 200 | Fundamentals of Accounting   | 3      |
| ACCY 201 | Accounting and Accountancy I   | 3      |
| ACCY 202 | Accounting and Accountancy II  | 3      |
| ACE 210  | Environmental Economics & Policy                                     | 3      |
| ACE 221  | Negotiation  | 2      |
| ACE 240  | Personal Financial Planning  | 3      |
| ACE 310  | Natural Resource Economics   | 3      |
| ACE 345  | Small Business Finance   | 3      |
| ACE 346  | Tax Policy and Finan Planning  | 3      |
| ACE 432  | Advanced Farm Management   | 3 or 4 |
| ACE 435  | Global Agribusiness Management                                       | 3      |
| BADM 300 | The Legal Environment of Bus   | 3      |
| BADM 310 | Mgmt and Organizational Beh  | 3      |
| BADM 311 | Leading Individuals and Teams  | 3      |
| BADM 312 | Designing and Managing Orgs  | 3      |
| BADM 313 | Strategic Human Resource Management                                  | 3      |
| BADM 314 | Leading Negotiations   | 3      |
| BADM 320 | Principles of Marketing  | 3      |
| FIN 230  | Introduction to Insurance  | 3      |
| LER 290  | Introduction to Employment Law                                       | 3      |
| LEAD 260 | Foundations of Leadership  | 3      |
| LEAD 340 | Leadership Ethics & Society: Addressing Contemporary Challenges      | 3      |
| LEAD 425 | Leading Teams  | 3      |
| SE 361   | Emotional Intelligence Skills  | 3      |
| SE 400   | Engineering Law  | 3 or 4 |
| TE 230   | Design Thinking/Need-Finding   | 3      |
| TE 450   | Startups: Incorporation, Funding, Contracts, & Intellectual Property | 3      |

| Code  | Title | Hours |
|---|-------|-------|
| <b>Digital &amp; Precision Agriculture Concentration Core</b> |       |       |
| <b>Introductory-Related Courses 8</b>                         |       |       |

|          |                               |  |
|----------|-------------------------------|--|
| CPSC 112 | Introduction to Crop Sciences |  |
| NRES 201 | Introductory Soils            |  |

**ETMA Electives. A minimum of 11 hours at the advanced level are required. 20**

|          |   |   |
|----------|---|---|
| ETMA 103 | Agricultural Machinery and Technology   | 2 |
| ETMA 262 | Agricultural Machine Systems Management | 3 |
| ETMA 363 | Fluid Power Systems                     | 2 |
| ETMA 435 | Elec Computer Ctrl Sys                  | 3 |
| ETMA 467 | Precision Agric Technology              | 3 |

Select an additional 7 hours from the list below for a total of 20 hours:

|          |   |  |
|----------|---|--|
| ETMA 130 | Basics of CAD                                     |  |
| ETMA 132 | Basics of Project Management                      |  |
| ETMA 233 | Metallurgy & Welding Processes                    |  |
| ETMA 234 | Wiring, Motors and Control Sys                    |  |
| ETMA 295 | Undergrad Research or Thesis                      |  |
| ETMA 352 | Land and Water Mgt Systems                        |  |
| ETMA 381 | Grain Drying & Storage Systems                    |  |
| ETMA 396 | UG Honors Research or Thesis                      |  |
| ETMA 425 | Managing Industrial and Agricultural Safety Risks |  |
| ETMA 464 | Heavy Equipment Powertrains                       |  |
| ETMA 486 | Grain Bioprocessing Coproducts                    |  |
| ETMA 496 | Independent Study                                 |  |

**Concentration Electives 18**

Select 18 hours from the lists below with a minimum of 12 hours at the advanced level.

Select one of the following:

|         |                                  |  |
|---------|----------------------------------|--|
| ACE 210 | Environmental Economics & Policy |  |
| ACE 222 | Agricultural Marketing           |  |
| ACE 231 | Food and Agribusiness Mgt        |  |
| ACE 232 | Farm Management                  |  |
| ACE 427 | Commodity Price Analysis         |  |
| ACE 428 | Commodity Futures and Options    |  |
| ACE 432 | Advanced Farm Management         |  |
| ACE 435 | Global Agribusiness Management   |  |

Select one of the following:

|             |  |  |
|-------------|--|--|
| GGIS 379    | Introduction to Geographic Information Systems |  |
| or GGIS 380 | Geographic Information Systems II              |  |

OR

|             |                                |  |
|-------------|--------------------------------|--|
| GGIS 477    | Introduction to Remote Sensing |  |
| or GGIS 478 | Techniques of Remote Sensing   |  |

OR

|                     |  |  |
|---------------------|--|--|
| NRES 454 & NRES 455 | GIS in Natural Resource Mgmt and Advanced GIS for Environmental Management |  |
|---------------------|--|--|

Select one of the following:

|          |                             |  |
|----------|-----------------------------|--|
| NRES 438 | Soil Nutrient Cycling       |  |
| NRES 471 | Pedology                    |  |
| NRES 474 | Soil and Water Conservation |  |
| NRES 475 | Environmental Microbiology  |  |

|                                     |                                |
|-------------------------------------|--------------------------------|
| NRES 488                            | Soil Fertility and Fertilizers |
| <b>Select one of the following:</b> |                                |
| CPSC 304                            | Plant Pathology                |
| CPSC 370                            | Applied Entomology             |
| <b>Select one of the following:</b> |                                |
| CPSC 408                            | Integrated Pest Management     |
| CPSC 412                            | Principles of Crop Production  |
| CPSC 418                            | Crop Growth and Management     |
| CPSC 426                            | Weed Mgt in Agronomic Crops    |
| CPSC 473                            | Mgmt of Field Crop Insects     |

| Code               | Title | Hours      |
|--------------------|-------|------------|
| <b>Total Hours</b> |       | <b>126</b> |

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## Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. For more information, see the corresponding section on the Degree and General Education Requirements page (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

| First Year                              |   |           |
|---|---|-----------|
| First Semester                          | Hours Second Semester                   | Hours     |
| ETMA 100                                | 3 CHEM 102                              | 3         |
| ACES 101                                | CHEM 103                                | 1         |
| Composition I or Communication Option   | 3 Communication Option or Composition I | 4         |
| ECON 102 or ACE 100                     | 3 MATH 234                              | 4         |
| Language Other than English (3rd level) | 4 ETMA Elective                         | 4         |
|   | <b>13</b>                               | <b>16</b> |

**Total Hours 29**

| Second Year    |                                      |       |
|----------------|--------------------------------------|-------|
| First Semester | Hours Second Semester                | Hours |
| PHYS 101       | 5 CHEM 104 or PHYS 102               | 3     |
| CS 105         | 3 CHEM 105 (or Free Elective course) | 1     |
| ETMA 103       | 2 Statistics course                  | 3     |

|                          |            |           |
|--------------------------|------------|-----------|
| Business Elective        | 3 NRES 201 | 4         |
| General Education course | 3 ETMA 262 | 3         |
|                          | ETMA 363   | 2         |
|                          | <b>16</b>  | <b>16</b> |

**Total Hours 32**

### Third Year

| First Semester  | Hours Second Semester                | Hours     |
|---|--------------------------------------|-----------|
| ETMA 421 or 422   | 3 ETMA 339                           | 3         |
| CPSC 112  | 4 Advanced ETMA Communication Option | 3         |
| Concentration Elective  | 3 Concentration Elective             | 3         |
| General Education course (choose a course that fulfills two categories) | 3 Business Elective                  | 3         |
| Free Elective course  | 2 General Education course           | 3         |
|   | <b>15</b>                            | <b>15</b> |

**Total Hours 30**

### Fourth Year

| First Semester           | Hours Second Semester      | Hours     |
|--------------------------|----------------------------|-----------|
| ETMA 430                 | 2 ETMA 439                 | 4         |
| ETMA 435                 | 3 ETMA 467                 | 3         |
| Concentration Elective   | 3 ETMA Elective            | 3         |
| Concentration Elective   | 3 Concentration Elective   | 3         |
| Concentration Elective   | 3 General Education course | 3         |
| General Education course | 3                          |           |
|                          | <b>17</b>                  | <b>16</b> |

**Total Hours 33**

**Total Hours: 126**

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1. Provide academic and technical knowledge and experiences needed for success in an increasingly technological agricultural industry and world.
2. Enhance students' abilities to formulate questions and find solutions both individually and as a part of a team.
3. Improve students' abilities to communication both written and oral forms.
4. Enhance the use and understanding of mathematics and calculation for analysis in technology and business.

5. Provide opportunities to learn and enhance professional and ethical values and leadership skills.
6. Understand their role in society and the social and cultural implications of practice in their profession.
7. Recognize the need for and develop the abilities to engage in life-long learning.
8. Understand the global nature of agriculture and business.

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## **Agricultural & Biological Engineering**

Agricultural & Biological Engineering Department website (<https://abe.illinois.edu/>)

338 Agricultural Engineering Sciences Building  
1304 West Pennsylvania Avenue  
Urbana, IL 61801  
(217) 333-3570  
[abe@illinois.edu](mailto:abe@illinois.edu)

## **College of Agricultural, Consumer & Environmental Sciences**

College of Agricultural, Consumer & Environmental Sciences website (<https://aces.illinois.edu/>)

### **ACES Office of Academic Programs**

128 Mumford Hall  
1301 West Gregory Drive  
Urbana, IL 61801  
217-333-3380  
[aces-academics@illinois.edu](mailto:aces-academics@illinois.edu)

### **Advising**

ABE Advising website (<https://abe.illinois.edu/academics/advising/>)  
(217) 333-3570  
[tsm-etm-abe-advising@rt.aces.illinois.edu](mailto:tsm-etm-abe-advising@rt.aces.illinois.edu)

### **Admissions**

ACES Undergraduate Admissions (<https://aces.illinois.edu/admissions/>)  
University of Illinois Urbana-Champaign Undergrad Admissions (<https://www.admissions.illinois.edu/>)  
(217) 333-3380  
[visitACES@illinois.edu](mailto:visitACES@illinois.edu)

## **The Grainger College of Engineering**

The Grainger College of Engineering website (<https://grainger.illinois.edu/>)