HUMAN GENETICS-BIOL 4545

<u>INSTRUCTOR</u>: Dr. Greg Gibson, School of Biology, greg.gibson@biology.gatech.edu, 404-385-2343, Boggs 1-98, Office hours Friday 2-5 pm

<u>LECTURE</u>: TR, 3:05 pm - 4:25 pm, Cherry Emerson 320, Aug 22, 2011 - Dec 17, 2011, 3.0 Credits. Prerequisites: BIOL 2344 or BIOL 2354 with minimum grade of D.

<u>GOALS AND LEARNING OUTCOMES</u>: The objectives of this course are for students to emerge with (1) an appreciation for how genes and the environment interact to promote disease, (2) a foundation on which to evaluate media reports of human genetics, (3) a knowledge of the genetic basis of the major human diseases, and (4) an understanding of the statistical methods used to study human variation.

<u>PERSPECTIVE</u>: Human genetics has undergone a revolution over the past five years as genome-wide technologies have enabled a shift from pedigree-based studies to analysis of populations of unrelated individuals, and consequently from single-gene to complex disease. Understanding this shift is essential for students interested in medicine, and the approaches will be adopted by a wide spectrum of geneticists working in agriculture, ecology, and evolutionary biology. Furthermore, most cutting edge tools of genomics are being developed for biomedical human genetic research, including advanced population and quantitative genetic methods. This course covers the genetics of a full spectrum of human diseases and includes theory as well studies of normal human variation.

<u>OVERVIEW</u>:   This course will introduce students to the very latest strategies in human genetics, with a particular focus on contemporary analysis of complex disease. Students will be introduced to the concepts of genome-wide association studies, whole genome sequencing, and functional genomics, to theoretical models of disease and the evolution of susceptibility, to specific knowledge about the major sources of human morbidity, and to genomic methods, and finally biotechnology applications. The course is particularly suitable for students with a medical orientation, but should be attractive to any student with a general interest in genetics and human variation. This class fills a major gap in bio-medical education by introducing students to the heritable basis underlying complex diseases. Topics covered will include theory and methods of human genetics, and weeklong modules dealing with normal variation, cancer, immune diseases, metabolic syndrome, psychosis, and aging. Students will be required to read current literature, and show their understanding by developing posters, press-releases, critical reviews, and podcasts that will be presented in class sessions.

<u>FORMAT</u>: Course will meet for 3 hrs per week in two sessions on Tuesdays and Thursdays. Each new topic will be covered in week-long modules, generally following a traditional lecture format. Six times in the semester, a Thursday session will be set aside for poster or oral presentations with time for class discussion. No textbook is used in the course. Instead, students discuss contemporary papers from the literature. Therefore, lecture notes are essential.

EVALUATION:
Attendance and in-class participation - 5%; Class presentations - 10%;
Written reports - 35%; Mid-term exam - 25%; Final exam - 25%

HONOR POLICY:
Your conduct in the course should conform to the Student Honor Code
(http://www.honor.gatech.edu/).

LEARNING ACCOMMODATIONS: Classroom accommodations for students with disabilities
can be provided. These accommodations must be arranged in advance and in accordance with the
ADAPTS office (http://www.adapts.gatech.edu).

TOPICS:
1. Single Gene Disorders (Mendelian Human Genetics)
2. Methods - Genotypes, Expression, Sequences
3. Models of Disease
4. Normal Human Variation (Height, BMI, Hair color, etc) *
5. Breast and Prostate Cancer Sept *
6. Leukemia and Colon Cancer
Midterm exam in class
7. Infectious Disease susceptibility (HIV, TB) *
8. Inflammatory Diseases (Asthma and IBD)
9. Autoimmune Diseases and Type 1 Diabetes
10. Type 2 Diabetes and Metabolic Syndrome *
11. Cardiovascular Disease
12. Depression and Anxiety *
13. Schizophrenia and Autism
14. Alzheimer's Disease and Aging
15. Translational Genetics *
16. Personalized Medicine and Wrap-Up
* indicates student presentations (posters, discussion sessions) in class that week