

ANIMAL BIOTECHNOLOGY (ARSC 455/655; 3 semester credits)

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You are encouraged to contact me whenever you have problems and items that you would like to discuss. My office hours for this class are on Mondays and Wednesdays from 10 to 10:50 am. In addition, I expect to be in the office, in one of laboratories, or at one of livestock units between hours 8 a.m. and 5:00 p.m. However, the times that I will be physically in the office will be somewhat irregular because of teaching, research activities and committee meetings. Outside of my office hours, you are encouraged to schedule meeting with me a few hours or 1-2 days in advance.

Teaching Assistant: Beth Mordhorst, Hultz Hall, room # 106; tel. 712-880-2559; email bethany.mordhorst@my.ndsu.edu

Class Meeting Times:

MWF from 11:00 to 11:50 am in Morrill 109.

Course information is available on Blackboard

Textbooks: 1. William J. Thieman and Michael A. Palladino. Introduction to Biotechnology. Pearson. 2009 and 2013.

Selected texts from:

2. H. Joe Bearden and John W. Fuquay, Applied Animal Reproduction, Prentice Hall, 1997.
3. P.L. Senger. Pathways to Pregnancy and Parturition. Current Conceptions, 2003.

Course Objectives:

1. To provide students with a scientific and technical understanding of animal biotechnology.
2. 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.
3. 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

Pedagogical style:

- This is primarily a lecture-discussion class. The first 5-10 min of each lecture will be dedicated to class discussion of student questions and review of previous lecture.
- Reading assignments provided below will be made at the beginning of each section.

- Students should feel free to ask questions at any time during lectures, but they will not be graded upon participation in discussion.
- All graduate students are required to draft a term paper (8-10 pages) on a mutually agreed topic relating to current issues in animal biotechnology; the due date is four calendar weeks before the last scheduled lecture.

Catalog description:

Animal biotechnology, biotechnology in human health, biotechnology in reproduction, biotechniques.

Course Outline:

Section	Lectures	Approx # Lectures	
1. Introduction to biotechnology and biotechniques	1. History and the foundations of modern biotechnology; promise and controversy; safety in biotechnology	1	
	2. Gene expression (DNA structure; DNA replication; the gene; ribonucleic acid; transcription; proteins; the genetic code; translation).	1	
	3. Regulation of gene expression	1	
	4. Microscopy lecture	1	
	5. Class in the laboratories of the Reproductive Physiology in Hultz Hall: Western analysis and in vitro fertilization	1	
	6. Class in the Advanced Imaging and Microscopy laboratory	1	
	7. Class in the laboratories of the Reproductive Physiology in Hultz Hall: Molecular biology techniques	1	
Total number of lectures/classes in section 1		7	
Assignment 1		Available	Due
Exam 1			
2. Epigenetics, developmental programming and basic principles of recombinant DNA technology	1. Epigenetic regulation of gene expression	1	
	2. Developmental programming	1	
	3. Cutting and joining DNA; separating restriction fragments and visualizing DNA; cell transformation;	1	
	4. Cloning vectors (plasmids, bacteriophages, cosmids, artificial chromosomes;	1	
	5. Methods of molecular biology: Southern blot, polymerase chain reaction; DNA sequencing, microarray, RNA interference; antibody production,	1	

	6. Immunobiotechnology: Function of immune system.	1	
	Total number of lectures in section 2	6	
Presentations 1	3 students	Present on	
	Assignment 2	Available:	Due:
	Exam 2		
3. Animal biotechnology	1. Gene transfer methods in animals	1	
	2. Transgenic animals	3	
	3. Cloning and xenotransplantation	2	
	4. Animal and human genome projects	1	
	Total number of lectures in section 3	7	
	Assignment 3	Available:	Due:
	Exam 3		
Presentations 2	3 students	Present on	
4. Animal reproductive biotechnology	1. Physiology of reproduction (review)	3	
	2. Assisted reproduction biotechnology: Artificial insemination;	1	
	3. Assisted reproduction biotechnology: estrous synchronization; superovulation;	1	
	4. Assisted reproduction biotechnology: embryo transfer, pregnancy and parturition control, monitoring reproductive status	2	
	5. Assisted reproduction biotechnology: in vitro fertilization, sperm and embryo sexing	3	
	Total number of lectures in section 4	10	
	Assignment 4	Available:	Due:
	Exam 4		
5. Biotechnology and human health	1. Assisted reproductive technology in humans, preimplantation genetic diagnosis;	2	
	2. Medical biotechnology (gene therapy; gene delivery methods; gene therapy models; vaccines; synthetic drugs; tissue engineering; antibody engineering; drug delivery;	2	
	3. Stem cell biotechnology	1	
	4. Forensics and DNA profiling	1	
	Total number of lectures in section 5	6	
	Assignment 5	Available:	Due:
	Exam 5		

Total: Five exams and one make up exam.

Grading System:

- For each exam - 40 points for undergraduate and graduate students;

- For discussion and presentation of current developments in animal biotechnology - 30 points for undergraduate and graduate students;
- For each assignment – 15 points for undergraduate and graduate students;
- For a paper – 50 points only graduate students;
- For leading discussion concerning current developments in animal biotechnology, 20 points only graduate students.

For undergraduate students five exams (total 200 points), one presentation (30 points total) and 5 assignments (total 75 points) will comprise the course grade (100% = 305 points). For graduate students five exams (total 200 points), one presentation (30 points), leading discussion concerning current developments in animal biotechnology (20 points), 5 assignments (total 75 points), and a paper (50 points) will comprise the course grade (100% = 375 points).

After each section about one hour exam will take place. Students will be informed about date and time for each exam. The makeup final exam will be offered for students who wish to improve grade on the last week of semester.

Examinations will include multiple choice questions and short essays to determine the depth of the students understanding as well as their ability to communicate that understanding to others. Topics will be chosen from lectures and textbook(s) mainly, but occasionally from the media, popular press or scientific literature so as to cover the breadth of the topics. **Extra credits could be gained by taking occasional 5-10 min. quizzes (5-10 points/quiz) before selected lectures.**

Grading would be based on percentage of total points obtained, as follows: 90-100%= A; 80-89%= B; 70-79%= C; 60-69%= D; <60% = F.

Attendance:

Attendance is required at all lectures. Perfect attendance will be awarded by 10 bonus points, 7 bonus points will be awarded for student(s) missing one lecture and 5 bonus points will be awarded for student with two absences. Excused absences prior to being gone are requested.

Outcomes:

Students will better understand the several aspects of biotechnology. They will begin to make an association between animal and human health with development of technology. They will understand how to modify physiological processes to obtain biotechnological products to be applied to agricultural, social and medical areas.

Expectations

All students are encouraged to participate freely in the discussion. Students are requested to remove all hats and coats, and not consume beverages or food during lectures.

Course Philosophy and Assessment

Support and participation will also be sought across campus from other colleges such as business, engineering and the humanities in an attempt to provide a broad but integrated

program. Lectures from other faculty as well as invited speakers will be incorporated into the basic program in order to achieve these goals. Assessment quiz will be offered at the first lecture and on the lecture during last week of class.

Prerequisites:

Biol 115 (or Biol 150) or permission of instructor. Fundamental knowledge of biology and chemistry will be helpful.

Course format:

This is a 3 day a week lecture course. The lectures will be supplemented with videotapes, overheads and/or slides. Questions and discussion during lecture are encouraged.

The University's Emergency Action Guide is located at http://www.ndsu.edu/police_safety/safety/Forms/EmergencyActionGuidePosterNew09.pdf

CAFSNR Syllabus Attachment – Spring 2013

Academic Honesty: All students taking any course in the College of Agriculture, Food Systems, and Natural Resources are under the Honor System (<http://www.ag.ndsu.edu/academics/honor-system-1>). The Honor System is a system that is governed by the students and operates on the premise that most students are honest and work best when their honesty, and the honesty of others, is not in question. It functions to prevent cheating as well as penalize those who are dishonest. It is the responsibility of the students to report any violations of the honor pledge to the instructor, honor commission or the Dean of the College of Agriculture, Food Systems, and Natural Resources.

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct (<http://www.ndsu.edu/fileadmin/policy/335.pdf>).

Students with special requirements: Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor as soon as possible. Assistance is also available from Disability Services in 212 Ceres Hall (231-8463). <http://www.ndsu.edu/disabilityservices/>

Veterans and military personnel: Veterans or military personnel with special circumstances or who are activated are encouraged to notify the instructor as early as possible.