GENE 602 Introduction to Genetic Model Systems  
Credits 2. 2 Lecture Hours.  
Introduction to the main eukaryotic genetic model systems (MS): yeast, C. elegans, Arabidopsis, Drosophila, zebrafish and mouse.

GENE 603 Genetics  
Credits 4. 4 Lecture Hours.  
Development of fundamental concepts related to the structure, function, organization, transmission and distribution of genetic material.  
Prerequisite: GENE 301.

GENE 606 Quantitative Phylogenetics  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Designed to provide the theory and tools required for inference of phylogenetic (evolutionary) relationships among biological taxa using various types of comparative data including morphological characters, biochemical and molecular characters, and DNA sequences; hands-on analysis of data using contemporary tools.  
Prerequisite: Entomology 601 or approval of instructor.  
Cross Listing: ENTO 606 and WFSC 646.

GENE 608 Critical Analysis of Genetic Literature  
Credits 2. 2 Lecture Hours.  
Introduction to Major Genetic Model Systems (MSs).

GENE 612 Population Genetics  
Credits 3. 3 Lecture Hours.  
Biological approach to genetic characteristics of populations dealing with genetic equilibrium, allelic variation, determination of genetic variation in populations, effects of mating systems, selection, mutation and drift on population parameters.  
Prerequisites: GENE 603; STAT 651.

GENE 613 Quantitative Genetics I  
Credits 3. 3 Lecture Hours.  
Quantitative genetics concepts particularly dealing with partitioning of phenotypic variance into genetic and environmental components, selection response, effects of systems of mating, genetic covariance and threshold effects.  
Prerequisites: STAT 651.

GENE 614/ANSC 614 Maximum Likelihood Estimation of Genetics  
Credits 3. 3 Lecture Hours.  
Theoretical and analytical approaches to the application of maximum likelihood for the estimation of parameters under linear and nonlinear models; single and polygene genetic models including Hardy-Weinberg equilibrium, linkage analysis and quantitative trait loci detection.  
Prerequisites: GENE 603; STAT 651; STAT 652 or STAT 601.  
Cross Listing: ANSC 614/GENE 614.

GENE 620 Cytogenetics  
Credits 3. 3 Lecture Hours.  
Examination and analysis of variation in chromosome structure, behavior and number; developmental and evolutionary effects of this variation.  
Prerequisite: GENE 603.

GENE 626/ANSC 626 Analyses of Gene Expression  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
Proficiency in handling DNA and RNA gained during exercises used routinely in analyses of gene expression; RNA preparation and analysis on Northern blots; in vitro transcription and polyacrylamide gel analysis of nucleic acids; sub-cloning and mRNA quantitation using polymerase chain reaction.  
Prerequisites: GENE 450 or approval of instructor; radiation safety training.  
Cross Listing: ANSC 626/GENE 626.

GENE 629 Applied Animal Genomics  
Credits 3. 3 Lecture Hours.  
Theory and application of genomics by livestock industries; consideration of genetic markers, gene mapping methods, genome analysis and emerging technologies such as microarrays, transgenesis, cloning and marker assisted selection; exposure to bioinformatic tools for genomics.  
Prerequisite: GENE 603 or approval of instructor.  
Cross Listing: ANSC 629 and POSC 630.

GENE 631/BICH 631 Biochemical Genetics  
Credits 3. 3 Lecture Hours.  
Genetic control of cellular metabolism. Mechanism of gene action; gene-enzyme relationships; regulation of gene expression; structure and organization of genomes; biochemical manipulation and characterization of genetic molecules.  
Prerequisite: GENE 431/BICH 431 or BICH 431/GENE 431; BICH 603.  
Cross Listing: BICH 631/GENE 631.

GENE 633/WFSC 633 Conservation Genetics  
Credits 3. 3 Lecture Hours.  
Genetic concepts and techniques relevant to management and conservation of biological diversity; research and conservation within a conservation genetics framework.  
Prerequisites: Introductory courses in genetics and ecology or biological conservation.  
Cross Listing: WFSC 633/GENE 633.

GENE 638/ANSC 638 Predictions of Genetic Merit  
Credits 3. 3 Lecture Hours.  
Mixed linear models and best linear unbiased prediction for genetic evaluation.  
Prerequisite: GENE 613.  
Cross Listing: ANSC 638/GENE 638.

GENE 643/SCSC 643 Molecular Quantitative Genetics and Plant Breeding  
Credits 3. 3 Lecture Hours.  
Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis and epistasis); genotype by environment interaction; mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software.  
Prerequisites: STAT 651, SCSC 642 or GENE 613 or approval of instructor.  
Cross Listing: SCSC 643/GENE 643.

GENE 648/WFSC 648 Molecular Evolution  
Credits 3. 2 Lecture Hours. 1 Lab Hour.  
Theory and tools used in the analysis of molecular evolutionary patterns of DNA and protein sequences; format combines lecture presentations by instructor, discussion of relevant scientific literature, computer exercises, preparation of research proposal or independent research project, and practice in peer review process.  
Prerequisites: Basic courses in general Genetics and in Evolution.  
GENE 654 Analysis of Complex Genomes  
**Credits 3. 3 Lecture Hours.**  
History and current status of genetic and molecular analysis of higher eukaryotic genomes; coverage of techniques for dissection of genomes into manageable parts; investigations in genetics, breeding and evolution; emphasis on quantitative inheritance, genetic mapping, physical mapping, map-based cloning, with examples drawn from a wide range of organisms.  
**Prerequisite:** GENE 603.  
**Cross Listing:** SCSC 654 and MEPS 654.

GENE 655 Analysis of Complex Genomes—Lab  
**Credits 3. 7 Lab Hours.**  
Analysis of Complex Genomes—Lab. Laboratory methods in molecular genetic techniques for genetic mapping, physical mapping, and map-based cloning of both qualitative and quantitative phenotypes.  
**Prerequisite:** GENE 603 or equivalent or approval of instructor.  
**Cross Listing:** SCSC 655 and MEPS 655.

GENE 673/BICH 673 Gene Expression  
**Credit 1. 1 Lecture Hour.**  
Oral presentations and discussions related to the biochemistry and molecular biology of gene expression in animal, plant, and microbial systems. Course may be repeated for credit up to 12 times.  
**Prerequisite:** Graduate classification in biochemistry or genetics or approval of instructor.  
**Cross Listing:** BICH 673/GENE 673.

GENE 677/MCMD 677 Genes and Diseases  
**Credits 3. 3 Lecture Hours.**  
Molecular and genetic basis for human disease; structure, function and evolution of chromosomes; epigenetics; gene mapping; complex genetic traits; cancer genetics; neurodegenerative disorders; animal models (yeast, mouse, worms, fruit flies); ethics.  
**Prerequisite:** GENE 603, GENE 631/BICH 631, or MSCI 601 or approval of instructor.  
**Cross Listing:** MCMD 677/GENE 677.

GENE 681 Seminar  
**Credit 1. 1 Lecture Hour.**  
Reports and discussions of topics of current importance in genetics; reports to be prepared and presented by graduate students enrolled in course.

GENE 682 Seminar Presentation  
**Credit 1. 1 Lecture Hour.**  
Presentation of research progress and results; perform peer assessment.

GENE 685 Directed Studies  
**Credits 1 to 4. 1 to 4 Other Hours.**  
Individual problems or research not pertaining to thesis or dissertation.  
**Prerequisite:** Approval of instructor.

GENE 689 Special Topics in...  
**Credits 1 to 4. 1 to 4 Lecture Hours.**  
Selected topics in an identified area of genetics. May be repeated for credit.  
**Prerequisite:** Approval of instructor.

GENE 691 Research  
**Credits 1 to 23. 1 to 23 Other Hours.**  
**Prerequisite:** GENE 603.

GENE 697 Teaching Genetics Labs  
**Credit 1. 1 Lecture Hour.**  
Theory and practical aspects of teaching genetics labs, with emphasis on content, grading, instructional methods and practical aspects of genetics labs. May be repeated for credit.  
**Prerequisites:** Graduate classification in genetics; appointment as a TA for genetics labs.