Course Justification (ANSC 446)

1. **What is the new course?**

   The title of this new course is "Genes and Animal Biology". This course focuses on learning animal biology at the level of genes and their regulations. It will cover the basic science of molecular techniques and current developments in functional regulation of the genes that are important to animal agriculture.

2. **Why is the course being requested?**

   Genes and their regulations have developed into a central focus of life science research and education. More than ever before, molecular technology is showing us how to recognize and study biological connections among different cells, tissues and organs within an animal. Many important genes have been discovered to be involved in various animal biological processes in the past decade. A fundamental understanding of animal biology, such as development, reproduction and lactation depends upon current knowledge of the functional regulation of these genes. Training in molecular biology for agricultural undergraduates has become a major course in most life science colleges. In the current undergraduate curriculum of animal science at the University of Hawaii, there is not a specific course that focuses on understanding animal biology at the gene or molecular level. This course is proposed to provide instructions in understanding genes and their regulations in the context of animal biology and agriculture. The offering of this course will not only enhance animal science curriculum, but also stimulate learning interests in molecular technology for animal agriculture.

3. **How will the content be organized?**

   This course contains three parts: 1) the basic science of gene and gene manipulation; 2) valuable genes in animal biology; 3) applications of molecular technologies to animal science. The first and second part will be instructed by classroom lectures. The third part will be taught by lectures and student oral presentation in combination with writing assignment. An outline of the topic is included in the attached course syllabus.
4. What other courses at UHM closely parallel the proposed course, and in what way will the latter make a distinct contribution?

Several courses related to molecular biology and biotechnology are listed in the UHM course catalog. These include BIOL401 (Molecular Biotechnology), BIOL407 (Molecular Biology), BIOL270 (Cell & Molecular Biology) and CMB680 (Molecular genetics). In general, these courses are comprehensive and cover basic principles of molecular biology. For example, BIOL 401 instructs basic principles, applications and approaches of biotechnology from prokaryotic to eucaryotic cells. Students majoring in animal science are not interested in learning the molecular knowledge of plants and microbiology because of their irrelevancies to animals. The proposed course differs significantly from these basic molecular biology and genetics courses in that an emphasis is placed on genes and their regulations in the context of understanding the biology and physiology of agricultural animals, and application of the valuable genes for efficient animal production. Therefore the course is named as "Genes and Animal Biology". This course will make a distinct contribution by integrating current knowledge of genes and their regulations with animal biology and potential applications for livestock production.

5. Where of how does the proposed course fit into the current and future curriculum?

The proposed course is intended to provide basic trainings in molecular biology and genetics for animal science curriculum. In current curriculum, we have courses at the introductory level such as "Humans, Animals and Agriculture" (ANSC 200), "Principles of Animal Science" (ANSC 201), as well as some required courses for understanding how animal works, including ANSC 301 (anatomy), ANSC 451 (physiology), ANSC 244 (nutrition), ANSC 445 (genetics), and ANSC 454 (growth). In addition, we also have many courses to deal with different species of livestock and agricultural production, which including ANSC 353 (Horse), ANSC 360 (Aquaculture), ANSC 431 (Beef), ANSC 433 (Dairy), ANSC 432 (Swine), and ANSC 453 (Disease Control). The current animal science curriculum is comprehensive in general animal science training. However, as we approach a higher level of understanding animal physiology, genetics, growth, reproduction, lactation and nutrition at the gene and molecular level, we certainly need to
teach the students with knowledge in animal genome, important genes for livestock animals and other fundamentals in molecular technology related to animal agriculture. The new course of "Gene and Animal Biology" fits the current curriculum very well. By offering this course, the animal science curriculum at the UHM will be entering a higher level of undergraduate education in the field of animal science.

Most of animal science students at the UHM are pre-veterinary students, as well as students who are interested in animal agriculture, scientific research and technology development. There are great needs in animal science education to emphasize the curriculum development that are favorable for veterinary and new technology training. The new course of "Gene and Animal Biology" will not only focus on molecular understanding of animal biology, but also instruct practical and potential applications of biotechnology to the scientific research and new technology development for veterinary and animal agriculture. Therefore, this course also fits future animal science curriculum.

6. **Why is the number of credits and level justified? Explain the prerequisites and the absence thereof.**

This course will include intensive lectures covering basic knowledge in gene and gene expression, as well as molecular technology for animal research and agriculture. In addition to classroom lecture, group discussion and student presentations will also be used in the instruction. To get a comprehensive understanding of important contents and details in this subject, this course will need to be instructed three times a week (150 minutes in total), so three credits is suggested. In terms of prerequisite, a basic understanding of biological systems is necessary to understand lectures. A basic biology course or equivalents such as BIOL 171 (Introduction to Biology) has been suggested.

7. **How will the course assist students to achieve the critical skills and competencies expected of CTAHR graduates?**

i. Written communications. Students will be required to write two essays, which will be critically evaluated by the instructor.

ii. Oral Communications: Student presentation in combination with the writing assignment will be arranged after lecture instructions of basic knowledge in genes and
molecular biology. Group or individual advices will be conducted by the instructor.

iii. Analytical/Problem Solving skills: The important concepts on gene and their applications in animal science will be presented in the lectures, which will used as examples for analyzing problem-solving training through class discussion.

iv. Leadership/Person characteristics/Human Relation skills: Students will be encouraged to take initiative and take pride in help organizing group discussion and presentations.

v. Computer skills: DNA sequence and genomic informatics will be demonstrated through human genome database. Students are encouraged to gain practical experiences using computers to gain gene and molecular knowledge through available websites.

vi. "Real World" experience: The industry of gene and molecular technology is "biotechnology". Examples about successful biotech companies, along with problems associated the biotechnology will be discussed in the class to help students understand the "Real World" business of new technology development.

8. **How will students be evaluated?**

Students will be evaluated via their exam performances and writing assignment. Exams basically test their knowledge and analyzing skills, while the writing assignment will evaluate their working capability and the skills of applying the knowledge to solving some problems in animal science.

- Mid-term examinations: 30 points
- Student presentation: 15 points
- Assignment Essay: 15 points
- Quiz and class attendance: 10 points
- Final exams: 30 points

Grades will be assigned using the following scale:
A: >90 points; B: 80-89 points; C: 70-79 points; D: 60-69 points, F: <60 points.
9. **What are the minimum qualifications for teaching this course? Is a qualified instructor available?**

This course is an integration of molecular biology and genomics and their applications to animal science. The instructor is required to have training and working experiences in molecular biology in context with animal science application. This course will be initially instructed by Dr. Jinzeng Yang in the Department of Human Nutrition, Food and Animal Sciences. Dr. Yang has the appropriate training and research experiences to serve as the instructor for this course.

10. **How will the course be financed, assuming no further cutbacks?**

This course is primarily based on classroom teaching, student presentation and experimental demonstration. The resource will be firstly sought from existing educational funds within the academic units. We may need some funds to purchase some teaching materials and molecular reagents for classroom demonstrations, which will be sought from the animal science program or the CTAHR. Since this is a new course and it is related to teaching and training of new technologies, the instructor may seek external funding from USDA and NSF for the development of educational program in molecular bio-techniques for native Hawaiian students.

11. **Has the course been offered before? Is there a demand for it?**

This course has not been offered before. However, there is a great demand for training animal science students with knowledge in molecular biology and animal genomics. As a fact, most animal science programs in the other agricultural colleges have undergraduate courses focusing on animal genomics, molecular biology and biotechnology. Undergraduates majoring in animal science are interested in learning molecular knowledge in understanding animal biology and physiology, which will not only increase their career opportunities but also stimulates their further interests in graduate studies in animal sciences.

12. **Is the course cross-listed with another department?**

No.