GENETICS (GEN)

# Course numbers with the # symbol included (e.g. #400) have not been
taught in the last 3 years.

GEN 804 - Genetics of Prokaryotic Microbes
Credits: 5
Maintenance, exchange, and expression of genetic material in bacteria
and their viruses. Historical overview of the role microbial genetics
played in development of modern molecular biology. Contemporary
perspective on methods used to understand the function of genes
and their applications to basic science, biomedical research, and
biotechnology. Introductory microbiology and microbiology lab AND one
semester genetics recommended. Lab.
Equivalent(s): MICR 804
Grade Mode: Letter Grading
Special Fee: Yes

GEN 805 - Population Genetics
Credits: 3
Exploration of the forces (mutation, selection, random drift, inbreeding,
assortative mating) affecting the frequency and distribution of genetic
variation in natural populations. Quantifying the structure of populations.
Methods of analysis for theoretical and practical applications. One
semester of genetics and one semester of statistics recommended.
Equivalent(s): ZOOL 805
Grade Mode: Letter Grading

GEN 806 - Human Genetics
Credits: 4
Genetic basis of human traits and diseases including both traditional
methods of diagnosis and contemporary molecular genetic approaches
stemming from the human genome project. Case studies exemplify
common practices in human genetic counseling and integrate the
scientific basis of diagnosis with the special ethical implications of
human genetic analysis. One semester of genetics recommended.
Equivalent(s): ANSC 806
Grade Mode: Letter Grading

GEN 811 - Genomics and Bioinformatics
Credits: 0 or 4
Methods, applications, and implications of genomics-the analysis of
whole genomes. Microbial, plant and animal genomics are addressed.
Medical, ethical and legal implications of genomic data. Computer
lab provides exposure and experience in a range of bioinformatics
approaches used in genome analysis. One semester of genetics
recommended. Computer lab.
Equivalent(s): BCHM 811, MICR 811
Grade Mode: Letter Grading

GEN 812 - Programming for Bioinformatics
Credits: 5
Development of programming skills that enable life science students
to ask fundamental biological questions that require computers to
automate repetitive tasks and handle query results efficiently. Topics
include: computer values of important parameters of biological sequence
data; pattern search and motif discovery scripts; accessing, querying,
manipulating, retrieving, parsing, analyzing, and saving data from local
and remote databases. One semester of bioinformatics and one semester
of genetics recommended. Computer Lab.
Grade Mode: Letter Grading

GEN 813 - Microbial Ecology and Evolution
Credits: 4
Evolutionary and ecological forces that generate the tremendous
diversity of microbial life on Earth with emphasis on viruses, archaea and
bacteria. Functional roles of microorganisms, their population dynamics
and interactions, and their mechanisms of evolutionary change in a
variety of environmental settings, including natural communities and
laboratory microcosms. Introductory microbiology and microbiology lab
and one semester of genetics recommended.
Equivalent(s): MICR 813
Grade Mode: Letter Grading

GEN 815 - Molecular Evolution
Credits: 4
Rates and patterns of evolutionary change in biomolecules. Forces
affecting the size and structure of genomes. Molecular mechanisms
of organismal evolution. Emphasizes integrating evidence from
biochemistry, molecular genetics and organismal studies. Methods for
reconstructing phylogeny from molecular sequences. One semester of
genetics and one semester of statistics recommended. Computer lab.
Equivalent(s): ZOOL 815
Grade Mode: Letter Grading

GEN 817 - Molecular Microbiology
Credits: 5
Fundamental physiological and metabolic processes of archaea bacteria
and fungi with a strong emphasis on prokaryotes. Literature-based
course with lab. Topics include regulation and coordination of microbial
metabolism, bacterial cell cycle, global control of gene expression, signal
transduction, and microbial cell differentiation. Introductory microbiology
and microbiology lab and one semester of genetics recommended. Lab.
Equivalent(s): MICR 817
Grade Mode: Letter Grading

GEN 818 - Comparative Genomics
Credits: 4
Explores the central questions and themes in contemporary comparative
genomics, including genome biology, phylogenomics, human origins,
population genomics, and ecological genomics. Provides the conceptual
framework required to evaluate new work in this fast-changing field. One
semester of genetics recommended.
Grade Mode: Letter Grading

GEN 821 - Comparative Genomics
Credits: 4
Explores the central questions and themes in contemporary comparative
genomics, including genome biology, phylogenomics, human origins,
population genomics, and ecological genomics. Provides the conceptual
framework required to evaluate new work in this fast-changing field. One
semester of genetics recommended.
Grade Mode: Letter Grading

GEN 825 - Population Genetics Lab
Credits: 2
Hands-on approach to exploration of evolutionary forces affecting the
frequency and distribution of genetic variation in natural populations.
Wet lab techniques include DNA extraction, restriction enzyme digestion,
PCR, DNA fragment size-selection. Computational skills include high-
throughput sequencing data control, identifying allelic variants, and
generation of population genetic summary statistics. One semester of
genetics and one semester of statistics recommended.
Co-requisite: GEN 805
Grade Mode: Letter Grading

GEN 827 - Exotic Animal Genetics
Credits: 4
Structure, organization, replication, dynamics, and expression of genetic
information in eukaryotes. Focus on molecular genetic and epigenetic
mechanisms of gene expression and its control; molecular genetic
control of cell division and differentiation during development. One
semester of genetics recommended.
Equivalent(s): BCHM 871
Grade Mode: Letter Grading
GEN 872 - Evolutionary Genetics of Plants
Credits: 4
Mechanisms of genetic change in plant evolution, both in nature and under human influence. Topics include neo-Darwinian theory; speciation and hybridization; origins and co-evolution of nuclear and organelle genomes; gene and genome evolution; transposable elements; chromosome rearrangements; polyploidy; genetic modification. Lab introduces methods in information gathering, bioinformatics, genome analysis, plant breeding, and genetic manipulation. One semester of genetics recommended prior to taking this course. Lab.
Equivalent(s): PBIO 872
Grade Mode: Letter Grading

GEN 874 - Techniques in Plant Genetic Engineering and Biotechnology
Credits: 4
Theory and hands-on experience with techniques used in plant genetic engineering, including cell and tissue culture, gene cloning, and analysis of foreign gene expression. Discussion of role of plant biotechnology in sustainable agriculture and climate change; modifying plants for better nutrition and stress response, environmental remediation, and for production of pharmaceuticals; controversies associated with this technology. Lab. One semester of genetics recommended.
Equivalent(s): PBIO 874
Grade Mode: Letter Grading
Special Fee: Yes