

# MOLECULAR GENETICS AND GENOMICS (M.S.)

## Admission Requirements

Admission to the Molecular Genetics and Genomics graduate programs is contingent upon admission to the Graduate School (<http://bulletins.wayne.edu/graduate/general-information/admission/>) and the graduate programs of the School of Medicine (<http://bulletins.wayne.edu/graduate/school-medicine/programs/>). Applicants for the M.S. program must have an undergraduate degree with a major in biology or related science. Students with backgrounds in mathematics or computer science are also encouraged to apply, as are students with significant research experience. Applicants should submit a personal statement and Graduate Record Examination scores and have three letters of recommendation sent directly to the Program. International students must be proficient in English and demonstrate a satisfactory performance on the TOEFL English proficiency examination. Members of the admissions committee will interview select applicants.

The Plan A MS degree requires completion of Master's Thesis Research and Direction (MGG 8999 (<http://bulletins.wayne.edu/search/?P=MGG%208999>), Cr. 8), which includes original research and writing and defense of a thesis. The Plan B MS degree requires completion of Master's Essay in Molecular Genetics and Genomics. The MS degree requires 34 credit hours to graduate. Students in the MS program enroll in the following courses.

Code	Title	Credits
MGG 7010	Molecular Biology and Genetics	4
GS 0900	Essential Research Practices: Responsible Conduct of Research	0
FPH 7015	Biostatistics I	3
MGG 7015	Introduction to Genetics	2
MGG 7030	Functional Genomics and Systems Biology	2
MGG 7050	Bioinformatics: theory and practice	3
MGG 7091	Scientific Communication	2

Elective courses in Molecular Genetics and Genomics

Code	Title	Credits
MGG 7020	Metabolism and Disease	2
MGG 7400	Molecular Biology of Cellular Signalling	2
MGG 8010	Quantitative Data Analysis for Biological and Medical Sciences	2
MGG 8680	Advanced Topics in Molecular Genetics and Genomics	1-3
MGG 8770	Molecular Biology of Mitochondrial Disease	2

All course work must be completed in accordance with the regulations of the Graduate School (<http://bulletins.wayne.edu/graduate/general-information/academic-regulations/>) and the School of Medicine (<http://bulletins.wayne.edu/graduate/school-medicine/programs/>) governing graduate scholarship and degrees.

### MGG 6010 Molecular Biology and Genetics Cr. 4

Covers the basic aspects of molecular genetics. Students should have completed previous coursework in organic chemistry, introductory biology, and biochemistry or cell and molecular biology. Offered Yearly.  
**Restriction(s):** Enrollment is limited to Undergraduate level students.

### MGG 7010 Molecular Biology and Genetics Cr. 4

Basic aspects of molecular genetics. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7015 Introduction to Genetics Cr. 2

Forges a link between genotype and phenotype and covers topics in contemporary genetics, including Mendelian analysis, chromosomes, mitosis/meiosis, recombination, mutations and mutagenesis, linkage mapping, complementation, extranuclear inheritance, genetic interactions and epistasis, epigenetics, and developmental genetics. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7020 Metabolism and Disease Cr. 2

This course will review normal metabolic pathways and their regulation and then discuss in depth aberrant metabolism as it contributes to or causes diseases such as diabetes, cancer, and neurodegeneration. Didactic lectures will be complemented with student-based presentations of classic and current primary literature studies. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7030 Functional Genomics and Systems Biology Cr. 2

Exploration of several new technologies for determining gene function on a genome-wide scale and for integrating information into a systems-level view of biological processes. Offered Winter.

**Prerequisite:** IBS 7015 with a minimum grade of C or MGG 7010 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**Equivalent:** IBS 7030

### MGG 7040 Molecular Organelle Physiology Cr. 2

Consists of lectures covering the fundamental topics of eukaryotic cell biology, with a focus on the cellular and molecular mechanisms that underlie organelle activities and their relevance in human physiology, metabolism and diseases. Offered Yearly.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7050 Bioinformatics: theory and practice Cr. 3

This course will teach graduate students in the biological sciences how to use public web-based bioinformatics resources to analyze the structure and function of protein-coding and noncoding-RNA genes. Offered Winter.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7091 Scientific Communication Cr. 2

Advanced technical and grant-writing techniques related to the unique requirements in NIH grant proposals. Offered Winter.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7400 Molecular Biology of Cellular Signalling Cr. 2

Molecular basis of cell-cell interactions, hormonal interactions, and interactions between different cellular compartments. Offered Every Other Year.

**Restriction(s):** Enrollment is limited to Graduate level students.

### MGG 7460 Research Training in Molecular Biology and Genetics Cr. 1-8

Direct participation in laboratory research under the supervision of faculty advisor. Design and execution of experiments; analysis of laboratory data; interpretation of results and their relation to published findings. Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 8 Credits**

### MGG 7600 Advanced Human Genetics Cr. 4

Concepts, problems, and methods of human genetics at an advanced level. Offered Winter.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7640 Principles of Genetic Counseling Cr. 4**

History and evolution of genetic counseling and how it relates to clinical genetic services within the health care delivery system. Genetic counseling skills such as case preparation, interviewing techniques, and family history assessment; counseling methods. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7660 Practical Applications of Genetic Counseling Cr. 3**

Provides the foundation for identifying and applying the practical aspects of genetic counseling, including genetic testing and billing and reimbursement, to the reproductive, cardiovascular, pediatric, neurogenetic and cancer genetics clinical settings. Offered Winter.

**Prerequisite:** MGG 7640 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7710 Introduction to Medical Genetics Cr. 2**

The principles of genetics and genomics related to medical genetics and how it is integrated into clinical practice. Offered Winter.

**Prerequisite:** MGG 7010 with a minimum grade of C or IBS 7015 with a minimum grade of C

**Restriction(s):** Enrollment is limited to students with a major in Genetic Counseling.

**MGG 7740 Theory and Practice of Genetic Counseling Cr. 3**

Major theories of human behavior and application of these theories to the practice of genetic counseling. Development of interpersonal communication and psychosocial assessment skills. Offered Winter.

**Prerequisite:** MGG 7640 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7741 Advanced Genetic Counseling Theory and Practice Cr. 3**

Cultural, social, ethical, legal, professional and health-related issues that influence delivery of genetic counseling service and patient decision-making. Application of knowledge to practice. Offered Fall.

**Prerequisite:** MGG 7740 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7800 Advanced Medical Genetics Cr. 3**

Overview of medical genetic disorders taught at a level suitable for those preparing for certification examinations in clinical genetics specialties or for those whose research focus or clinical practice will have a strong emphasis in medical genetics. Offered Fall.

**Prerequisite:** MGG 7600 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7830 Human Development and Teratology Seminar Cr. 1**

Through lecture, self-study, exam, and oral presentation, students learn key aspects of fetal development, the embryological basis of birth defects and genetic dysmorphology syndromes, clinical teratology, and the associated medical terminology. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7850 Current Topics in Molecular Biology and Genetics Cr. 2**

Current literature in molecular biology and genetics; one student makes oral presentation with student and faculty discussion. Offered Intermittently.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 4 Credits**

**MGG 7860 Evaluating the Health Care Literature Cr. 1**

Reading and analysis of health care literature with focus on research articles. Principles of health research design and analysis; skills for critical assessment of medical literature. Offered Winter.

**Restriction(s):** Enrollment is limited to students with a major, minor, or concentration in Genetic Counseling; enrollment is limited to Graduate level students.

**MGG 7880 Genetic Counseling Seminar Cr. 1-6**

Discussion format; issues relevant to medical genetics and the genetic counseling process. Presentations by students and invited faculty.

Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 6 Credits**

**MGG 7881 Senior Seminar in Genetic Counseling Cr. 2**

Preparation for the transition to from student to practicing professional in the areas of the job search, billing and reimbursement, clinical supervision, developing effective educational programs, advocacy, and other relevant areas. Offered Winter.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 7998 Master's Essay in Molecular Genetics and Genomics Cr. 3**

Students will write a scholarly document (essay) based upon a topic of ongoing research in genetics or genomics. Offered Every Term.

**Restriction(s):** Enrollment limited to students with a class of Candidate Masters; enrollment is limited to students with a major in Molecular Genetics & Genomics.

**MGG 7999 Master's Research Project and Direction Cr. 1-5**

Student conducts hypothesis-driven research and prepares written manuscript and oral presentation. Offered Every Term.

**Restriction(s):** Enrollment is limited to students with a major, minor, or concentration in Genetic Counseling; enrollment is limited to Graduate level students; enrollment limited to students in a MS in Genetic Counseling degree.

**Repeatable for 5 Credits**

**MGG 8010 Quantitative Data Analysis for Biological and Medical Sciences Cr. 2**

Covers several of the statistical concepts and data analytic skills needed to succeed in data-driven life science research, beginning with relatively basic concepts related to computing p-values and advancing to topics related to analyzing high-throughput data. Offered Every Other Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 8680 Advanced Topics in Molecular Genetics and Genomics Cr. 1-3**

Offers an in-depth study of concepts and research in specific fields.

Offered Intermittently.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 12 Credits**

**MGG 8770 Molecular Biology of Mitochondrial Disease Cr. 2**

Mitochondrial structure and function; mitochondria as sites of phenomena such as cell death, generation of free radicals, and production of most cellular energy. Traditional mitochondrial diseases (e.g., caused by mutations in the mitochondrial DNA); more recent findings of involvement of mitochondria in pathologies such as cancer, diabetes, aging, and neurodegenerative diseases. Offered Fall.

**Prerequisite:** IBS 7015 with a minimum grade of C or MGG 7010 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 8998 Genetic Counseling Internship Cr. 1-8**

Students work in variety of genetics and subspecialty clinics as well as laboratory settings, under supervision of genetic counselor/geneticist. Offered Every Term.

**Restriction(s):** Enrollment is limited to students with a major, minor, or concentration in Genetic Counseling; enrollment is limited to Graduate level students; enrollment limited to students in a MS in Genetic Counseling degree.

**Repeatable for 8 Credits**

**MGG 8999 Master's Thesis Research and Direction Cr. 1-8**

Student conducts research and prepares written presentation, designed to test specific hypothesis dealing with method, concept, or data. Offered Every Term.

**Restriction(s):** Enrollment limited to students with a class of Candidate Masters; enrollment is limited to students with a major, minor, or concentration in Molecular Biology and Genetics; enrollment is limited to Graduate level students; enrollment limited to students in a Master of Science degree.

**Repeatable for 8 Credits**

**MGG 9990 Pre-Doctoral Candidacy Research Cr. 1-8**

Research in preparation for doctoral dissertation. Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 12 Credits**

**MGG 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Prerequisite:** MBG 9991 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Prerequisite:** MBG 9992 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Prerequisite:** MBG 9993 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**MGG 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0**

Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Course Material Fees:** \$384.7

**Repeatable for 0 Credits**