



# DISCOVER

University of Kentucky • College of Agriculture

## Agricultural Biotechnology

**UK**

Bachelor of Science in Agricultural Biotechnology  
Effective: July 1, 1996

Agricultural biotechnology encompasses cellular and molecular approaches to the manipulation and improvement of agricultural plants, animals and microorganisms, and the control of agricultural pests and diseases. The primary purpose of the baccalaureate degree program in Agricultural Biotechnology is to train students in modern cellular and molecular biology and genetic engineering.

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Students will be provided with a firm foundation in the principles of genetics and molecular biology of both prokaryotic and eukaryotic organisms. Each student will then specialize in an area appropriate to his or her interest and career objectives, including: microbial, fungal, plant, insects, and mammalian biotechnology.

Graduates will be prepared to assume governmental, academic, and industrial positions with research and technology applications to agriculture and food production. Students completing the Agricultural Biotechnology program will also be well prepared to continue their training towards advanced degrees in graduate or professional schools.

### Administration of Program

The Agricultural Biotechnology Program is administered by two faculty Co-Directors and a Coordinating Committee consisting of six faculty members representing the breadth of the College of Agriculture.

First year and transfer students are required to meet with a Co-Director of the Agricultural Biotechnology Program during their first semester. The Co-Director will initially advise you with regards to course enrollment, career planning, part-time job opportunities and, in consultation with you, appoint another faculty member as

your permanent advisor. You should identify and be assigned to faculty advisors within your first year. Further administration of the program will be on an individual basis with a faculty advisor.

The Agricultural Biotechnology Program has an individualized curriculum to meet the needs of a diverse field. All students in the Agricultural Biotechnology program are expected to develop a preliminary curriculum plan with the help of their advisors, and to file that plan with the Chair of the Coordinating Committee by October 1 of their sophomore year. Junior and senior students are expected to meet with advisors each month to discuss course work, current research problems, and journal papers. An updated version of the curriculum plan should be submitted again on or before October 1 of their junior year.

To obtain a B.S. with a major in Agricultural Biotechnology, you must complete an independent research project relevant to your area of interest. Proposals describing your project should be submitted for approval at the same time you submit your updated curriculum plan (on or before October 1 of your junior year). You should not begin your work before submitting your plan and gaining approval for the plan from the Coordinating Committee. Both a written and oral report will be required upon completion of the study project.

### Career Opportunities

Employment opportunities include research scientists, laboratory technicians or managers in university, governmental, industrial, or clinical laboratories using biotechnological tools for research and production. Examples of research areas include: gene cloning, construction of novel pest and disease resistance genes, development of new immunological and nucleic acid types of diagnostic probes for plant and animal disease, genetic engineering of microorganisms for the production of important pharmaceutical agents, and development of new bioengineered strains of microorganisms for fermentation and food production services. Students will also be prepared to enter graduate programs in agriculture, molecular biology, and the biological sciences, or professional programs such as veterinary medicine.

## Requirements for Graduation

To earn a Bachelor of Science degree in Agricultural Biotechnology you must complete 132 semester hours with at least 48 hours from courses at the 300 level and above. A 2.0 grade point standing (on a 4.0 scale) is necessary and remedial courses cannot be counted toward the total hours required for the degree. In addition to university and college requirements you must satisfy pre-major, major and specialty support requirements including an independent research project relevant to your interest in biotechnology.

## University Studies Program (USP) Requirements: 36-48 hours

Courses specifically listed in the University Studies outline also satisfy college, pre-major, major, or specialty support requirements.

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### I. Basic Skills

#### A. Mathematics

*Completed by one of the following:*

1. A score  $\geq 26$  on mathematics section of ACT **or**
2. A bypass examination **or**
3. MA 109 College Algebra **or**
4. Any calculus course (satisfies section II-A requirement)

#### B. Foreign Language

*Completed by one of the following:*

1. Two years of the same foreign language in high school **or**
2. Six hours from an approved USP sequence

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### II. Inference and Communicative Skills

#### A. Inference

*Completed by any calculus course*

#### B. University Writing

*Completed by one of the following:*

1. ENG 101/102 Writing I and II **or**
2. Students who score  $\geq 29$  on English section of ACT and who pass an English proficiency examination may satisfy University Writing requirement by passing ENG 105 Writing: An Accelerated Course

#### C. Communication

*Three hours from an approved list\**

\* Students who begin their first academic year in the College of Agriculture will satisfy this requirement with GEN 100 and GEN 200 (under College Requirements).

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### III. Disciplinary Requirements

#### A. Natural Sciences

- CHE 105— General College Chemistry I
- CHE 107— General College Chemistry II
- CHE 115— General Chemistry Laboratory

#### B. Social Sciences

- Six hours from an approved sequence.*
- (Can be satisfied by GEN 101 and GEN 102)

#### C. Humanities

- Six hours from an approved sequence.*

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### IV. Cross Disciplinary Requirements

BIO 150— Principles of Biology I\*\*

BIO 152— Principles of Biology II\*\*

\*\* Satisfies Area IV when CHE 105, CHE 107, and CHE 115 are used to satisfy Area III-A.

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### V. Cross-Cultural Requirement

*Three hours from the approved list.*

## College Requirements: 6-9 hours

#### A. General Requirements: 6 hours

GEN 100— Issues in Agriculture: The Development of Modern Agriculture\*

GEN 200— Issues in Agriculture: Contemporary Problems in Agriculture\*

\* Students transferring into the College of Agriculture after completing their first academic year in another UK major or at another university are required to take only GEN 200.

#### B. Business or Technical Writing: 3 hours\*\*

\*\* Requirement can be satisfied by ABT 101, 201, and 401.

#### C. Complete a proposed plan of study for third and fourth years

## Pre-Major Requirements

### I. Math

MA 123— Elementary Calculus ..... 3

MA 132— Calculus for the Life Sciences ..... 3

**or**

MA 113— Calculus I ..... 3

### II. Biology

BIO 150— Principles of Biology I..... 3

BIO 151— Principles of Biology Laboratory I ..... 2

BIO 152— Principles of Biology II ..... 3

BIO 153— Principles of Biology Laboratory II ..... 2

### III. Physics

PHY 211— General Elementary Physics .....	5
PHY 213— General Elementary Physics .....	5
<i>(or equivalent with laboratory)</i>	

### IV. Chemistry

CHE 105— General College Chemistry .....	3
CHE 107— Elements of College Chemistry .....	3
CHE 115— General Chemistry Laboratory .....	3
<b>and</b>	
CHE 230, 231, 232 and 233—	
Organic Chemistry Lecture and Laboratory .....	10

## Major Requirements

### I. Biotechnology

ABT 101— Introduction to Biotechnology .....	1
ABT 201— Scientific Methods in Biotechnology .....	1
ABT 401— Technical Presentations	
in Biotechnology .....	2

### II. Microbiology

BIO 308/209— Principles of Microbiology and Laboratory .....	5
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### III. Biochemistry

BCH 401G— Fundamentals of Biochemistry .....	3
<i>(or BCH 607 and 608 General Biochemistry)</i>	

### IV. Genetics

ABT 360— Genetics I (or BIO 304 Principles of	
Genetics) <b>and</b>	
ABT 460/461— Genetics (Introduction to Molecular and	
Population Genetics) .....	8

### V. Statistics

STA 291— Introduction to Statistics .....	3
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### VI. Advanced Practical Skills

ABT 495— Experimental Methods in Biotechnology .....	4
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### VII. Independent Study

ABT 395— Independent Study in Biotechnology .....	3 or
ABT 399— Experiential Learning in Biotechnology .....	3

All students are expected to undertake an independent study in an area of their interest. This requirement can be met by a research project or an internship that is agreed upon by a student's advisor and approved by the Biotechnology Coordinating Committee prior to initiation of the project. Both written and oral reports are required when the project is completed. See examples of research topics on the following page.

## Specialty Support Requirements

Students must take a minimum of 21 credit hours of specialty support courses and at least one course from category 1. A number of the courses listed here may have additional prerequisites.

### 1. Cell Biology and Physiology

ASC 364— Reproductive Physiology of	
Farm Animals .....	3
BIO 315— Introduction to Cell Biology .....	3
BIO 350— Animal Physiology .....	4
BIO 476G— General Microbial Physiology .....	4
BIO/PGY 502— Principles of Physiology .....	5
BIO 515— General Cell Biology .....	3
BIO 530— Plant Physiology .....	3
BIO 550— Comparative Physiology .....	5
BIO 580— Metabolism of Microorganisms .....	4
PPA/BCH 503— Plant Biochemistry .....	3

### 2. Examples of Other Specialty Support Courses

*Students are advised to check for course availability and new course offerings.*

### Plant and Soil Science

PLS 404— Integrated Weed Management .....	3
PLS 502— Ecology of Economic Plants .....	3
PLS 556— Seed Technology .....	3
PLS 566— Soil Microbiology .....	3
PLS 450— Plant Propagation .....	3

### Animal Sciences, Veterinary Sciences, and Physiology

ASC 362— Animal Breeding .....	3
ASC 378— Animal Nutrition .....	3
ASC 462G— Artificial Insemination and	
Fertility of Farm Animals .....	2
ASC 550— Hormonal Regulation	
of Farm Animals .....	3
VS 350— Introductory Anatomy, Physiology,	
and Animal Hygiene .....	3
VS 351— Principles of Animal Hygiene	
and Disease Control .....	3
PGY 522— Quantitative Physiology .....	4

## Biology

BIO/MI 494G— Immunobiology .....	3
BIO 529— Developmental Biology .....	3
BIO 535— Comparative Neurobiology and Behavior .....	3
BIO 540— General Radiation Biology .....	4
BIO 549— Comparative Endocrinology .....	3
BIO 551— Plant Autecology .....	4
BIO/ENT 563— Parasitology .....	4
BIO 585— Pathogenic Bacteriology .....	4

## Chemistry

CHE 520— Radiochemistry .....	3
CHE 521— Radiochemistry Laboratory .....	1-2
CHE 533— Qualitative Organic Analysis Laboratory .....	2

## Entomology

ENT 300— General Entomology .....	3
ENT 340— Livestock Entomology .....	2
ENT/FOR 402— Forest Entomology .....	3
ENT 530— Integrated Pest Management .....	3
ENT 561— Medical Entomology .....	4

## Food Science

FSC 434G— Food Chemistry .....	4
FSC 530— Food Microbiology .....	5
FSC 536— Advanced Food Technology .....	4
FSC 538— Food Fermentation and Thermal Processing .....	4
FSC 540— Food Sanitation .....	3

## Forestry and Plant Pathology

PPA 400G— Principles of Plant Pathology .....	3
PPA/FOR 410— Forest Pathology .....	3

## Pharmacy

PHR 340— Principles of Medicinal Chemistry .....	4
PHR 510— Modern Methods in Pharmaceutical Analysis .....	5

## Statistics

STA 570— Basic Statistical Analysis .....	4
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## Electives

Students must take a minimum of 10 credit hours of elective courses.

## Examples of Independent Research Project Titles

Transformation of *Arabidopsis thaliana* Plants with S-adenosylmethionine Decarboxylase Genes Using Whole Plant and Root Transformations Techniques

Tumor Suppression via Overexpression of PHAS-1

Characterization of the Wyoming Isolate Hypervariable Region of the Long Terminal Repeat of Equine Infectious Anemia Virus

Effects of Static Field Magnetism on Rat Osteosarcoma Cells

PCR-SSCP Analysis and DNA Sequence of Exon 15 of the Horse Transferrin Locus

The Effects of Teratocyte Secretory Products upon Protein Production in *Helicoverpa zea* Testes and Silk Glands

A Simple Method for Multipurpose Airway Access Through Percutaneous Tracheostomy in Rabbits

Soybean Transformation with Mammalian Fatty Acid Desaturase

The Influence of Mutations in Human Nucleotide Excision Repair Genes on Microsatellite DNA Stability

Identification of Cytochrome P450 Monooxygenase Enzyme Genes in Corn

## Suggested Schedule

If you enroll in the Agricultural Biotechnology program at UK during your first semester, you may follow this suggested schedule. **Use this schedule only as a guide**, since schedules will vary if: you have previously attended another college, you have earned credit by examination or via a high school advanced placement course, or you are not starting in the fall semester. Your faculty advisor will assist you in course selection and career planning.

This schedule assumes the foreign language component of the University Studies Program (USP) was completed in high school.

### First Year

#### Fall Semester (15 hours)

ABT 101 .....	1
MA 123* .....	3
BIO 150 .....	3
BIO 151 .....	2
CHE 105 .....	3
ENG 101 .....	3

\*MA 113 may be taken instead of MA 123 and MA 132. MA 114 is recommended as a sequel to MA 113.

#### Spring Semester (17 hours)

GEN 100 .....	3
BIO 152 .....	3
BIO 153 .....	2
CHE 107 .....	3
CHE 115 .....	3
ENG 102 .....	3

### Second Year

#### Fall Semester (17 hours)

ABT 201 .....	1
ABT 360 (genetics) .....	3
CHE 230 .....	3
CHE 231 .....	2
MA 132 .....	3
BIO 308 .....	3
BIO 209 .....	2

#### Spring Semester (18 hours)

ABT 460 (molecular genetics) .....	3
ABT 461 (population genetics) .....	2
CHE 232 .....	3
CHE Lab 233 .....	2
GEN 200 .....	3
USP Humanities .....	3
USP Social Science .....	3

### Third Year

#### Fall Semester (16 hours)

ABT 401 .....	2
PHY 211 .....	5
USP Social Science .....	3
USP Humanities .....	3
BCH 401G .....	3

#### Spring Semester (17 hours)

PHY 213 .....	5
Specialty Support .....	3
Specialty Support .....	3
USP Cross Cultural .....	3
Elective .....	3

### Fourth Year

#### Fall Semester (16 hours)

Specialty Support .....	3
Specialty Support.....	3
3	
STA 291 .....	3
Elective .....	3
ABT 395 (ABT 399) .....	4

#### Spring Semester (17 hours)

Specialty Support .....	3
Elective .....	4
Specialty Support .....	3
Specialty Support .....	3
ABT 495 .....	4

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For more information  
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