FTDR 3999  FULL-TIME DISSERTATION RESEARCH  Credit(s): 00.0
DOCTORAL CANDIDATES WHO HAVE COMPLETED ALL CREDIT REQUIREMENTS FOR THE DEGREE, INCLUDING ANY MINIMUM DISSERTATION REQUIREMENTS, AND ARE WORKING FULL-TIME ON THEIR DISSERTATIONS MAY REGISTER FOR THIS COURSE. WHILE THE COURSE CARRIES NO CREDITS AND NO GRADE, STUDENTS WHO ENROLL IN "FULL-TIME DISSERTATION STUDY" ARE CONSIDERED BY THE UNIVERSITY TO HAVE FULL-TIME REGISTRATION STATUS.

HUGEN 2010  BIOINF RESOURCES GENETICISTS  Credit(s): 01.0
Corequisite(s): HUGEN 2022 and HUGEN 2040
The focus of this course is the online bioinformatic resources available to geneticists. Students will learn to locate and use such resources and interpret the data therein to inform the development of research questions, aid in clinical decision-making, and enhance the understanding and contextualization of research results.

[New course for fall 2016, term 2171. For HUGEN students.]

HUGEN 2021  SPECIAL STUDIES  Credit(s): 0.1 TO 15.0
QUALIFIED STUDENTS MAY UNDERTAKE ADVANCED WORK OR RESEARCH WITH THE APPROVAL AND UNDER THE GUIDANCE OF A MEMBER OF THE STAFF.

HUGEN 2022  HUMAN POPULATION GENETICS  Credit(s): 02.0
DEALS WITH GENERAL PRINCIPLES OF POPULATION GENETICS, ESPECIALLY THOSE APPLICABLE TO HUMAN POPULATIONS.

HUGEN 2024  ADVANCED TOPICS HUMAN GENETICS  Credit(s): 01.0
THIS COURSE IS INTENDED TO PROVIDE A BRIEF INTRODUCTION TO THE R STATISTICAL ENVIRONMENT, INCLUDING DATA MANIPULATION IN R, BASIC STATISTICS, PLOTTING, SOME SIMPLE PROGRAMMING ROUTINES (LOOPS AND CONDITIONALS), AND GENETIC ANALYSIS ROUTINES. STUDENTS ARE EXPECTED TO HAVE A BASIC KNOWLEDGE OF BIOSTATISTICS, POPULATION GENETICS, AND COMPUTER PROGRAMMING. LECTURES WILL BE EXTENSIVELY BASED ON PROBLEM-SOLVING CASE STUDIES, AND STUDENTS ARE EXPECTED TO CONTRIBUTE TO THE DISCUSSION OF EACH CASE. GRADING WILL BE VIA CLASS PARTICIPATION AS WELL AS A FINAL PROJECT INVOLVING ANALYSIS OF GENETIC DATA. <Students should have a basic understanding of biostatistics (Biost 2041) and population genetics (Hugen 2022), as well as basic computing skills and some programming experience.>

HUGEN 2025  HUMAN GENETICS SEMINAR  Credit(s): 00.0
HUMAN GENETICS SEMINARS PRESENT CURRENT GENETICS METHODOLOGY, THEORY, AND DATA.

HUGEN 2026  SPECIAL STUDIES HUMAN GENETICS  Credit(s): 03.0
THIS COURSE IS DESIGNED TO PROVIDE ADVANCED UNDERGRADUATES AND GRADUATE STUDENTS WITH DIRECTED, INTENSIVE TRAINING IN LABORATORY, STATISTICAL OR CLINICAL RESEARCH METHODS RELEVANT TO HUMAN GENETICS. THESE WILL BE SPECIALIZED SKILLS NOT AVAILABLE THROUGH REGULARLY TAUGHT COURSES IN THE UNIVERSITY. EACH SPECIAL STUDY IS DESIGNED IN CONSULTATION WITH AN INDIVIDUAL MEMBER OF THE HUMAN GENETICS FACULTY. COURSE PERFORMANCE WILL BE JUDGED BY THE PREPARATION OF A WRITTEN FINAL REPORT TO THE SUPERVISING FACULTY MEMBER.
HUGEN 2027 HUMAN GENETICS FALL JOURNAL CLUB Credit(s): 01.0

HUMAN GENETICS JOURNAL CLUB MEETS ONCE A WEEK DURING THE FALL SEMESTER TO GIVE STUDENTS AND FACULTY A CHANCE TO PRESENT EXCITING RESEARCH WHICH THEY FEEL IS RELEVANT TO THE DEPARTMENT. THE AUDIENCE IS OTHER STUDENTS AND FACULTY FROM THE DEPARTMENT AND OTHER DEPARTMENTS OF THE SCHOOLS OF HEALTH SCIENCES. PRESENTATIONS ARE INFORMAL AND MEANT TO GIVE STUDENTS THE EXPERIENCE NECESSARY TO BE AN EFFECTIVE COMMUNICATOR, AND TO TEACH THEM CRITICAL SKILLS FOR EVALUATING RESEARCH PUBLICATIONS.

HUGEN 2028 HUMAN GENETICS JOURNAL CLUB & PEER REVIEW Credit(s): 01.0

HUMAN GENETICS JOURNAL CLUB AND PEER REVIEW MEETS ONCE PER WEEK FOR ONE HOUR AND PROVIDES STUDENTS AND FACULTY WITH AN OPPORTUNITY TO PRESENT EXCITING RESEARCH IN AN INFORMAL FORMAT. THE PURPOSE OF THE COURSE IS TO HONE STUDENTS’ ORAL AND WRITTEN CRITICAL EVALUATION SKILLS VIA ORAL PRESENTATIONS OF PUBLISHED LITERATURE, AS WELL AS A WRITTEN REVIEW OF A MANUSCRIPT. UPON COMPLETION OF THE COURSE, STUDENTS WILL BE ABLE TO ORALLY CRITIQUE A PAPER FROM THE LITERATURE AND ALSO CRITICALLY REVIEW A MANUSCRIPT FOR PUBLICATION.

HUGEN 2029 INTRODUCTION TO GENE MAPPING Credit(s): 03.0

Prerequisite(s): HUGEN 2022 and HUGEN 2040 and HUGEN 2034 and BIOST 2041

THIS COURSE PRESENTS A LITERATURE-BASED APPROACH TO UNDERSTANDING AND INTERPRETING RESULTS FROM GENE MAPPING PAPERS IN THE FIELD OF HUMAN GENETICS. TRADITIONAL AND STATE-OF-THE-ART LINKAGE ANALYTIC METHODOLOGIES WILL BE EXPLORED. STUDENTS SHOULD HAVE A BASIC KNOWLEDGE OF BIOSTATISTICS PRINCIPLES, MOLECULAR GENETICS, AND POPULATION GENETICS. SHORT SUMMARIES WILL BE GIVEN OF EACH ANALYTIC TECHNIQUE, FOLLOWED BY STUDENT-LED CRITIQUES OF REPRESENTATIVE PAPERS FROM THE CURRENT LITERATURE AND DISCUSSION OF STUDY DESIGN ISSUES, RESULTS, INTERPRETATIONS, AND SHORTCOMINGS OF EACH PAPER. <Students should have a basic understanding of biostatistics (BIOST 2041), molecular genetics (HUGEN 2034 or HUGEN 2040), and population genetics (HUGEN 2022).>

HUGEN 2031 CHROMOSOMES AND HUMAN DISEASE Credit(s): 03.0

THE ROLE OF CHROMOSOMES IN HUMAN DISEASE IS DISCUSSED AFTER A THOROUGH BACKGROUND ON CHROMOSOME STRUCTURE AND FUNCTION IS PRESENTED. TOPICS COVERED INCLUDE CYTOGENETIC METHODOLOGY, ANEUPLOIDY, CHROMOSOME REARRANGEMENTS, CHROMOSOMES AND CANCER, CHROMOSOME BREAKAGE SYNDROMES, AND FRAGILE SITES ON HUMAN CHROMOSOMES.

HUGEN 2032 GENETIC TECHNIQUES Credit(s): 02.0

Prerequisite(s): HUGEN 2031

STUDENTS PARTICIPATE IN LABORATORY EXERCISES TO BECOME ACQUAINTED WITH CYTOGENETICS LABORATORY PROCEDURES INCLUDING CELL CULTURE, CHROMOSOME PREPARATION, CHROMOSOME BANDING, AND KARYOTYPING. CHROMOSOME ANALYSIS AND KARYOTYPE INTERPRETATION ARE PRACTICED.

HUGEN 2034 BIOCHEM MOLEC GENET CPLX DS Credit(s): 03.0

THIS COURSE PROVIDES STUDENTS WITH AN UNDERSTANDING OF THE MOLECULAR AND BIOCHEMICAL GENETIC APPROACHES TO UNDERSTANDING GENETICALLY DETERMINED SUSCEPTIBILITY TO COMMON DISEASE. THIS WILL BE PRESENTED USING SELECTED EXAMPLES OF COMPLEX HUMAN DISEASES (CARDIOVASCULAR DISEASE, NEURODEGENERATIVE DISEASES, DIABETES, LUPUS, AGE-RELATED MACULAR DEGENERATION, CANCER AND OSTEOPOROSIS). RISK OF COMMON, COMPLEX DISEASES IS DETERMINED BY GENOTYPES AT MULTIPLE GENETIC LOCIS AND THE COMPLEX INTERACTION OF GENETIC VARIATION AND ENVIRONMENTAL EXPOSURES. RISK OF ALMOST EVERY COMMON DISEASE IS INFLUENCED BY GENES, BUT THE RELATIONSHIP BETWEEN GENOTYPE AND DISEASE PHENOTYPE IS WEAK COMPARED TO THAT OBSERVED WITH RARE MENDELIAN TRAITS. HOWEVER, UNDERSTANDING THE CONTRIBUTION OF GENES TO COMMON DISEASE SUSCEPTIBILITY IS IMPORTANT TO PUBLIC HEALTH.

(title change effective for spring term 2010; previous title: Introduction to Human Biochemical & Molecular Genetics)

HUGEN 2035 PRINCIPLES OF GENETIC COUNSELING Credit(s): 03.0

PROVIDES BASIC TRAINING IN GENETIC COUNSELING WITH PARTICULAR REFERENCE TO ITS APPLICATIONS IN PUBLIC HEALTH PROGRAMS.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>HUGEN 2036</td>
<td>GENETIC COUNSELING INTERNSHIP</td>
<td>04.0</td>
<td>Provides practical applications of the fundamentals of genetic counseling. Involves both the observation of and participation in at least 50 counseling sessions in the medical genetics departments of childrens, Magee-Womens and West Penn Hospitals. Literature review and searches pertinent to each patient will be necessary for adequate preparation. Weekly case presentations and/or lectures will also be included. (For Genetic Counseling students)</td>
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<tr>
<td>HUGEN 2038</td>
<td>INTERVNTN SKILL GENETIC CNSLG</td>
<td>03.0</td>
<td>Focuses on the understanding of theories of intervention, skill development and application to genetic counseling. The course aims at sensitizing students to the ethical dilemmas faced by affected families and health-care providers. (For Genetic Counseling students)</td>
</tr>
<tr>
<td>HUGEN 2039</td>
<td>RISK CALCULATION GENETIC CNSLG</td>
<td>01.0</td>
<td>Provides training in calculating risk of disease, or carrier status, in a variety of genetic counseling situations by learning to identify the sources of risk in the counselee's personal and family history and to analyze and synthesize a single overall risk of disease from these competing risks.</td>
</tr>
<tr>
<td>HUGEN 2040</td>
<td>MOL BASIS OF HUMN INHERITED DS</td>
<td>03.0</td>
<td>This course will provide an up-to-date overview of the most common and biologically informative human inherited disorders and will integrate clinical descriptions with recent genetic, molecular genetic and biochemical insights. Disorders covered include lysosomal storage disorders, neuromuscular diseases, organic acidopathies, amino acidopathies, neurofibromatosis, cystic fibrosis, neurodegenerative and ophthalmic disorders. Current techniques of gene mapping, cloning, transfer, and expression will be integrated into the overviews.</td>
</tr>
<tr>
<td>HUGEN 2041</td>
<td>BIOETHICS</td>
<td>03.0</td>
<td>This course is an advanced treatment of significant problems in medical ethics. Topics may include euthanasia, rights to health care, competency, allocation of resources, and other issues of medical ethics.</td>
</tr>
<tr>
<td>HUGEN 2044</td>
<td>HUMAN GENETICS SEMINAR</td>
<td>03.0</td>
<td>This seminar will examine the ethical, legal and social issues that arise from genetic counseling, genetic screening, genetic therapy, and genetic technology. This course surveys the complexities of the structure and function of both prokaryotic and eukaryotic genomes, with special emphasis on the mammalian genome. Specific topics include the mitochondrial genome, repetitive DNA sequences, methods of gene mapping and DNA sequencing, higher order chromosome organization, and evolution. General knowledge of genetics and molecular genetics methods required.</td>
</tr>
<tr>
<td>HUGEN 2047</td>
<td>CLIN GENETICS CASE CONFERENCE</td>
<td>01.0</td>
<td>With clinical cases and specimens from various clinical genetics service units, this seminar illustrates and provides insights into the biologic, medical, ethical, and emotional aspects of genetic disorders.</td>
</tr>
<tr>
<td>HUGEN 2049</td>
<td>INTRODUCTION TO PUBLIC HEALTH GENETICS</td>
<td>03.0</td>
<td>This graduate level course focuses on public health genetics. The goal of this course is to educate the student about the basic principles of genetics and their application to public health practice and research. Public health genetics is the application of advances in genetics and molecular biotechnology to improve public health and prevent disease. This course will provide the knowledge necessary to apply genetic concepts to public health practice.</td>
</tr>
</tbody>
</table>
### HUGEN 2050 PUBLIC HEALTH GENETICS PRACTCM
**Credit(s):** 01.0 to 06.0

The practicum, through a structured and educationally supervised placement at an approved site with an experienced professional is aimed at providing a means to identify and to apply a variety of theories and skills discussed and demonstrated in the classroom to the real-life experiences to which the student is assigned in the field under professional supervision. The choice of practicum site is determined by the MPH degree director and the director of graduate studies for the Department of Human Genetics. The MPH degree requirements and career goals of the student influence the choice of the practicum assignment. This practicum is required for the MPH in Public Health Genetics.  
(For PH genetic students and PH Genetic Certificate)

### HUGEN 2051 INBORN ERRORS OF DEVELOPMENT
**Credit(s):** 02.0

This course focuses on the connections between human development and inherited disease. The course will include core principles of development of the body plan and signaling pathways involved in development and differentiation. These biological processes will be used to categorize inherited human diseases, understand disease mechanisms, and the current efforts to develop targeted treatments.

### HUGEN 2052 ETHCL ISS CLN & PUBHL GENTICS
**Corequisite(s):** HUGEN 2035 or HUGEN 2049

This course is designed to explore ethical issues as they relate to genetics and genomics in both the clinical and public health contexts. This seminar series provides an ethical framework for analyzing arguments in the literature and cases arising in clinical and research contexts and proceeds throughout the semester with a discussion-based format that encourages students to assume responsibility for engaging in ethical analysis.  

[New course for spring 2017, term 2174.]

### HUGEN 2070 BIOINF FOR HUMAN GENETICS
**Prerequisite(s):** HUGEN 2022 and BIOST 2041

This course focuses on manipulation and management of human genetic data, with an emphasis on association and linkage studies. The course will cover bioinformatics for genome-wide association analysis, sequence data, and integrated analyses, as well as the R statistical computing language. A key component of the course will be hands-on analyses of example data sets.  
(Note: Students should also have basic computing and programming skills.)

### HUGEN 2080 STATISTICAL GENETICS
**Prerequisite(s):** HUGEN 2022 and BIOST 2041

An advanced course which discusses the principles and practice of statistical genetics in the area of genetic epidemiology of human diseases and traits. The course will cover statistical modeling and methodology in familial aggregation, linkage analysis and association analysis; the course includes hands-on experience with current computer programs used in these research areas.  
Prequisites: HUGEN 2022, POPULATION GENETICS and BIOST 2041, BIOSTATISTICS METHODS I (and BASIC COMPUTING AND PROGRAMMING SKILLS).

### HUGEN 2601 MOLECULAR EPIDEMIOLOGY - LABORATORY
**Prerequisite(s):** EPIDEM 2600 and HUGEN 2017

This course is designed for students who have a basic understanding of human and molecular genetics, but no prior experience with molecular biology. In addition to gaining experience with the most commonly used laboratory methods, the students will process molecular data to evaluate associations and interactions between genetic/environmental risk factors for chronic disease.

### HUGEN 3010 RESEARCH & DISSERTATION PH.D.
**Credit(s):** 01.0 to 15.0

Dissertation credits for qualified doctoral students in the Department of Human Genetics.