

# MEDICAL GENETICS (MD GENET)

## MD GENET/GENETICS 565 – HUMAN GENETICS

3 credits.

Principles, problems, and methods of modern human genetics. Focuses on how researchers discover the genetics of diseases and how those discoveries are used to improve clinical practice. Surveys aspects of (i) the molecular function of the human genome, (ii) the basic principles of human genetics including statistical genetics, quantitative genetics, and genomic variation in human populations, (iii) the genetics of rare disorders and common diseases, and genomic analysis approaches, including genome-wide association studies and sequencing, and (iv) how genetics are used in medicine and discussions covering ethical considerations of human genomic data.

**Requisites:** GENETICS 466, 468, BIOCORE 587, or graduate/professional standing

**Course Designation:** Breadth – Biological Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2023

## MD GENET/BIOCHEM/GENETICS 620 – EUKARYOTIC MOLECULAR BIOLOGY

3 credits.

Focuses on the basic molecular mechanisms that regulate DNA, RNA, and protein metabolism in eukaryotic organisms.

**Requisites:** BIOCHEM 501, 508 or graduate/professional standing

**Course Designation:** Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2024

**Learning Outcomes:** 1. Recall core principles that govern the structure and function of DNA, RNA, and protein. Audience: Both Grad Undergrad

2. Describe techniques for quantifying the expression, interaction, and cellular localization of specific molecules and for determining their necessity and sufficiency in molecular processes. Audience: Both Grad Undergrad

3. Explain how molecular processes that control the synthesis, decay, interactions, localization, folding, and modification of molecules are silenced, initiated, maintained, and terminated. Audience: Both Grad Undergrad

4. Describe how information is transferred between molecules to alter cellular activity in response to developmental and environmental signals. Audience: Both Grad Undergrad

5. Critique and weigh the credibility of existing molecular data. Audience: Both Grad Undergrad

6. Develop and draw hypotheses that use existing data to account for as yet unexplained molecular processes in eukaryotic organisms. Audience: Both Grad Undergrad

7. Design discovery/observation, loss-of-function, and gain-of-function experiments to test molecular hypotheses. Audience: Both Grad Undergrad

8. Implement problem solving strategies in thesis research project. Audience: Graduate

**MD GENET/GENETICS/POP HLTH 636 – PUBLIC HEALTH GENOMICS**

1 credit.

Provides an introduction to public health genomics through a review of fundamental principles of genetics, the use of genetic information in clinical and research settings, and its implications for disease management and prevention, and health promotion. Explores policies that guide public health and discusses current ethical, legal, and social implications of these policies.

**Requisites:** (Junior standing and ZOOLOGY/BIOLOGY/BOTANY 151) or graduate/professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2022

**MD GENET/GENETICS 662 – CANCER GENETICS**

3 credits.

Cancer remains one of the most difficult health issues facing our society. There is hope in the horizon due to an increasing understanding of both genetic and epigenetic alterations in cancer. In particular, DNA sequencing of human cancers is becoming more common in major health care centers, and there is expectation that this technology will allow for personalized medicine. Thus, there has been a rapid increase in this knowledge over the last decade. Become aware of the current major issues in cancer research and critically evaluate the cancer genetics literature.

**Requisites:** GENETICS 466, 467 or BIOCORE 383

**Repeatable for Credit:** No

**Last Taught:** Spring 2024

**MD GENET/GENETICS 677 – ADVANCED TOPICS IN GENETICS**

1-3 credits.

Contents vary; consideration of subjects not included in the curriculum.

**Requisites:** Graduate/professional standing, GENETICS 466, 468, or BIOCORE 383

**Course Designation:** Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Spring 2024

**Learning Outcomes:** 1. Apply, analyze, or evaluate advanced theories, concepts, or methods in genetics and genomics. Audience: Both Grad Undergrad

2. Apply knowledge of experimental genetics and genomics to related research projects. Audience: Graduate

**MD GENET 699 – INDEPENDENT READING**

1-3 credits.

Directed study projects as arranged with instructor.

**Requisites:** Consent of instructor

**Course Designation:** Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Fall 2015

**Learning Outcomes:** 1. Apply concepts learned in coursework to real life situations Audience: Undergraduate

2. Develop critical, analytical, and independent thinking skills Audience: Undergraduate

**MD GENET/GENETICS 707 – GENETICS OF DEVELOPMENT**

3 credits.

A research-level analysis of the current status of the investigation of processes controlling differential gene activity and cellular behavior. The major emphasis is genetic. In successive years, the focus moves from the gene to the cell to the organism.

**Requisites:** Declared in Genetics graduate program

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Spring 2023

**Learning Outcomes:** 1. Critically evaluate papers, form meaningful questions based on the material, and engage scientists in conversations about their work. Audience: Graduate

2. Improve oral presentations and scientific writing (grants, review articles). Audience: Graduate

3. Expand scientific literacy. Audience: Graduate

**MD GENET/GENETICS 708 – METHODS AND LOGIC IN GENETIC ANALYSIS**

3 credits.

Contemporary issues in genetic, developmental, cell, and molecular biology are addressed in a discussion format. Invited speakers give research lectures and reading material is taken from the primary literature. The discussion focuses on evaluating genetic approaches to biological problems.

**Requisites:** Declared in Genetics graduate program

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2024

**Learning Outcomes:** 1. Critically evaluate papers, form meaningful questions based on the material, and engage scientists in conversations about their work. Audience: Graduate

2. Improve oral presentations and scientific writing (grants, review articles). Audience: Graduate

3. Expand scientific literacy. Audience: Graduate

### **MD GENET 911 – MODERN CLINICAL GENETICS: HOW TO APPROACH A RAPIDLY CHANGING FIELD**

2 credits.

Genetics and genomics are rapidly evolving fields. In modern clinical care settings, clinicians will be exposed to genetic and genomic data, including that brought by patients, and knowing how to read genetic and genomic data is increasingly necessary in clinical practice. Genetics and genomics in a clinical setting spans a wide range of topics including diagnosis and treatment of genetic diseases. Familiarity with clinical genetic analysis, and the genetic approaches used in basic science, helps medical students better understand genetic disease background. Learn how to bridge basic concepts of human genetics and clinical genetics (actual diseases). Emphases will include research into human genetic diseases, including designing genetic testing, using model organisms and/or cell culture systems, and the development of genetic testing technologies.

**Requisites:** MED SC-M 810, 811, 812, and 813

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2023

**Learning Outcomes:** 1. Demonstrate understanding of basic concepts of human genetics Audience: Graduate

2. Describe various genetic approaches and models for studying human genetic diseases Audience: Graduate

3. Apply basic concepts of genetics to answering questions in human genetic diseases Audience: Graduate

4. Explain fundamentals of clinical genetics, including genetic testing Audience: Graduate

5. Model logical thinking process to organize scientific discussion and presentation Audience: Graduate

### **MD GENET 999 – INDEPENDENT WORK**

1-3 credits.

Directed study projects as arranged with instructor.

**Requisites:** Consent of instructor

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Fall 2010

**Learning Outcomes:** 1. Exhibit a broad understanding of general Genetics and Genomics principles. Audience: Graduate

2. Conduct advanced independent research using a variety of approaches. Audience: Graduate