# Applied Biotechnology Course No. 18320 Credit: 1.0

|  |  |  |  |
| --- | --- | --- | --- |
| **Student name:** |  | **Graduation Date:** |  |

Pathways and CIP Codes: **Biotechnology (26.1201)**

Course Description: Introduces theories and methods relating to applications of biotechnology in agriculture. The course emphasizes emerging laboratory technologies around agricultural biotechnology including food and natural resource management. The course will explore plan and animal genetic engineering, alternative fuel production, food production, agricultural pests and controls, and other topics.

Directions:The following competencies are required for full approval of this course. Check the appropriate number to indicate the level of competency reached for learner evaluation.

**RATING SCALE:**

4. Exemplary Achievement: Student possesses outstanding knowledge, skills or professional attitude.

3. Proficient Achievement:Student demonstrates good knowledge, skills or professional attitude. Requires limited supervision.

2. Limited Achievement:Student demonstrates fragmented knowledge, skills or professional attitude. Requires close supervision.

1. Inadequate Achievement:Student lacks knowledge, skills or professional attitude.

0. No Instruction/Training:Student has not received instruction or training in this area.

## Benchmark 1: Biotechnology in Agriculture

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.1 | Create a timeline and use it to explain the developmental progression of biotechnology. |  |
| 1.1 | Research and report on current work being done in agricultural biotechnology. |  |
| 1.1 | Analyze the scope and impact of agricultural biotechnology in today’s global society. |  |
| 1.1 | Research and report on emerging problems and issues associated with agricultural biotechnology. |  |
| 1.1 | Assess the future impact agricultural biotechnology could have on world populations. |  |

## Benchmark 2: Regulatory Issues & Agencies

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 2.1 | Interpret the major regulatory issues related to biotechnology. |  |
| 2.2 | Recognize OSHA, EPA and local regulations practiced in the Science Lab and workplace. |  |
| 2.3 | Identify and explain the roles of the FDA, EPA, and USDA in Biotechnology product development. |  |

## Benchmark 3: Ethical, Legal, Social & Cultural Issues

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 3.1 | Evaluate the benefits and risks associated with biotechnology. |  |
| 3.2 | Examine an ethical dilemma associated with biotechnology by identifying its components. |  |
| 3.3 | Research and debate an ethical issue associated with biotechnology. |  |
| 3.4 | Examine intellectual properties associated with biotechnology by defining their components. |  |

## Benchmark 4: Biotechnology Laboratory Records

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 4.1 | Analyze strengths of the research based on data and procedures and propose future investigation. |  |
| 4.2 | Keep, maintain, and demonstrate proper lab documentation in a lab notebook. |  |
| 4.3 | Demonstrate writing and importance the of a Standard Operating procedure (SOP) related to lab protocol. |  |

## Benchmark 5:Operate Laboratory Equipment

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 5.1 | Operate advanced laboratory equipment and measurement devices. |  |

## Benchmark 6: Procedure Using Biological Materials

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 6.1 | Demonstrate advanced aseptic techniques in the biotechnology laboratory. |  |
| 6.2 | Demonstrate Aseptic Technique. |  |

## Benchmark 7: Safely Manage Biological Materials

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 7.1 | Inventory biological and chemical materials and maintain accurate records of supplies and expiration dates. |  |
| 7.2 | Diagram the flow of waste after it leaves the laboratory. |  |

## Benchmark 8: Perform a Variety of Procedures

### Competencies

| **#** | **Description** | **RATING** |
| --- | --- | --- |
| 8.1 | Isolate, maintain, quantify, and store cell cultures. |  |
| 8.2 | Characterize the physical, chemical, and biological properties of microbes. |  |
| 8.3 | Explain the molecular basis for heredity and the tools and techniques used in DNA and RNA manipulations. |  |
| 8.4 | Perform electrophoretic techniques and interpret electrophoresis fragmentation patterns. |  |
| 8.5 | Perform protein separation techniques and interpret the results. |  |
| 8.6 | Conduct an Enzyme-Linked Immunosorbent Assay (ELISA). |  |
| 8.7 | Research and describe the use of biotechnology to detect microbes. |  |
| 8.8 | Design and perform an assay to detect a target microorganism in food, water or the environment. |  |

## Benchmark 9: Genetic Engineering Improve Products

### Competencies

| **#** | **Description** | **Rating** |
| --- | --- | --- |
| 9.1 | Diagram the processes and describe the techniques used to produce transgenic eukaryotes. |  |
| 9.2 | Describe processes by which enzymes are produced through biotechnology. |  |
| 9.3 | Diagram the process by which organisms are genetically engineered for waste treatment. |  |
| 9.4 | Investigate and report on genetic engineering procedures used in the production of aquatic species. |  |

## Benchmark 10: Perform Biotechnology Processes

### Competencies

| **#** | **Description** | **rating** |
| --- | --- | --- |
| 10.1 | Describe the processes used to produce animal hormones from transgenic organisms. |  |
| 10.2 | Compare and contrast bioengineering and conventional pathways used in food processing. |  |
| 10.3 | Processing food using biotechnology. |  |
| 10.4 | Describe the process used in producing alcohol from biomass. |  |
| 10.5 | Produce alcohol and co-products from biomass. |  |
| 10.6 | Diagram the process used in producing biodiesel from biomass. |  |
| 10.7 | Produce biodiesel and co- products from biomass. |  |
| 10.8 | Illustrate the process used in producing methane from biomass. |  |

## Benchmark 11: Monitor & Evaluate Procedures

### Competencies

| **#** | **Description** | **Rating** |
| --- | --- | --- |
| 11.1 | Select biotechnology tools used to monitor and direct plant breeding. |  |
| 11.2 | Design and conduct an experiment using biotechnology tools to evaluate selectively bred plants. |  |
| 11.3 | Assess the benefits, risks and opportunities associated with using biotechnology to promote animal health. |  |
| 11.4 | Describe the use of biotechnology in bioremediation. |  |
| 11.5 | Monitor and evaluate the effectiveness of bioremediation efforts by participating in a bioremediation project. |  |
| 11.6 | Describe the processes involved in biotreatment of biological chemical wastes. |  |
| 11.7 | Interpret the processes involved in biotreatment of industrial chemical wastes. |  |
| 11.8 | Select biotechnology tools used to measure biodiversity. |  |
| 11.9 | Explain how biotechnology tools can be used to monitor the effects of agricultural practices on wild populations. |  |
| 11.10 | Assess the characteristics of biomass that make it useful for biofuels production. |  |
| 11.11 | Describe the processes used in the production of molecules for use in industrial applications. |  |

I certify that the student has received training in the areas indicated.

Instructor Signature:

For more information, contact:

CTE Pathways Help Desk

(785) 296-4908

[pathwayshelpdesk@ksde.org](mailto:pathwayshelpdesk@ksde.org)



900 S.W. Jackson Street, Suite 102

Topeka, Kansas 66612-1212

[https://www.ksde.org](https://www.ksde.org/)

The Kansas State Department of Education does not discriminate on the basis of race, color, national origin, sex, disability or age in its programs and activities and provides equal access to any group officially affiliated with the Boy Scouts of America and other designated youth groups. The following person has been designated to handle inquiries regarding the nondiscrimination policies: KSDE General Counsel, Office of General Counsel, KSDE, Landon State Office Building, 900 S.W. Jackson, Suite 102, Topeka, KS 66612, (785) 296-3201.