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| **The University of Jordan**  **Faculty of Agriculture**  **Dept. of Animal Production** | **ANIMAL BIOTECHNOLOGY 602793**  **3 credit hours** |
| **Instructor:**  **Prof. Hosam Titi** |

**COURSE DESCRIPTION**

The objective of this course is to introduce students to cutting edge biotechnologies that can be used for animal research. This course provides an advance exposure to the diverse field of animal biotechnology and will provide students with knowledge on the multiple applications of biotechnology in the field of livestock production and on the generation of genetically modified animals for diagnostic, therapeutic and environmental protection uses. Basic principles underlying genetics, nutrition or reproduction, biotechnology and their technological applications will be discussed. Challenges facing the intensive and extensive livestock industries will be discussed and debated in the context of biotechnologies that may be applied. In addition, the use of biotechnology for animal related issues such as food safety, disease control and biosecurity will be addressed. The integration of these technologies to improve animal production, health and welfare will be explored. Lastly, biotechnological animal models will be examined for potential application to human and veterinarian medicine.

**Course outcome**

* To provide students with a scientific and technical understanding of animal biotechnology.
* To introduce students to the commercial and ethical aspects of the biotechnology industry, and to challenge students with some of the moral and ethical issues that face biotechnologists, legislators and the general public.
* To present concepts of the potential influence of animal biotechnology on urban and rural communities and to encourage students to derive informed opinions on the potential benefit or danger of biotechnology and its impact on animal agriculture

**A. Knowledge and Understanding:** Students are expected to

A1- Aquire basic knowledge on the use of biotechnologies for improving animal production.

A2- Having nformation on the use of reproductive biotechnologies in modern animal breeding;

A3- Having information on the most innovative applications of biotechnology.

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to

B1‐ Understanding and discussing critically the results of scientific studies in the field of animal biotechnology.

B2‐ Knowing the criteria and limits of the use of animal biotechnologies and apply them in different contexts.

B3‐ Developing and apply new biotechnological approaches for innovative animal products.

B4‐ Applying biotechnologies in the modern farming seeking to increase yield, and improve animal health.

B5‐ Applying the gained knowledge to resolve scientific issues related to animal biotechnology.

**C. Subject- Specific Skills:** Students is expected to

C1- Ability to understand and review a scientific paper on animal biotechnology.

C2- Ability to understand methods described on procedure manuals and scientific publications.

C3- Capacity to update the gained skills by following the progress of science and technology.

C4- Write and read scientific reports and publications on animal biotechnology.

**D. Transferable Key Skills:** Students is expected to

D1- Ability to communicate in a clear and comprehensible way the basics of the animal biotechnology.

D2- Able to explain the importance and to highlight the impact of modern biotechnological applications.

D3- Ability to extract, summarize and present the results of biotechnological studies.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A**. Knowledge & Understanding (**A1-A3**) | Lectures and Discussions | Reports, Exam. |
| **B**. Intellectual Analytical and Cognitive Skills (**B1-B5**) | Lectures and Discussions | Reports, Exam. |
| **C**. Subject Specific Skills (**C1-C4**) | Lectures and Discussions | Reports, Exam. |
| **D**. Transferable Key Skills (**D1-** **D 3**) | Reports, Lectures and Discussions. | Reports, Exam. |

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| **Lecture/**  **Week** | **Subject** | **Sources** | **ILOs** |
| 1 | History and the foundations of modern biotechnology; promise and controversy; safety in biotechnology | Power Point, Internet Sheet HO. | A1-2, B1, D1 |
| 2-3 | Stem Cells in Domestic Livestock Species   * The Discovery of Embryonic Stem Cells * Stem Cells in Action & Clinical Trials Reprogramming Somatic Cells * Induced Pluripotent Stem Cells | Power Point, Internet Sheet HO. | A1, A3, , B1, C1-3, D1 |
| 4-6 | Animal genes and genomes.   * Gene transfer methods in animals * Transgenic animals * Cloning and xenotransplantation * Animal and human genome projects * Gene transfer methods for mammalian cells and animal transgenics * Valuable genes in animals * Animal germ cells, development and animal cloning * Functional genomics, ethics and the future of animal biotechnology. | Power Point, Internet Sheet HO. | A1, A2, A4, A5, D1-2. |
| 7-8 | Cloning in Domestic Livestock:   * Ethics of Cloning * A Dolly Story * Is it a viable option * Pets and Endangered Species | Power Point, Internet Sheet HO. | A1-3, B1-2, C1-3, D1, D3 |
| 9-11 | BIOTECHNOLOGY IN ANIMAL PRODUCTION:   * Artificial insemination. * Superovulation, Embryo transfer. * In vitro fertilization. * Sexing of embryos, Embryo splitting; Cryopreservation of embryo. * Animal as bioreactors. * Probiotics as growth promoters – Ideal characteristics of probiotics, Mode of action – uses of probiotics * Manipulation of lactation – Lactogenesis – galactopoiesis * Manipulation of wool growth * Manipulation of rumen microbial digestive system * Manipulation of Growth hormone somatotropic hormone * Thyroid hormone. |  | A1-3, B1-4, C2-3, D1-3. |
| 12 | Large Animal Models for Disease and Injury  Disease Resistant Transgenic Animals | Power Point, Internet Sheet HO. | A1, A2, A4, A6, B2-4, C2-4, D1, D2 |
| 13 | Pharm Animals  Xenotransplantation | Power Point, Internet Sheet HO. | A1, A2, A4, A6, B2-4, C2-4, D1, D2**.** |
| 14-16 | Oral presentations |  | A1, A3, B5, C3-4, D3. |
| 16 | Final Exam | Power Point, Internet Sheet HO. | A1, A2, A4, A6, D1, D4 |

**Textbooks**: William J. Thieman and Michael A. Palladino. Introduction to Biotechnology. Pearson. 2009 and 2013.

**Learning Methodology**

The course will be structured in lectures, discussions, and weekly assignments. In addition, each student will have to submit a term paper with presentation. Students will be evaluated through both exams and oral presentation.

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| **Evaluation** | **Point %** |
| Med term exam | 30% |
| Term paper | 10% |
| Oral presentation and discussion | 20% |
| Final exam | 40% |
| **Total** | 100 |