I. **OVERVIEW**  
The following information will appear in the 2012 - 2013 catalog

**ANSC 226**  
**Dairy Breeding & Selection**  
3 Units

The study of basic genetic principles with the study of the anatomical and physiological aspects of reproduction as they relate primarily to the bovine. Genetic principles to be emphasized include basic inheritance, selection techniques, mating systems, heterosis, and performance evaluation. Reproductive aspects to include endocrinology, estrous cycles, mating behaviors, gametogenesis, conception, gestation, parturition, and maternal behaviors. Artificial insemination, embryo manipulation, and current innovations in reproductive biotechnology will also be examined.

Field trips are required.  
(A-F Only) Lecture /Lab  
Transfer: (CSU)

II. **LEARNING CONTEXT**  
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**

   a. Importance of animal improvement
   b. Historical background of animal breeding
   c. Anatomy of the female reproduction system
   d. Anatomy of the male reproduction system
   e. Physiology of the female reproduction system
   f. Physiology of the male reproduction system
   g. Physiology of spermatozoa and ova
   h. Gametogenesis
   i. Sex determination
   j. Fertilization and prenatal development
   k. Fertility and sterility
   l. Methods used in breeding cattle
   m. Breeding management practice
   n. Artificial insemination
      i. Importance
      ii. Methods
iii. Procedures

o. Collection, handling, and evaluation of semen

p. Pregnancy and parturition

q. Abnormal parturition and problems concerned with parturition

r. Diseases concerned with or following parturition

s. Mechanism of heredity
   i. Background of heredity
   ii. Physical basis of heredity
   iii. Laws of heredity
   iv. Lethal effects of genes

t. Systems of breeding
   i. Inbreeding, outbreeding, crossbreeding, and linebreeding

u. Principles of selection
   i. Phenotype, genotype, and performance

v. Selecting dairy cattle (term problem required)
   i. Conformation (judging, classification and analysis a.A.a.)
   ii. Pedigree
   iii. Bloodlines, cow families, etc.
   iv. Performance

2. Required Lab Content:

   a. Reproductive female anatomy
   b. Physiology of female reproduction
   c. Reproductive anatomy/physiology of the male
   d. Cytology-meiosis and mitosis
   e. Reproductive aids
   f. Embryology and fetal development
   g. Embryo transfer procedures
   h. Observation of an embryo transfer
   i. Introduction to dairy cattle evaluation
j. Introduction to dairy cattle genetics  
k. Pregnancy diagnosis  
l. Semen collection and evaluation  
m. Artificial insemination procedures  
n. Parturition and dystocia births  

B. HOURS AND UNITS

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<th>INST METHOD</th>
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C. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Lecture  
2. Discussion  
3. Demonstration  
4. Field trips and "hands-on" activities  
5. Presentations by industry professionals

D. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

Time spent on coursework in addition to hours of instruction (lecture hours)

a. Study and preparation for weekly quizzes  
b. Study and preparation for midterm and final exam  
c. Weekly field trip laboratory reports  
d. Reading and homework assignments requiring research and analysis

2. EVIDENCE OF CRITICAL THINKING

Assignments require the appropriate level of critical thinking

a. Prepare a comprehensive laboratory notebook which includes critical analysis, conclusion, and summary of all weekly laboratory activities.  
b. Evaluate and discuss published industry articles on selected or related topics.  
c. Interpretation of textbook reading assignments.  
d. Study and discuss the principles of hereditary relevant to dairy cattle and USDA evaluations for genetic improvement.
E. TEXTS AND OTHER READINGS (TYPICAL)


III. DESIRED LEARNING

A. COURSE GOAL

As a result of satisfactory completion of this course, the student should be prepared to:

describe genetic principles including basic inheritance and selection techniques, explain the estrous cycles, conception, gestation, parturition and maternal behaviors, identify reproductive structures, and explain livestock breeding techniques.

B. STUDENT LEARNING GOALS

Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. Required Learning Goals

Upon satisfactory completion of this course, the student will be able to:

a. Explain the historical importance of animal selection with major emphasis on breeding of dairy cattle.

b. Identify and explain the physiological functions of the major anatomical points of the male and female reproductive tracts.

c. Describe the origin and function of the major hormones, both male and female, involved in reproduction.

d. Explain the anatomical and physiological aspects of conception, implantation, and gestation.

2. Compare and contrast various methods of pregnancy detection. (field trip)

f. Describe the correct fetal position, delivery process, approximate timeline and maternal behaviors for a normal parturition.

g. Identify factors that may contribute to dystocia.

h. Explain and analyze the physiology of the spermatozoa and ovum.

i. Diagram the phases of the estrous cycle.

j. Explain the process of collecting, handling, freezing, and evaluating semen.

k. Compare and contrast artificial insemination to natural mating.

l. Identify and explain the equipment used in artificial insemination. (field trip)

m. Explain the advantages and limitations of artificial insemination.

n. Explain the mating concepts of inbreeding, linebreeding, outcrossing, and crossbreeding.

o. Describe the ideal dairy type and practice dairy selection.

p. Analyze and compare dairy pedigrees as a tool for selection and mating.

q. Describe the effect of heritability on selection progress for individual traits.

r. Explain the basic laws of heredity.

s. Discuss the concepts of gene frequency, alleles, homozygosity, heterozygosity, dominance, co-dominance, and recessive genes.
t. Determine the possible genetic and phenotypic ratios for two traits, resulting from the mating of two heterozygous individuals, by using the Punnet Square method.

u. Identify and treat common reproductive diseases.

v. Analyze the significance and benefits of innovations in reproductive biotechnology, such as cloning, and the splitting, sexing, storing and transfer of embryos. (field trip)

2. **Lab Learning Goals**

*Upon satisfactory completion of the lab portion of this course, the student will be able to:*

a. Physically identify all female reproductive parts; observe, describe and evaluate several bovine reproductive tracts and their differences to determine the stage of estrous, gestation, infection or other abnormalities

b. Diagram the hormones of the reproductive tract in a parallel linegraph that shows the fluctuation intensity levels throughout the estrous cycle and gestation.

c. Describe and discuss the differences between genotype and phenotype, while showing the relationships and correlations found in pedigree data from breed association data that can predict phenotypes.

d. Identify and explain the various stages of mitosis and meiosis and be able to explain their importance in livestock production.

e. Describe and discuss from the point of copulation to parturition of a bovine, gametogenesis, fertility, fetal development, gestational development, sterility issues and forms of dystocia.

### IV. METHODS OF ASSESSMENT (TYPICAL)

**A. FORMATIVE ASSESSMENT**

1. Weekly quizzes

2. Homework assignments

3. Laboratory reports

4. Periodical reviews

5. Midterm exam

**B. SUMMATIVE ASSESSMENT**

1. Final exam

2. Laboratory practical exam

3. Analysis and discussion of various scenarios as presented on reproductive problems such as conception problems, dystocia and performance evaluations.