

PH.D. IN HUMAN GENETICS AND GENOMICS

Curriculum Requirements

Code	Title	Credit Hours
Biomedical Science Core		
PIB 700	Journal Club	1
PIB 701	Introduction to Biomedical Sciences	5
PIB 702	Scientific Reasoning	3
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	1-5
PIB 780	Responsible and Ethical Conduct of Research	1
PIB 782	Professional Development: Skills for Success I	1
PIB 783	Professional Development: Skills for Success II	1
PIB 785	PIBS Bioinformatics Workshop	1
PIB 830	Doctoral Dissertation	1
Human Genetics & Genomics Required Courses		
HGG 601	Seminar/Journal Club	1
HGG 630	Variation and Disease ((taken during PIBS year))	2
HGG 631	Genes in Populations	3
HGG 640	Family Studies and Genetic Analysis ((taken during PIBS year))	2
HGG 660	Bioinformatics Theory and Practice	3
HGG 680	Genome Ethics and Public Policy	3
HGG 681	Human Genetics Clinical Rotation	1
HGG 689	Human Genetics and Genomics Teaching Practicum	1
Computational / Molecular Track Course Requirements ²		3-6
HGG 621	Design and Analysis of Human Genomic Studies ³	
EPH 602	Biostatistics II ³	
HGG 650	Advanced Topics in Molecular Genetics ⁴	
Research Credits		18-24
HGG 830	Doctoral Dissertation - Pre-Candidacy	
HGG 840	Doctoral Dissertation - Post Candidacy	
HGG 850	Research in Residence	
Total Credit Hours		55-68

¹ HGG 601 is required for all HGG students - 1 semester credit each fall and spring semester.

² All students must complete course requirements for either Computational or Molecular track.

³ HGG 621 / EPH 602: Required for Computational Track students only (may be taken as elective otherwise).

⁴ HGG 650: Required for Molecular Track students only (may be taken as elective otherwise)..

* The molecular track requires a minimum of 62 credits. The computational track requires a minimum of 65 credits.

Program Plan

The PhD in Human Genetics and Genomics (HGG) curriculum allows candidates to pursue a track in *molecular* or *computational* genetics by their second year of training; however, all students complete a core curriculum in the first three years of graduate study. Students will also participate in seminars and journal clubs in the fall and spring semesters, through all years of study.

First-year students interested in Human Genetics and Genomics are strongly encouraged to take two introductory HGG short courses in the spring semester: HGG 630 – Variation and Disease and HGG 640 – Family Studies and Genetic Analysis which are requirements for completing the HGG degree. Courses in computational / quantitative skills, including biostatistics and bioinformatics will also form part of the first year PIBS curriculum. Each PIBS student completes at least three lab rotations of nine weeks each and chooses a dissertation laboratory (and graduate program) during the latter half of the spring semester. If necessary a fourth rotation may be possible, and in this case a laboratory choice may be deferred until June. All first year students will make short presentations to a group of faculty after each lab rotation. For these presentations the students will be divided into four groups with related research interests.

After choosing a mentor and laboratory at the end of the first year, a student becomes a member of the HGG Program. Students select and follow a track in *molecular* genetics or *computational* genetics in the first semester of year 2. At this point course requirements differ slightly between these two paths: Students in the *molecular* genetics track take Advanced Topics in Molecular Genetics (HGG 650) in the second semester, while the *computational* genetics track students take a second course in biostatistics (EPH 602) and a course in Design and Analysis of Human Genomic Studies (HGG 621).

In addition to the required core courses, all students participate in a clinical rotation and serve one semester as a teaching assistant for a core course any time after passing the Qualifying Examination.

It is expected that on average, students will complete the program in five years. Please review the complete course descriptions on the COURSE tab above. The general core curriculum is shown in the Plan of Study below:

Plan of Study - Molecular Track

Year One		
Fall		Credit Hours
PIB 701	Introduction to Biomedical Sciences	1-5
PIB 702	Scientific Reasoning	1-3
PIB 731	Laboratory Research ((1 credit per lab rotation))	2
PIB 700	Journal Club	1
PIB 780	Responsible and Ethical Conduct of Research	1
PIB 782	Professional Development: Skills for Success I	1
Credit Hours		7-13
Spring		
PIB 700	Journal Club	1
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	1-2
PIB 783	Professional Development: Skills for Success II	1
HGG 630	Variation and Disease (HGG program short course - Spring I)	2
HGG 640	Family Studies and Genetic Analysis (HGG program short course - Spring II)	2
Credit Hours		10-11
Summer		
PIB 830	Doctoral Dissertation	1
Credit Hours		1
Year Two		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 631	Genes in Populations	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		5
Spring		
HGG 601	Seminar/Journal Club	1
HGG 650	Advanced Topics in Molecular Genetics (Molecular Track Requirement)	3
HGG 660	Bioinformatics Theory and Practice	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		8
Summer		
HGG 680	Genome Ethics and Public Policy	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		4
Year Three		
Fall		
HGG 601	Seminar/Journal Club	1

HGG 830	Doctoral Dissertation - Pre-Candidacy	1
	Credit Hours	2
Spring		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	2
Summer		
HGG 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	1
Year Four		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 681	Human Genetics Clinical Rotation (Can be completed anytime after passing QE and Admission to Candidacy is achieved (Year 3, 4, or 5))	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
	Credit Hours	4
Spring		
HGG 601	Seminar/Journal Club	1
HGG 689	Human Genetics and Genomics Teaching Practicum (Can be completed anytime after passing QE and Admission to Candidacy is achieved (Year 3, 4, or 5))	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
	Credit Hours	4
Summer		
HGG 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	1
Year Five		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
	Credit Hours	3
Spring		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
HGG 850	Research in Residence (Final Semester)	1
	Credit Hours	4
	Total Credit Hours	56-63

Plan of Study - Computational Track

Year One		Credit Hours
Fall		
PIB 701	Introduction to Biomedical Sciences	1-5
PIB 702	Scientific Reasoning	1-3
PIB 731	Laboratory Research ((1 credit per lab rotation))	2
PIB 700	Journal Club	1
PIB 780	Responsible and Ethical Conduct of Research	1
PIB 782	Professional Development: Skills for Success I	1
	Credit Hours	7-13
Spring		
PIB 700	Journal Club	1
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	1-2

PIB 783	Professional Development: Skills for Success II	1
HGG 630	Variation and Disease (HGG program short course - Spring I)	2
HGG 640	Family Studies and Genetic Analysis (HGG program short course - Spring II)	2
Credit Hours		10-11
Summer		
PIB 830	Doctoral Dissertation	1
Credit Hours		1
Year Two		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 621	Design and Analysis of Human Genomic Studies ((Computational Track Requirement))	3
HGG 631	Genes in Populations	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		8
Spring		
HGG 601	Seminar/Journal Club	1
HGG 660	Bioinformatics Theory and Practice	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
EPH 602	Biostatistics II (Computational Track Requirement)	3
Credit Hours		8
Summer		
HGG 680	Genome Ethics and Public Policy	3
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		4
Year Three		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 830	Doctoral Dissertation - Pre-Candidacy	1
Credit Hours		2
Spring		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	1
Credit Hours		2
Summer		
HGG 840	Doctoral Dissertation - Post Candidacy	1
Credit Hours		1
Year Four		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 681	Human Genetics Clinical Rotation (Can be completed anytime after passing QE and Admission to Candidacy is achieved (Year 3, 4, or 5))	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
Credit Hours		4
Spring		
HGG 601	Seminar/Journal Club	1
HGG 689	Human Genetics and Genomics Teaching Practicum (Can be completed anytime after passing QE and Admission to Candidacy is achieved (Year 3, 4, or 5))	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
Credit Hours		4

Summer		
HGG 840	Doctoral Dissertation - Post Candidacy	1
Credit Hours		1
Year Five		
Fall		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
Credit Hours		3
Spring		
HGG 601	Seminar/Journal Club	1
HGG 840	Doctoral Dissertation - Post Candidacy	2
HGG 850	Research in Residence (Final Semester)	1
Credit Hours		4
Total Credit Hours		59-66

Mission

The Interdepartmental PhD Program in Human Genetics and Genomics (HGG) aims to train scientists broadly in areas of human genetics and genomics relevant to human health and disease. Human genetics is a multidisciplinary field that requires training in three core competencies: clinical, molecular, and statistical genetics. This broad training differentiates human genetics graduate programs from other programs in molecular biology, biochemistry, epidemiology, or statistics that focus training on one of the three core areas. The mission of the HGG is to prepare the next generation of genomic scientists to conduct research in molecular, statistical and clinical genetics and to translate these research results into improved medical care and public health interventions.

Goals

Student Learning Outcomes

- Students will demonstrate an overall knowledge and understanding of the core concepts in Human Genetics and Genomics, including the essential skills to conduct research in Human Genetics and Genomics.
- Students will demonstrate critical thinking skills, the capability to develop hypotheses, and the ability to evaluate their hypotheses, paying attention to responsible conduct of research as appropriate.
- Students will demonstrate the ability to write effective scientific reports and to present scientific results orally.