

**JEFFERSON COLLEGE  
OF  
BIOMEDICAL SCIENCES**

**2017-2018  
CATALOGUE**

## Notice of Equal Opportunity

Thomas Jefferson University is committed to providing equal educational and employment opportunities for all persons without regard to race, color, national or ethnic origin, marital status, religion, sex, sexual orientation, gender identity, age, disability or veteran's status. The consideration of factors unrelated to a person's ability, qualifications and performance is inconsistent with this policy. Any person having inquiries or complaints concerning Thomas Jefferson University's compliance with Title VI, Title IX, the Age Discrimination Act of 1975, the Americans with Disabilities Act, or Section 504 of the Rehabilitation Act is directed to contact their Student Affairs Dean or Human Resources – Employee Relations, who have been designated by Thomas Jefferson University to coordinate the institution's efforts to comply with the these laws. Any person may also contact the Assistant Secretary for Civil Rights, U.S. Department of Education, Washington, D.C. 20202, or the Director, U.S. Department of Education, Office for Civil Rights, Region Three, Philadelphia, Pennsylvania, regarding the University's compliance with the equal opportunity laws.

## Provisions of this Catalogue

The intent of this catalogue is to describe the academic programs of the Jefferson College of Biomedical Sciences for the 2016 - 2017 academic year. It is not intended to be a binding, irrevocable contract between Thomas Jefferson University and the student. The institution reserves the right to alter without notice its policies, procedures, fees, and academic offerings as is deemed expedient and necessary. JCBS academic policies are contained within the JCBS Student Handbook available at

<http://www.jefferson.edu/content/dam/university/biomedical-sciences/student-guide/policies/JCBS%20Handbook%202016-2017%20-%20PDF.pdf>.

Additional general university-wide policies are available on the Thomas Jefferson University Student Handbook website at

<http://www.jefferson.edu/university/academic-affairs/schools/student-affairs/student-handbooks.html>

For more current information about our graduate programs, consult our Jefferson College of Biomedical Sciences website at:

<http://www.jefferson.edu/university/biomedical-sciences.html>

*Thomas Jefferson University is fully accredited by the Commission of Higher Education of the Middle States Association of Colleges and Schools.*

*Revised August 30, 2017*

# **Jefferson College of Biomedical Sciences**

## **Catalogue**

**Thomas Jefferson University  
2017-2018**

**Jefferson College of Biomedical Sciences  
1020 Locust Street  
Philadelphia, PA 19107-6799  
215-503-4400**

**<http://www.jefferson.edu/university/biomedical-sciences.html>**

## Table of Contents

<b>Notice of Equal Opportunity</b>	<b>Page 2</b>
<b>Provisions of this Handbook</b>	<b>Page 2</b>
<b>Table of Contents</b>	<b>Page 4</b>
<b>PhD Programs</b>	<b>Page 6</b>
<b>MS Programs</b>	<b>Page 26</b>
<b>Graduate Certificate Programs</b>	<b>Page 46</b>
<b>Postbaccalaureate Pre-Professional Program</b>	<b>Page 58</b>

# **Thomas Jefferson University**

## **Jefferson College of Biomedical Sciences**

The Jefferson College of Biomedical Sciences of Thomas Jefferson University, originally established July 1, 1969 as the Jefferson College of Graduate Studies, is responsible for the planning, operation, and administration of educational programs of Thomas Jefferson University that lead to graduate degrees in the biomedical sciences, including the Master of Science and Doctor of Philosophy degrees. It is also responsible for stimulating, establishing, and coordinating research and post-baccalaureate educational projects that cross traditional school boundaries.

The Jefferson College of Biomedical Sciences offers Ph.D. programs in biochemistry and molecular pharmacology; cell and developmental biology; genetics, genomics and cancer biology; immunology and microbial pathogenesis; and neuroscience. An M.D./Ph.D. program is offered jointly by the Jefferson College of Biomedical Sciences and Sidney Kimmel Medical College. The College of Biomedical Sciences also offers M.S. programs in biomedical sciences, cell and developmental biology, clinical research, forensic toxicology, genetic counseling, microbiology, and pharmacology. Additionally the College offers graduate certificate programs in clinical research and trials: implementation, clinical research: operations, human clinical investigation: theory, infectious disease control, and patient-centered research.

For individuals seeking to complete their basic science requirements in preparation for entrance to medical and other health professional schools, the Jefferson College of Biomedical Sciences offers a Postbaccalaureate Pre- Professional Program (P4). Both a two-year as well as a one-year accelerated track are available. The curriculum includes undergraduate courses with lectures and labs in General Chemistry, Biology, Organic Chemistry, and Physics, as well as professional experience and advising obtained through the courses Healthcare Practicum and The Art and Science of Healthcare. A formal course in MCAT preparation is also a component of the program.

The Jefferson College of Biomedical Sciences is also the administrative home of the Office of Postdoctoral Affairs.

The administrative offices of the Jefferson College of Biomedical Sciences are located on the mezzanine floor of Jefferson Alumni Hall, 1020 Locust Street. The Office of the Dean and Office of Finance and Business Planning reside in suite M-63. The Office of the Postbaccalaureate Pre-Professional Program is in room M-60. The Office of Admissions, Office of Academic Services, and Office of Postdoctoral Affairs are located in suite M-46. The Director of Admissions and staff handle all materials of applicants seeking admission to the College. Enrollment and all academic records of matriculated and non-degree students are administered by the University Registrar and staff, located in the Curtis Building, 1015 Walnut Street. The

University Financial Aid Office, located on the 1st floor of the Curtis Building, assists students with student loans and other financial matters.

The Graduate Council has jurisdiction over academic policy, acting on behalf of the Graduate Faculty. Its membership consists of representatives of the graduate degree programs. Under the chairmanship of the Dean, the Council approves new programs and courses, and acts on student requests and petitions regarding academic matters. Each Ph.D. and M.S. degree program is supervised by a faculty committee, headed by a program director.

The Office of Postdoctoral Affairs within the College of Biomedical Sciences oversees matters related to postdoctoral training, including establishment of personnel policies for the postdoc population, coordinating career seminars and extracurricular activities.

# PhD Programs

## **PhD Programs**

Reflecting the increasingly interdisciplinary nature of biomedical research, The Jefferson College of Biomedical Sciences utilizes a Targeted Flexible Entry Pathway for admissions to our PhD Programs in the Biomedical Sciences.

This allows students to explore research opportunities across multiple programs and research areas and participate in a first year curriculum that includes core fundamentals essential to all biomedical fields. In addition, students select laboratory rotations and more specialized advanced courses during their first year that are targeted to their research interests and career objectives.

By the end of the first year, students choose their thesis advisor and matriculate into one of the below PhD programs for their further studies.

### **Biochemistry & Molecular Pharmacology**

The PhD Program in Biochemistry & Molecular Pharmacology trains students to become talented research scientists with a multidisciplinary approach, providing strong basic knowledge of biochemistry, molecular biology, cell biology and genetics.

### **Cell Biology & Regenerative Medicine**

The PhD Program in Cell Biology & Regenerative Medicine is intended for students of outstanding ability who are preparing for a career that includes research in cell biology, developmental biology or the pathobiology of disease.

### **Genetics, Genomics & Cancer Biology**

The PhD Program in Genetics, Genomics & Cancer Biology takes a multidisciplinary approach to training students to become independent scientific investigators by providing a comprehensive knowledge base in genetics, biochemistry, molecular and cell biology and bioinformatics.

### **Immunology & Microbial Pathogenesis**

Comprehensive training in Immunology & Microbial Pathogenesis with strong emphasis placed on the dynamic relationship between host and pathogen.

### **Neuroscience**

The interdisciplinary graduate program in Neuroscience at Thomas Jefferson University is directed toward developing strong research scientists in areas of basic and translational neuroscience.



## **PhD Program in Biochemistry and Molecular Pharmacology**

The PhD Program in Biochemistry and Molecular Pharmacology (BMP) employs a multidisciplinary approach to train students in the rigors of experimental biomedical sciences and to prepare them for independent research careers. The curriculum is designed to convey the fundamentals of biochemistry, molecular biology, structural biology, molecular pharmacology, cell biology and genetics. The education is reinforced at the bench in advanced research laboratories broadly grouped into three research emphases: Molecular & Cellular Pharmacology, Chemical & Structural Biology and Molecular Biology & Gene Regulation. Students graduating from this program will have the comprehensive scientific foundation and technical expertise to excel in all areas of biomedical research.

In addition to extensive basic equipment found in each laboratory, students have access to numerous specialized resources, including genomic and multiplex sequencing, microarray analysis, flow cytometry and cell sorting, confocal and TIRF microscopy, X-ray crystallography and macromolecular characterization (surface plasmon resonance, calorimetry, circular dichroism and fluorescence spectroscopy).

### **Program of Study**

In the first year of the program, students complete Foundations in Biomedical Sciences, a course that lays the foundation in Biochemistry, Cell Biology, Genetics and Molecular Biology. They then proceed to basic courses in Biochemistry and Molecular Pharmacology, followed by more advanced specialized training, generally geared to meet the individual needs of students as they move into the specific areas of their thesis research.

First year students take three integrated courses that impart a broad knowledge base in the structure-function relationships of macromolecules, the utilization of genetic information in living systems and the pathways of intracellular signal transduction that govern tissue development, cellular differentiation and cell death. These three courses are augmented by advanced electives in selected topics chosen by the student in consultation with their academic and research advisers. Students are given flexibility in designing a curriculum that meets their scientific interests and research needs.

In addition to coursework, first year students engage in research during three 10-week rotations in the laboratories of program faculty. These rotations not only serve as introductions to different experimental systems and approaches, but also give students a chance to sample different research environments in their search for a thesis laboratory. PhD thesis research involves meaningful, critical thinking and executing ideas in the laboratory through the use of sound scientific method. Students are guided by their mentors and a thesis research committee that meets on a routine basis throughout the training experience.

The PhD degree requires a minimum of 180 credits. At least 54 credits must be obtained from formal courses (including research rotations and seminars), of which a minimum of 18 credits must be in disciplines other than the major. The BMP Program requires the completion of nine credits of seminar. The Graduate School requires successful completion of GC 640 Research Ethics: The Responsible Conduct of Research, of all doctoral students.

Course requirements are usually completed by the end of the second year, and students spend an average of another two to three years to complete their individual thesis projects. Throughout their experience, students take part in weekly journal clubs, attend seminars, and have many opportunities to present and discuss their work both with faculty and students at Thomas Jefferson University and at national scientific meetings. It is expected that most students will complete their PhD degree about five years after starting the program.

### Contact Us

Michael Root, MD, PhD  
Director and Professor, Biochemistry & Molecular Biology  
233 South 10th Street  
Room 802, Bluemle Life Sciences Building (BLSB)  
Philadelphia, PA 19107  
Phone: (215) 503-4564

Joanne Balitzky, MS  
Program Coordinator  
233 South 10th Street  
Room 910, Bluemle Life Sciences Building (BLSB)  
Philadelphia, PA 19107  
Phone: (215) 503-6687

### **Curriculum**

Note: Credits for the 910, 920 and 930 Research courses and Electives are variable. Assign credits to Research and/or Electives to equal the target number of credits for each semester.

### Year One

#### Fall Semester (20 Credits)

Course Title and Credits

GC 550 Foundations of Biomedical Science, 10  
BI 511 Research Rotation 1, 3  
BI 710 Seminar in Biochemistry & Molecular Pharmacology, 1

BI 910 Research, Variable

Spring Semesters (30 Credits)

BI 521 Research Rotation 2, Spring I, 3

BI 525 Biochemistry – Genetics Information Transfer, Spring I, 3

PR 613 Macromolecular Structure, Spring I, 3

GC 640 Research Ethics, Spring I, 1

BI 720 Seminar in Biochemistry & Molecular Pharmacology, Spring I, 1

BI 725 Journal Club, Spring I, 1

Elective, Spring II, Variable

BI 531 Research Rotation 3, Spring II, 3

NS 740 Applied Statistics, Spring II, 2

BI 730 Seminar in Biochemistry & Molecular Pharmacology, Spring II, 1

BI 735 Journal Club Spring II, 1

BI 920 Research, Spring I - Spring II, Variable

Summer Semester (10 Credits)

BI 930 Research, Variable

Year Two

Fall Semester (20 Credits)

Elective, Variable

GC 730 Planning & Writing a Research Grant, 1

BI 710 Seminar in Biochemistry & Molecular Pharmacology, 2

BI 715 Journal Club, 1

BI 910 Research, Variable

Spring Semesters (30 Credits)

Elective, Spring I, Variable

BI 720 Seminar in Biochemistry & Molecular Pharmacology, Spring I, 2

BI 725 Journal Club, Spring I, 1

Elective, Spring II, Variable

BI 730 Seminar in Biochemistry & Molecular Pharmacology, Spring II, 2

BI 735 Journal Club, Spring II, 1

BI 920 Research, Spring I - Spring II, Variable

Summer Semester (10 Credits)

BI 930 Research, Variable

Common Electives by Course Title, Semester and Credits

BI 612 Advanced Topics in Protein Function and Dysfunction, Fall , 3  
BI 614 Macromolecular Function, Spring II, 3  
BI 535 Biochemistry-Metabolism, Spring II, 3  
PR 522 General Pharmacology, Fall, 3  
GC 630 Fundamentals of Clinical Trials, Fall , 3  
GC 645 Genomics and Bioinformatics, Spring II , 3  
GC 665 Cell Signaling, Spring II, 4  
GE 612 Genetics of Model Organisms, Spring I, 3  
GE 636 Regulation of Cell Cycle & Apoptosis, Fall , 3  
GE 637 Advanced Human Genetics, Spring II, 3  
GE 651 Pathobiology of Cancer, Spring I, 2  
GE 652 Molecular Basis of Cancer, Spring I , 2  
CB 615 Developmental Biology I – Embryology, Fall , 3  
CB 625 Mechanisms of Development, Spring I, 3  
IMP 505A Fundamentals of Immunology, Spring I, 2  
IMP 505B Immune System in Health & Disease, Spring I, 2  
NS 700 Cellular Neurophysiology, Spring I , 4  
NS 715 Molecular & Cellular Neuroscience, Spring II , 3

## **PhD Program in Cell Biology & Regenerative Medicine**

The Cell Biology & Regenerative Graduate Program (CBRM) seeks students with a strong interest and background in science and engineering, particularly cell biology, biochemistry, developmental biology and bioengineering. Students are offered comprehensive coursework, seminars, journal clubs and research discussion groups to further enrich their academic experience. The Graduate Program boasts an outstanding faculty and state-of-the-art research facilities, which offers students a wide range of exciting and advanced research opportunities. Students' research and education is supported through NIH training grants, endowed fellowships and investigator initiated research grants. Graduates of the CBRM program have successfully pursued career options both in academia and industry, with several obtaining faculty positions after post-doctoral training. There are five major areas within the program:

- Cancer Cell Biology
- Computational Biology & Systems Biology
- Mitochondrial Metabolism & Pathology
- Musculoskeletal, Connective Tissue & Matrix Biology
- Neurodegenerative Disorders & Vision
- Tissue Engineering & Regenerative Medicine

In 2016-2017, there are 23 PhD students and 5 MD/PhD students in the Cell Biology & Regenerative Medicine Program. A low student-to-faculty ratio is maintained to ensure an optimal learning environment for our students. The student body is diverse. There is a Graduate Student Association (GSA) that coordinates many cultural and recreational activities as well organizing community projects.

### **Program of Study**

Prior to registering for their first academic year, each new graduate student meets with the Program Directors to determine an initial course of study. First-year pre-doctoral students are also offered the opportunity to begin their training during the summer preceding registration for their first semester of classes.

The curriculum for the Cell Biology & Regenerative Medicine (CBRM) Program consists of two parts. The first is an interdisciplinary core of courses, which each student is required to successfully complete. The second part is comprised of additional graduate courses deemed necessary by the student's research committee. These are not limited to courses offered through the CBRM Program, and may be selected from the course offerings available through any of our graduate programs.

A minimal requirement for the Jefferson College of Biomedical Sciences is the successful completion of 180 total graduate credits, including research. Of these, there should be no less than 54 course credits of graduate course work, 26 of which must be outside the area of Cell Biology & Regenerative Medicine.

Students spend a substantial portion of their first year and part of their second year in course work. A course in the Foundations of Biomedical Science, GC 550, is required of all incoming graduate students. This course provides a solid introduction to biochemistry, cell biology and genetics. Program requirements include courses in cell biology, biochemistry, molecular biology, developmental biology and pathology. Advanced courses can be selected from either the CBRM program or other programs in the Jefferson College of Biomedical Sciences. Courses in Writing a Research Grant and Statistical Analysis are required of all graduate students at the University.

### Contact Us

Dr. Nancy Philp  
Co-Director, Cell Biology & Regenerative Medicine Graduate Program  
1020 Locust Street  
Room 263A, Jefferson Alumni Hall  
Philadelphia, PA 19107-6799  
Phone: (215) 503-7854  
E-mail: [nancy.philp@jefferson.edu](mailto:nancy.philp@jefferson.edu)

Dr. Makarand Risbud  
Co-Director, Cell Biology & Regenerative Medicine Graduate Program  
1015 Walnut Street  
Suite 501, Curtis Building  
Philadelphia, PA 19107-6799  
Phone: (215) 955-1063  
E-mail: [makarand.risbud@jefferson.edu](mailto:makarand.risbud@jefferson.edu)

Danielle Park  
Education Coordinator II  
1020 Locust Street  
Suite 336, Jefferson Alumni Hall  
Philadelphia, PA 19107-6799  
Phone: (215) 503-5791  
E-mail: [Danielle.Park@jefferson.edu](mailto:Danielle.Park@jefferson.edu)

### **Curriculum**

#### Required Courses listed by Course Title, Semester and Credits

CB 610/620/630 Research Rotations (first year PhD), Fall, Spring I & II, Variable  
CB 616/626/636 Current Topics: Journal Club and Research in Progress (R.I.P),  
Fall, Spring I & II, 1 each

CB 710/720/730 Seminar: Grand Rounds, Showcase Seminars, MPM's, Fall, Spring I &  
II, 1 each

CB 910/920/930 Research, Fall, Spring I & Summer, Variable  
GC 529 Lab Animal Science, Spring II, 2  
GC 550 Foundations in Biomedical Sciences, Fall, 10  
GC 640 Research Ethics, Fall, 1  
GC 645 Computational Genomics and Bioinformatics I, Spring II, 3  
GC 660 Statistical Methods, Fall, Spring I & II, 3  
GC 665 Cell Signaling, Spring II, 4  
GC 720 Scientific Writing, Summer, 2  
GC 730 Planning & Writing Research Grant, Spring II, 1  
TE 624 Extracellular Matrix, Fall, 2

Suggested Electives listed by Course Title, Semester and Credits

BI 525 Genetic Information, Spring I, 3  
BI 612 Advance Topic Protein Function & Dysfunction, Fall, 3  
CB 570 Pathological Aspects of Disease, Summer, 3  
CB Developmental Biology I – Embryology, Fall, 3  
CB 635 Gene Environment Interactions, Birth Defects & Disease, Spring II, 3  
CB 740 Mechanisms in Personalized Medicine\*, Fall, 1  
GC 630 Fund-Clinical Trials, Spring I, 3  
GC 636 Principles of Care Management-Diverse BM Careers, Spring I-Spring II, 2  
GE 612 Genetics of Model Organism, Spring II, 3  
GE 637 Advanced Human Genetics, Spring I, 3  
GE 651 Pathobiology of Cancer, Spring I, 2

\*The course presentations for CB 740 are from September to May, if you register you will have to present.

## **PhD Program in Genetics, Genomics & Cancer Biology**

The PhD Program in Genetics, Genomics & Cancer Biology provides aspiring students with the background, training and experience necessary to launch careers as independent scientific investigators and scholars in the field of molecular genetics of disease, genomics and cancer biology. The Program is designed to take a multidisciplinary approach to the field by providing the student with a strong basic knowledge of genetics, biochemistry, cell biology and molecular biology, with additional exposure to other areas of related interest. Additionally, the Program provides sufficient flexibility so that graduating students can pursue research careers in either an academic or industrial setting.

Research laboratories are primarily located in the Bluemle Life Sciences Building. In addition to extensive basic equipment and facilities, the Program provides access to numerous specialized resources. These include facilities for cancer genomics, peptide synthesis and sequencing, cell sorting by flow cytometry, protein purification and characterization, microarray analyses and biomolecular imaging.

### **Program of Study**

The Program is focused on research training, which begins in the first year as rotations in different laboratories, and continues as the student begins potential thesis projects in a chosen mentor's laboratory. The PhD thesis research involves critical thinking and executing ideas in the laboratory through the use of sound scientific methods. Students are guided by their mentors and a selected thesis research committee, which meets on a routine basis throughout the training experience.

In the first year, students complete Foundations in Biomedical Sciences, a course that provides a foundation in Biochemistry, Cell Biology, Genetics and Molecular Biology. They then proceed to basic courses in Genetics, followed by more advanced specialized training. Course work during the first year is enhanced by three laboratory rotations, in which students learn advanced laboratory techniques and the principles of sound experimental methods.

At the end of the first year, the student selects a faculty supervisor for his or her thesis research. During the second year, the student takes specialized courses that focus on different aspects of the genetics of cancer and human diseases, including the molecular genetics of growth control, oncogene activation, tumor suppression, regulation of gene expression, receptor-ligand interactions and signal transduction. Additional credit hours of elective courses are available, and are generally geared to meet the individual needs of students as they move into the specific areas of their thesis research.

Throughout their experience, students take part in weekly journal clubs and attend regularly scheduled faculty and student seminars in molecular genetics and cancer biology as well as seminars given by invited speakers. Students are also trained and encouraged to present their work at both in-house and outside scientific meetings.



Course requirements are completed by the end of the second year and students spend an average of another two to three years to complete their individual thesis projects.

Typical areas of research include: functional genomics and epigenetics, analysis of the human genome, genetics of cancer susceptibility, genetics of the immune system, molecular genetics of animal models of human disease, molecular genetics of hematopoietic neoplasias and solid tumors, mechanisms of altered growth regulation by oncogenes and tumor suppressor genes, transcriptional regulation, chromatin organization and the control of gene expression, translational research, molecular therapeutics and personalized medicine.

## Contact Us

Joanne Balitzky, MS  
Graduate Programs Coordinator  
233 South 10th Street  
Bluemle Life Sciences Building (BLSB), Room 910  
Philadelphia, PA 19107  
Phone: (215) 503-6687

Lucia Languino, PhD  
Program Director  
233 South 10th Street  
Bluemle Life Sciences Building (BLSB), Suite 506  
Philadelphia, PA 19107  
Phone: (215) 503-3442

## Curriculum

### Year One

#### Fall Semester (20 Credits)

GC 550 Foundations of Biomedical Science, 10  
GE 710 Current Literature I, 1  
GE 715 Seminar I, 1  
GE 511 Lab Rotation 1, 3  
GE 910 Research, 5

#### Spring Semesters (30 Credits)

BI 525 Biochemistry-Genetics Information Transfer, Spring I, 3  
GC 640 Ethics, Spring I, 1  
GE 637 Advanced Human Genetics, Spring I, 3

GE 720 Current Literature II, Spring I, 1  
GE 725 Seminar II, Spring I, 1  
GE 521 Lab Rotation 2 , Spring I, 3  
GE 612 Genetics of Model Organisms offered every other year, Spring II, 3  
GE 730 Current Literature III, Spring II, 1  
GE 725 Seminar III, Spring II, 1  
GE 531 Lab Rotation 3, Spring II, 3  
NS 740 Applied Statistics in Neuroscience , Spring II, 2  
GE 920 Research, Spring I - Spring II, Variable

Summer Semester (10 Credits)

GE 930 Research, Variable

Year Two

Fall Semester (20 Credits)

GE 636 Regulation of Cell Cycle and Apoptosis, 3  
Elective, Variable  
GC 730 Planning & Writing a Research Grant, 1  
GE 710 Current Literature I, 1  
GE 715 Seminar I, 1  
GE 910 Research, Variable

Spring Semesters (30 Credits)

GE 652 Molecular Basis of Cancer, Spring I, 2  
GE 651 Pathobiology of Cancer, Spring I, 2  
GE 720 Current Literature II, Spring I, 1  
GE 725 Seminar II, Spring I, 1  
Elective, Spring I, Variable  
GE 612 Genetics of Model Organisms offered every other year, Spring II, 3  
GC 645 Genomics & Bioinformatics, Spring II, 3  
GE 730 Current Literature II, Spring II, 1  
GE 735 Seminar II, Spring II, 1  
Elective, Spring II, Variable  
GE 920 Research, Spring I - Spring II, Variable

Summer Semester (10 Credits)

GE 930 Research, Variable

Year Three

Fall Semester (20 Credits)

GE 710 Current Literature I, 1  
GE 715 Seminar I, 1  
GE 910 Research, Variable

Spring Semesters (30 Credits)

GE 720 Current Literature II, Spring I, 1  
GE 725 Seminar II, Spring I, 1  
GE 730 Current Literature III, Spring I, 1  
GE 735 Seminar III, Spring I, 1  
GE 920, Spring I - II , Variable

Summer Semester

GE 930 Research, Variable

## **PhD Program in Immunology & Microbial Pathogenesis (IMP)**

The PhD Program in Immunology & Microbial Pathogenesis (IMP) is designed to take a multidisciplinary approach to the field by providing the student with a strong, basic knowledge of immunology, microbiology, biochemistry, cell biology and molecular biology, with additional exposure to other areas of related interest. The ultimate goal of this program is to provide aspiring students with the background, training and experience necessary to launch careers as independent scientific investigators.

The Program is focused on research training, which begins in the first year as rotations in different laboratories and continues as the student begins potential thesis projects in a chosen mentor's laboratory. The PhD thesis research involves meaningful, critical thinking and executing ideas in the laboratory through the use of sound scientific method. Students are guided by their mentors and a selected thesis research committee, which meets on a routine basis throughout the training experience.

Research laboratories are primarily located in the Department of Microbiology & Immunology. In addition to extensive basic equipment and facilities, the Program provides access to numerous specialized resources. These include facilities for peptide synthesis and sequencing, cell sorting by flow cytometry, protein purification and characterization, proteomics and microarray analysis and biomolecular imaging.

### Contact Us

Jianke Zhang, PhD  
Program Director, Immunology & Microbial Pathogenesis  
233 South 10th Street  
Room 731, Bluemle Life Sciences Building (BLSB)  
Philadelphia, PA 19107  
Phone: (215) 503-4559

Joanne Balitzky, MS  
Program Coordinator  
233 South 10th Street  
Room 910, Bluemle Life Sciences Building (BLSB)  
Philadelphia, PA 19107  
Phone: (215) 503-6687

### **Curriculum**

Note: Credits for the 910, 920 and 930 Research courses and Electives are variable. Assign credits to Research and/or Electives to equal the target number of credits for each semester.

## Year One

### FALL SEMESTER (20 CREDITS)

GC 550 Foundations of Biomedical Science , 10  
IMP 710 Seminar, 1  
IMP 610 Lab Rotation 1 , 3  
IMP 910 Research Variable

### SPRING SEMESTERS (30 CREDITS)

IMP 505 A Fundamentals of Immunology , Spring I, 2  
IMP 600A Bacteriology, Mycology, & Parasitology , Spring I , 2  
IMP 720 Seminar, Spring I, 1  
IMP 722 Current Literature, Spring I, 1  
IMP 620 Lab Rotation 2, Spring I , 3  
GC 640 Ethics, Spring I, 1  
IMP 505 B Immune System in Health and Disease, Spring II, 2  
IMP 600B Virology, Spring II, 3  
IMP 730 Seminar, Spring I, 1  
IMP 732 Current Literature , Spring II, 1  
IMP 630 Lab Rotation 3, Spring II, 3  
NS 740 Applied Statistics in Neuroscience, Spring II, 2  
IMP 920 Research Spring I - Spring II , Variable

### SUMMER SEMESTER (10 CREDITS)

IMP 930 Research, Variable

## Year Two

### FALL SEMESTER (20 CREDITS)

IMP 530 Infection & Immunity OR IMP 605 Advanced Cellular & Molecular Immunology,  
3  
GC 730 Planning & Writing a Research Grant , 1  
IMP 710 Seminar, 1  
IMP 712 Current Literature, 1  
IMP 910 Research, Variable

### SPRING SEMESTERS (30 CREDITS)

Elective(s), Spring I, Variable  
IMP 720 Seminar, Spring I , 1  
IMP 722 Current Literature , Spring I, 1

Elective(s), Spring II, Variable  
IMP 730 Seminar , Spring II, 1  
IMP 732 Current Literature , Spring I, 1  
IMP 920 Research, Spring I - Spring II, Variable

SUMMER SEMESTER (10 CREDITS)

IMP 930 Research, Variable

Year Three

FALL SEMESTER (20 CREDITS)

IMP 530 Infection & Immunity OR IMP 605 Advanced Cellular & Molecular Immunology,  
3  
IMP 710 Seminar , 1  
IMP 712 Current Literature, 1  
IMP 910 Research, Variable  
Comprehensive Exam

SPRING SEMESTERS (30 CREDITS)

IMP 720 Seminar, Spring I, 1  
IMP 722 Current Literature , Spring I , 1  
IMP 730 Seminar , Spring II , 1  
IMP 732 Current Literature , Spring II , 1  
IMP 920 Research Spring I - Spring II, Variable

SUMMER SEMESTER (10 CREDITS)

IMP 930 Research, Variable

Note: Credits for the 910, 920 and 930 Research courses and Electives are variable.  
Assign credits to Research and/or Electives to equal the target number of credits for  
each semester.

## **PhD Program in Neuroscience**

Welcome to the PhD Program in Neuroscience (GPN) at Thomas Jefferson University. As your Program Directors, we are committed to making your training in neuroscience an intellectually stimulating and successful educational experience. Thank you for taking the time to explore our GPN website.

Our GPN is guided by an educational vision to provide well-rounded training in basic and translational neuroscience, while working in synergy with other basic and clinical research areas. We prepare our students for the research work environment of the future, where major roles are played by advanced technology, complimentary disciplines and collaborative projects between academia and industry as well as bench and clinical science.

Internationally recognized faculty from the Department of Neuroscience and from other basic science and clinical departments provide classroom and hands-on laboratory training covering diverse research areas in neuroscience, cell biology, biochemistry and molecular biology. Furthermore, advanced students can serve as teaching assistants to develop effective teaching skills. The Program thus provides flexibility to pursue careers in academic and industrial research and education.

Collegiality and mentorship are key aspects of the Program. Our classes are small and students work in a close-knit community with faculty and staff.

The PhD Graduate Program in Neuroscience (GPN) at Thomas Jefferson University provides high-level, scholarly, scientific training to qualified individuals interested in pursuing diverse careers to research, foster, disseminate and facilitate an in-depth understanding of the nervous system under normal and pathological conditions. Sidney Kimmel Medical College faculty from the Department of Neuroscience and other basic science and clinical departments train students in a breadth of topical areas in basic and translational neuroscience.

The curriculum of study includes neurophysiology, neuroanatomy, cell biology, biochemistry and molecular biology and requires completion of a research thesis under the tutelage of internationally recognized GPN faculty. A flexible program and multidisciplinary faculty prepare students to pursue professions in diverse fields, including education, research in academia and industry and consulting.

### **Contact Us**

Melanie B. Elliott, PhD  
Director, Neuroscience Graduate Program

Kyunghee Koh, PhD  
Director, Neuroscience Graduate Program

## Department of Neuroscience

900 Walnut Street, Suite 400  
Philadelphia, PA 19107  
Phone: (215) 503-4200  
Fax: (215) 503-9238

### **Curriculum**

Note: Credits for the 910, 920 and 930 Research courses and Electives are variable. Assign credits to Research and/or Electives to equal the target number of credits for each semester.

#### Course Title and Credits

##### Year One

##### Fall Semester (20 Credits)

GC 550 Foundations in Biomedical Sciences, 10  
NS 601 Profiles in Neuroscience Research , 1  
NS 610 Research Rotation, 1  
NS 616 Journal Club , 1  
NS 710 Seminar Series, 1  
NS 910 Research, Variable

##### Spring Semesters (30 Credits)

NS 700 Cellular Neurophysiology, Spring I, 4  
GC 640 Research Ethics, Spring I, 1  
NS 620 Research Rotation, Spring I, 1  
NS 626 Journal Club, Spring I , 1  
NS 720 Seminar Series, Spring I, 1  
NS 715 Cellular & Molecular Neuroscience, Spring II, 3  
Elective, Spring II, Variable  
NS 630 Research Rotation, Spring II, 3  
NS 636 Journal Club, Spring II, 1  
NS 730 Seminar Series, Spring II, 1  
NS 920 , Spring I - Spring II, Variable

##### Summer Semester (10 Credits)

NS 930 Research, Variable

##### Year Two



Fall Semester (20 Credits)  
Elective(s), Variable  
NS 616 Journal Club, 1  
NS 710 Seminar Series, 1  
NS 910 Research, Variable

Spring Semesters (30 Credits)

NS 690 Neuropharmacology, Spring I, 3  
Elective(s), Spring I, Variable  
NS 626 Journal Club , Spring I, 1  
NS 720 Seminar Series, Spring I, 1  
NS 740 Applied Statistics in Neuroscience, Spring , 2  
NS 530 Neuroanatomy, Spring II , 4  
Elective(s), Spring II, Variable  
NS 636 Journal Club, Spring II, 1  
NS 730 Seminar Series, Spring , 1  
NS 920 Research, Spring I - Spring II, Variable

Summer Semester (10 Credits)

Elective, Variable  
NS 930 Research, Variable

# MS Programs

## Master's Programs

Our Master's programs provide students with the skills and knowledge that will enable them to engage in the forefront of basic, applied and translational research or to continue their studies toward advanced degrees in biomedical science research and the health sciences. Most are also recognized as Professional Science Master's degrees (PSMs), programs consisting of advanced coursework in science with an appropriate array of professional skill-developed activities aligned with the needs of 21st century employers.

**Biomedical Sciences:** The Master of Science Program in Biomedical Sciences prepares graduates for positions as managers of clinical laboratories, consultants, research associates and research scientists in the pharmaceutical/biotechnology industry or medical toxicology.

**Cell & Developmental Biology:** The Master of Science Program in Cell & Developmental Biology prepares its graduates for positions in research and development in academia, industry and government.

**Clinical Research:** The Master of Science in Clinical Research is a new program for fall 2016 that was created by clinical researchers to train scientists with a variety of backgrounds.

**Forensic Toxicology:** The Master of Science Program in Forensic Toxicology is a unique program designed to position students for advancement and professional development in the specific field of forensic toxicology.

**Human Genetics & Genetic Counseling:** The Master of Science Program in Human Genetics & Genetic Counseling prepares its graduates for positions in the field of Genetic Counseling

**Microbiology:** The Master of Science Program in Microbiology offers choices for career specialization with flexible schedules, professional training for academic credit and academic preparation for national professional certification.

**Pharmacology:** The Master of Science Program in Pharmacology prepares graduates for positions in research and development, research management, clinical trials and toxicology review and assessment.

## Master of Science Program in Biomedical Sciences

The Master of Science Program in Biomedical Sciences prepares graduates for positions in the pharmaceutical/biotechnology industry or medical toxicology, such as:

Managers of clinical laboratories  
Consultants  
Research associates  
Research scientists

Graduates of the program have been accepted into PhD and professional doctoral programs.

The program may be completed on a part-time or accelerated (coursework) schedule over a period of 1.5 to four years. Courses are offered late afternoon/early evening and meet once per week, allowing students the flexibility to work while taking classes or devote their full attention to their studies. Flexibility is the key.

Charles Scott, PhD, Program Director  
Address: 833 Bluemle Life Science Building  
233 South 10th Street  
Philadelphia, PA 19107  
Phone: (215) 503-4569  
E-mail: [Charles.Scott@jefferson.edu](mailto:Charles.Scott@jefferson.edu)

### Curriculum

Students are required to take a minimum of 40 credits for conferral of degree.

#### Core Courses

19 credits required. 6 credits total of Master's Research.

#### Course Title and Credits

BI 550 Topics in Biomedical Chemistry 3  
GC 660 Biostatistical Methods of Data Analysis 3  
GC 715 MS Basic Sciences Seminar 1  
GC 680 Lab Techniques-Molecular Biology 3  
CB 560 Principles of Cell Biology 3  
BI 870 Master's Research 1-6  
BI 880 Master's Research 1-6  
BI 890 Master's Research 1-6

#### Management Courses

Select two courses, total of 4-6 credits.

GC 510 Database Design and Management	2
GC 525 Information Technology for Decision Making	3
GC 600 Management Skills	3
GC 605 Performance Improvement	2
GC 610 Strategic Mgmt: Increasing R&D Productivity	2
GC 617 Mgmt of Pharm Drug Development Projects	2
GC 620 Fundamentals of Financial Management	3
GC 621 Biotechnology Venture Management	2
GC 635 Fundamentals of Clinical Trials Management	2
GC 636 Principles of Career Management	2

### Suggested Electives

15-17 credits required. 6 credits maximum laboratory clerkship.

Course Title	Credits
BI 810 Laboratory Clerkship	1-6
BI 820 Laboratory Clerkship	1-6
BI 830 Laboratory Clerkship	1-6
CB 570 Pathologic Aspects of Disease	3
GC 529 Laboratory Animal Science	2
GC 625 Drug Development Issues	2
GC 630 Fund-Clinical Trials	3
GC 640 Research Ethics	1
GC 645 Genomics & Bioinformatics	3
GC 650 EconAnal of Healthcare Intervention	3
GC 665 Cell Signaling	4
GC 690 Reg Issues in Human Subject Research	2
GC 720 Scientific Writing	2
GC 740 Principles of Pedagogy	1
GC 741 Principles of Science Pedagogy	1
GE 651 Pathobiology of Cancer	2
GE 652 Molecular Basis of Cancer	2
MI 521 Intro to Immunology	2
MI 522 Vaccinology & Immunotherapeutics	2
MI 530 Microbial Pathogenesis of Disease	2
MI 540 MI-Antimicrobial Agents	2
MI 580 Principles - Epidemiology	3
NS 690 Neuropharmacology	3
NS 700 Cellular Neurophysiology	4
NS 715 Molecular Cellular Neuroscience	3
PR 505 Environmental Toxicology	3
PR 522 General Pharmacology	3
PR 525 Clinical Pharmacology	3
PR 526 Pharmacogenomics	2
PR 530 Fundamentals of Biosafety	2
PR 630 General Toxicology	3

## Master of Science Program in Cell & Developmental Biology

The Master of Science Program in Cell & Developmental Biology prepares its graduates for positions in research and development in academia, industry and government. Graduates may be employed as basic research scientists in academic institutions and industrial positions, or may go on to further study in PhD and professional doctoral programs.

This program consists of a core basic science curriculum in cell and developmental biology, supplemented with elective courses suited to individual career interests in the basic sciences or in management. Students in our program receive training in theoretical, experimental and practical aspects of normal cell development as well as abnormal aspects of these processes, which may cause birth defects or disease.

The program may be completed on a part-time or accelerated (coursework) schedule over a period of 1.5 to four years. Courses are offered late afternoon/early evening and meet once per week, allowing students the flexibility to work while taking classes or devote their full attention to their studies. Flexibility is the key.

Gerald Grunwald, PhD, Program Director

Address: M63 Jefferson Alumni Hall  
1020 Locust Street  
Philadelphia, PA 19107

E-mail: [Gerald.Grunwald@jefferson.edu](mailto:Gerald.Grunwald@jefferson.edu)

### Curriculum

Students are required to take a minimum of 40 credits for conferral of degree.

#### Core Courses

19 credits required. 6 credits total of Master's Research.

#### Course Title and Credits

BI 550 Topics in Biomedical Chemistry	3	
GC 660 Biostatistical Methods of Data Analysis		3
CB 615 Embryology	3	
CB 560 Principles of Cell Biology	3	
CB 635 Gene-Environment Interactions in Birth Defects & Disease	3	
CB 870 Master's Research	1-6	
CB 880 Master's Research	1-6	
CB 890 Master's Research	1-6	

#### Management Courses

Select two courses, total of 4-6 credits.

GC 510 Database Design & Management	2
GC 525 Information Technology for Decision Making	3
GC 600 Management Skills	3
GC 605 Performance Improvement	2
GC 610 Strategic Mgmt: Increasing R&D Productivity	2
GC 617 Mgmt of Pharma Drug Development Projects	2
GC 620 Fundamentals of Financial Management	3
GC 621 Biotechnology Venture Management	2
GC 635 Fundamentals of Clinical Trials Management	2
GC 636 Principles of Career Management	2

### Suggested Electives

5-17 credits required. 6 credits maximum laboratory clerkship.\*

CB 570 Pathologic Aspects of Disease	3
CB 810 Laboratory Clerkship	1-6
CB 820 Laboratory Clerkship	1-6
CB 830 Laboratory Clerkship	1-6
GC 529 Lab Animal Sciences	2
GC 625 Drug Developmental Issues	2
GC 630 Fund-Clinical Trials	3
GC 640 Research Ethics	1
GC 645 Genomics & Bioinformatics	3
GC 650 EconAnal of Healthcare Intervention	3
GC 665 Cell Signaling	4
GC 680 Lab Techniques-Molecular Biology	3
GC 690 Reg Issues in Human Subject Research	2
GC 720 Scientific Writing	2
GC 740 Principles of Pedagogy	1
GC 741 Principles of Science Pedagogy	1
GE 651 Pathobiology of Cancer	2
GE 652 Molecular Basis of Cancer	2
MI 521 Intro to Immunology	2
MI 522 Vaccinology & Immunotherapeutics	2
MI 530 Microbial Pathogenesis of Disease	2
MI 540 MI-Antimicrobial Agents	2
MI 580 Principles-Epidemiology	3
NS 690 Neuropharmacology	3
NS 700 Cellular Neurophysiology	4
NS 715 Molecular Cellular Neuroscience	3
PR 505 Environmental Toxicology	3
PR 522 General Pharmacology	3

PR 525 Princ-Clin Pharmacology 3  
PR 526 Pharmacogenomics 2  
PR 530 Fundamentals-Biosafety 2  
PR 630 General Toxicology 3

\*Students with a strong research background may request to substitute additional didactic courses in place of the clerkship experience. Career counseling and guidance is available through the Director's office.



## **Master of Science in Clinical Research**

The Master of Science in Clinical Research is a new program for fall 2016 that was created by clinical researchers to train scientists with a variety of backgrounds. This program is well suited for career changers with a background in life, physical or clinical sciences that would like to break into the field of clinical research. It is also appropriate for individuals already in the industry and looking for additional graduate-level training.

The field of clinical research is expanding and well-trained professionals are needed to coordinate, manage, and administer clinical research and trials. This master of science degree will provide students with the foundation that they need to be an effective clinical research scientist.

Students completing the MS in Clinical Research will:

- Understand the experimental design, statistical analysis and interpretation, and regulatory and ethical issues pertaining to human clinical research and trials.

- Be able to read, understand, and critique published reports of clinical trials.

- Acquire management skills that will enable them to develop a human clinical research project or trial from the idea phase to implementation to completion.

- Be prepared for employment in the academic industrial or hospital clinical research setting.

Prospective students with an interest in learning how to operate and manage clinical research and trials should also be:

- Current clinical researchers looking to expand their skill sets

- Graduates of baccalaureate programs in basic sciences, nursing, health professions, engineering, or business

- Graduates or students of professional programs (medicine, dentistry, veterinary medicine, law)

- Graduates or students of doctoral or post-doctoral programs.

Contact Us

Office of Admissions

Phone: (215) 503-4400

E-mail: [jgsbs-info@jefferson.edu](mailto:jgsbs-info@jefferson.edu)

## **Curriculum**

Students are required to take a minimum of 40 credits for conferral of degree.

### Core Courses

25 credits required. 6 credits of Master's Research

Course Title and Credits

GC660 Statistical Methods of Data Analysis 3  
 GC630 Fundamentals of Clinical Trials (GC660 is pre-req) 3  
 GC635 Introduction to Clinical Trials Management 2  
 GC637 Advanced Clinical Trials Management (GC635 is pre-req) 3  
 GC625 Drug Development 2  
 MI580 Epidemiology (GC 660 is pre-req) 3  
 GC690 Regulatory Issues in Scientific Research 2  
 GC640 Research Ethics and Responsible Conduct  
 1  
 Thesis Research (6 credits) including first credit Gateway to Thesis 6

### Management Courses

Select two courses, total of 4-6 credits.

GC600 Management Skills 3  
 GC510 Database Design and Management 2  
 GC615 Grants and Contracts Management 2  
 GC605 Performance Improvement 2  
 GC610 Strategic Management 3  
 GC620 Fundamentals of Financial Management 3  
 GC617 Management of Pharmaceutical Drug Development Projects 2

### Suggested Electives

9-11 credits required

Clerkship 3  
 GC650 Economic Analysis of Healthcare Interventions 3  
 GC654 Pharmacoepidemiology (GC 660, MI 580 are pre-req) 2  
 PR525 Clinical Pharmacology 3  
 PR522 General Pharmacology 3  
 GC631 Comparative Effectiveness & Patient-Centered Outcomes Research 3  
 GC680 Laboratory Techniques in Molecular Biology 2  
 PR526 Pharmacogenomics 2

## **MS Program in Forensic Toxicology**

Thomas Jefferson University and The Center for Forensic Science Research & Education (The Center) are excited to launch a new MS program in Forensic Toxicology, beginning Fall 2015. This is a unique program designed to position students for advancement and professional development in the specific field of forensic toxicology.

This is a full-time, two year program with courses taught at both the Thomas Jefferson University campus and The Center's Willow Grove, PA location.

This partnership will provide our students with expertise in all areas of toxicology, including:

Students conducting research

- Workplace drug testing
- Post mortem analysis
- Human performance toxicology
- Legal procedure and ethics
- Business & management coursework

The Program also gives students essential, hands-on training through the Center's internship program, provided at their state-of-the-art facility in Willow Grove, PA. This practicum immerses students in mock casework samples and provides them with experience in drug and toxin detection and extraction, quantification, instrumental analysis and data interpretation and report writing. The Program culminates in moot court experiences.

PSM – Professional Science Masters

This program is designated as a Professional Science Master's (PSM). PSM is a graduate/ professional degree grounded in science and designed for a variety of career options in business, government or non-profit organizations. The degree combines advanced coursework in science with an array of professional skill-development activities aligned with the needs of 21st century employers. Learn more about PSM on their website.

Contact Us

Barry K. Logan, PhD, F-ABFT, Program Director of the Forensic Toxicology Program

E-mail: [Barry.Logan@Jefferson.edu](mailto:Barry.Logan@Jefferson.edu)

Heather E. McKiernan, MSFS, Assistant Program Director of the Forensic Toxicology Program

E-mail: [Heather.McKiernan@Jefferson.edu](mailto:Heather.McKiernan@Jefferson.edu)

## Curriculum

### Year One (20 Credits)

#### Fall Semester

Course Title and Credits

FT 605 Analytical Forensic Toxicology, 3  
FT 606 Analytical Forensic Toxicology Lab, 1  
Management or General Elective, 2

#### Spring I Semester

FT 705 Advanced Analytical Forensic Toxicology 3  
FT 706 Advanced Analytical Forensic Toxicology Lab 1  
FT 610 Legal Procedure and Ethics 1

#### Spring II Semester

PR 525 Clinical Pharmacology 3  
Management or General Elective 2

#### Summer Semester

FT 880 Master's Thesis Research 1  
GC 660 Statistical Methods of Data Analysis 3

### Year Two (20 Credits)

#### Fall Semester

FT 715 Interpretative Forensic Toxicology 3  
FT 716 Interpretative Forensic Toxicology Lab 1  
FT 880 Master's Thesis Research 1

#### Spring I Semester

FT 880 Master's Thesis Research 2  
FT 620 Forensic Science Forum 1  
Management or General Elective 3

#### Spring II Semester

FT 880 Master's Thesis Research 2  
Management or General Elective 3

## Summer Semester

FT 810 Laboratory Clerkship	3	
FT 815 Regulatory Issues in Forensic Toxicology		1

## Program Structure

A total of 40 credits are required for degree completion. The required breakdown of courses and electives is as follows.

12 Foundation Courses (30 credits)

### MINIMUM FIVE CREDITS OF MANAGEMENT COURSES

GC 510 Database Design and Management	2	
GC 525 Information Technology for Decision Making	3	
GC 600 Management Skills	3	
GC 605 Performance Improvement	2	
GC 610 Strategic Management	2	
GC 620 Fundamentals of Financial Management	3	

### MINIMUM FIVE CREDITS OF ELECTIVE COURSES

CB 570 Pathologic Aspects of Disease	3	
GC 625 Drug Development Issues	2	
GC 640 Ethical Conduct of Research	1	
MI 580 Principles of Epidemiology	3	
PR 505 Environmental and Occupational Toxicology	3	
PR 522 General Pharmacology	3	
PR 526 Pharmacogenomics	2	
PR 630 General Toxicology	3	

\*Additional elective courses may be selected after consultation with the Program Director

## **MS Program in Human Genetics and Genetic Counseling**

The Human Genetics and Genetic Counseling Program within the Jefferson College of Biomedical Sciences at Thomas Jefferson University. Our program is a 19-month Master's level experience grounded in basic science and diversified through psychosocial education and varied clinical and research opportunities.

We encourage you to peruse our website to learn more about our program and the challenging and rewarding profession of genetic counseling. To learn more about the Human Genetics and Genetic Counseling Program or to schedule an on-campus visit, please email us at [rachael.brandt@jefferson.edu](mailto:rachael.brandt@jefferson.edu) or [zohra.ali-khancatts@jefferson.edu](mailto:zohra.ali-khancatts@jefferson.edu).

Sincerely,

Rachael Brandt, PhD, MS, LCGC  
Co-Director

Zohra Ali-Khan Catts, MS, LCGC  
Co-Director

What is Genetic Counseling?

The National Society of Genetic Counselors (2005) defines genetic counseling as the process of helping people understand and adapt to the medical, psychological and familial implications of genetic contributions to disease. This process integrates:

Interpretation of family and medical histories to assess the chance of disease occurrence or recurrence.

Education about inheritance, testing, management, prevention, resources and research.

Counseling to promote informed choices and adaptation to the risk or condition.

Genetic counseling is a rapidly expanding and diversifying profession that offers opportunities for practice in a wide variety of settings, such as hospitals/clinics, academia, laboratories, government agencies, public health, consulting and advocacy. Clinical practice areas encompass many specialties including prenatal, pediatrics, cardiology, neurology, metabolic disorders, infertility, cancer, etc. As a profession that blends scientific information with clinical, ethical, psychological and legal implications, genetic counselors have a uniquely satisfying and rewarding career that is in high demand.

To learn more about this exciting profession, visit:

National Society of Genetic Counselors (NSGC)

American Society of Human Genetics (ASHG)

American College of Medical Genetics (ACMG)

Science Journal: "Genetic counseling: A growing area of opportunity"

Jefferson College of Biomedical Sciences and the Institute of Emerging Health Professions are excited to launch a new MS program in Human Genetics & Genetic Counseling, beginning Fall 2017.

Employment of genetic counselors is projected to grow 41% from 2012 to 2022, much faster than the average for all occupations as reported by the U.S. Bureau of Labor Statistics. Employment for the mid-Atlantic region of PA, NJ, NY, and MD was reported at 180-230 genetic counselors in 2013. There are only 31 graduate genetic counseling programs in the country. Placement of a new genetic counseling program within the rich clinical and health science environment of the Jefferson enterprise would provide students significant competitive advantage.

The learning outcomes for our program are based on the 2014 Practice-Based Competencies for Genetic Counselors set forth by the Accreditation Council for Genetic Counseling:

#### Domain I: Genetics Expertise and Analysis

1. Demonstrate and utilize a depth and breadth of understanding and knowledge of genetics and genomics core concepts and principles.
2. Integrate knowledge of psychosocial aspects of conditions with a genetic component to promote client well-being.
3. Construct relevant, targeted and comprehensive personal and family histories and pedigrees.
4. Identify, assess, facilitate, and integrate genetic testing options in genetic counseling practice.
5. Assess individuals' and their relatives' probability of conditions with a genetic component or carrier status based on their pedigree, test result(s), and other pertinent information.
6. Demonstrate the skills necessary to successfully manage a genetic counseling case.
7. Critically assess genetic/genomic, medical and social science literature and information.

#### Domain II: Interpersonal, Psychosocial and Counseling Skills

8. Establish a mutually agreed upon genetic counseling agenda with the client.
9. Employ active listening and interviewing skills to identify, assess, and empathically respond to stated and emerging concerns.
10. Use a range of genetic counseling skills and models to facilitate informed decision-making and adaptation to genetic risks or conditions.
11. Promote client-centered, informed, non-coercive and value-based decision-making.
12. Understand how to adapt genetic counseling skills for varied service delivery models.
13. Apply genetic counseling skills in a culturally responsive and respectful manner to all clients.

### Domain III: Education

14. Effectively educate clients about a wide range of genetics and genomics information based on their needs, their characteristics and the circumstances of the encounter.
15. Write concise and understandable clinical and scientific information for audiences of varying educational backgrounds.
16. Effectively give a presentation on genetics, genomics and genetic counseling issues.

### Domain IV: Professional Development & Practice

17. Act in accordance with the ethical, legal and philosophical principles and values of the genetic counseling profession and the policies of one's institution or organization.
18. Demonstrate understanding of the research process.
19. Advocate for individuals, families, communities and the genetic counseling profession.
20. Demonstrate a self-reflective, evidenced-based and current approach to genetic counseling practice.
21. Understand the methods, roles and responsibilities of the process of clinical supervision of trainees.
22. Establish and maintain professional interdisciplinary relationships in both team and one-on-one settings, and recognize one's role in the larger healthcare system.

### **Curriculum**

The 64 credit curriculum includes the following required courses.

#### Year 1 - Fall Term -13 Credits

Introduction to Genetic Counseling (1cr)  
Human Genetics (3 cr)  
Embryology (3 cr)  
Medical Genetics I (2 cr)  
Clinical Applications I (2 cr)  
Cardiovascular Genetics (1 c)  
Lab/Clinical Observer Rotation (1 cr)

#### Year 1 – Spring 1 Term -12 Credits

Pathobiology of Cancer (2 cr)  
Clinical Cancer Genetics (2 cr)  
Medical Genetics II (2 cr)  
Psychosocial Genetic Counseling (4 cr)  
Clinical Applications II (1 cr)  
Clinical Rotation 1 day/week (1 cr)



Year 1 – Spring 2 Term – 12 Credits

Gene-Environment Interactions in Birth Defects and Disease (3 cr)  
Metabolic Genetics I (2 cr)  
Research Design and Methods for Genetic Counselors (2 cr)  
Clinical Applications (1 cr)  
Applied Statistics (2 cr)  
Clinical Rotation 2 days/week (2 cr)

Year 1 – Summer Term – 8 Credits

Genetic Counseling Theory and Practice I (2 cr)  
Thesis I (2 cr)  
Practical Issues in Genetic Counseling (1 cr)  
Clinical Rotation 3 days/week (3 cr)

Year 2 - Fall Term -12 Credits

Thesis II (2 cr)  
Genetic Counselor Workshop and Seminar I (2 cr)  
Genetic Counseling Theory and Practice II (2 cr)  
Metabolic Genetics II (2 cr)  
Genetic Basis of Neurologic and Psychiatric Disease (1 cr)  
Clinical Rotation 3 days/week (3 cr)

Year 2 – Spring 1 Term -7 Credits

Thesis III (2 cr)  
Genetic Counselor Workshop and Seminar II (2 cr)  
Clinical Rotation 3 days/week (3 cr)

Year 2 – Spring 2 Term – Supplemental

Thesis  
Clinical Rotation  
Board Review Course

## Master of Science in Microbiology

The Master of Science in Microbiology Program offers choices for career specialization with flexible schedules, professional training for academic credit and academic preparation for national professional certification.

The broad-based curriculum includes a minimum of 40 credits. Course content includes:

- The biology of microorganisms
- Immunology
- Epidemiology
- Pathology
- Biostatistics
- Management
- Clerkship
- Master's research thesis or, alternatively, a Non-Thesis Option

The program may be completed on a part-time or accelerated (coursework) schedule over a period of 1.5 to four years. Courses are offered late afternoon/early evening and meet once per week, allowing students the flexibility to work while taking classes or devote their full attention to their studies. Flexibility is the key. .

### Contact Us

James McGettigan, PhD, Program Director

Address: 466 Jefferson Alumni Hall  
1020 Locust Street  
Philadelphia, PA 19107

Phone: (215) 503-4629

E-mail: [James.Mcgettigan@jefferson.edu](mailto:James.Mcgettigan@jefferson.edu)

Students are required to take a minimum of 40 credits for conferral of degree.

## Curriculum

### Core Courses

23 credits required. 6 credits total of Master's Research.

Course Title Credits

MI 505 Biochemistry of Microorganisms 3

MI 521 Introduction to Immunology 2

MI 580 Principles of Epidemiology 3

MI 582 Diagnostic Microbiology 3

GC 660 Statistical Methods for Data Analysis 3

CB 570 Pathologic Aspects of Disease 3

MI 870 Master's Research 1-6

MI 880 Master's Research 1-6

MI 890 Master's Research 1-6

### Management Courses

Select two courses, total of 4-6 credits.

GC 510 Database Design & Management	2
GC 525 Information Technology for Decision Making	3
GC 600 Management Skills	3
GC 605 Performance Improvement	2
GC 610 Strategic Mgmt: Increasing R&D Productivity	2
GC 617 Mgmt of Pharma Drug Development Projects	2
GC 620 Fundamentals of Financial Management	3
GC 621 Biotechnology Venture Management	2
GC 635 Fundamentals of Clinical Trials Management	2
GC 636 Principles of Career Management	2

### Suggested Electives

1-13 credits required. 6 credits maximum laboratory clerkship.

CB 560 Principles of Cell Biology	3
GC 529 Lab Animal Sciences	2
GC 625 Drug Developmental Issues	2
GC 640 Research Ethics	1
GC 645 Genomics & Bioinformatics	3
GC 680 Lab Techniques-Molecular Biology	3
GC 690 Reg Issues in Human Subject Research	2
GC 720 Scientific Writing	2
MI 520 Diagnostic Parasitology	2
MI 522 Vaccinology & Immunotherapeutics	2
MI 530 Microbial Pathogenesis of Disease	2
MI 532 Medical Mycology	2
MI 540 Microbiology of Antimicrobial and Antiviral Agents	3
MI 590 Introduction to Clinical Virology	2
MI 610 Microbiology Teaching Experience	1
MI 682 Advanced Diagnostic Microbiology	2
MI 718 Infectious Disease Rounds	1
MI 810 Laboratory Clerkship	1-6
MI 820 Laboratory Clerkship	1-6
MI 830 Laboratory Clerkship	1-6

## Master of Science Program in Pharmacology

The Master of Science Program in Pharmacology prepares graduates for positions in:

- Research and development
- Research management
- Clinical trials
- Toxicology review and assessment

Graduates have been accepted into PhD and professional degree programs.

The MS Pharmacology Program also offers a track in Human Investigation. This track is for residents and fellows doing post-graduate clinical training.

Students applying to the Program should have taken undergraduate general and organic chemistry courses and at least one biology course. An undergraduate biochemistry course is strongly recommended, but not required.

The program may be completed on a part-time or accelerated (coursework) schedule over a period of 1.5 to four years. Courses are offered late afternoon/early evening and meet once per week, allowing students the flexibility to work while taking classes or devote their full attention to their studies. Flexibility is the key.

Carol Beck, PhD, Program Director  
Address: M46 Jefferson Alumni Hall  
1020 Locust Street  
Philadelphia, PA 19107  
Phone: (215) 503-6539  
E-mail: [Carol.Beck@jefferson.edu](mailto:Carol.Beck@jefferson.edu)

Students are required to take a minimum of 40 credits for conferral of degree.

### Curriculum

#### Core Courses

19 credits required. 6 credits total of Master's Research.

BI 505 Topics in Biomedical Chemistry	3	
GC 660 Biostatistical Methods of Data Analysis		3
GC 715 MS Basic Sciences Seminar	1	
PR 522 General Pharmacology	3	
PR 525 Clinical Pharmacology	3	
PR 870 Master's Research	1-6	
PR 880 Master's Research	1-6	
PR 890 Master's Research	1-6	

## Management Courses

Select two courses, total of 4-6 credits.

GC 510 Database Design & Management	2
GC 525 Information Technology for Decision Making	3
GC 600 Management Skills	3
GC 605 Performance Improvement	2
GC 610 Strategic Mgmt: Increasing R&D Productivity	2
GC 617 Mgmt of Pharma Drug Development Projects	2
GC 620 Fundamentals of Financial Management	3
GC 621 Biotechnology Venture Management	2
GC 635 Fundamentals of Clinical Trials Management	2
GC 636 Principles of Career Management	2

## Suggested Electives

15-17 credits required. 6 credits maximum laboratory clerkship.

CB 560 Principles of Cell Biology	3
CB 570 Pathologic Aspects of Disease	3
GC 529 Laboratory Animal Science	2
GC 600 Management Skills	3
GC 625 Drug Development Issues	2
GC 630 Fund-Clinical Trials	3
GC 640 Research Ethics	1
GC 645 Genomics & Bioinformatics	3
GC 650 EconAnal of Healthcare Intervention	3
GC 654 Pharmacoepidemiology	2
GC 665 Cell Signaling	4
GC 680 Lab Techniques-Molecular Biology	3
GC 690 Reg Issues in Human Subject Research	2
GC 700 Intro to Neuroscience	3
GC 720 Scientific Writing	2
GC 740 Principles of Pedagogy	1
GC 741 Principles of Science Pedagogy	1
GE 651 Pathobiology of Cancer	2
GE 652 Molecular Basis of Cancer	2
MI 521 Intro to Immunology	2
MI 522 Vaccinology & Immunotherapeutics	2
MI 530 Microbial Pathogenesis of Disease	2
MI 540 MI-Antimicrobial Agents	2
MI 580 Principles - Epidemiology	3
NS 690 Neuropharmacology	3
NS 700 Cellular Neurophysiology	4

NS 715 Molecular Cellular Neuroscience		3
PR 505 Environmental Toxicology	3	
PR 525 Principles-Clinical Pharmacology		3
PR 526 Pharmacogenomics	2	
PR 530 Fundamentals of Biosafety	2	
PR 630 General Toxicology	3	
PR 810 Laboratory Clerkship	1-6	
PR 820 Laboratory Clerkship	1-6	
PR 830 Laboratory Clerkship	1-6	

### Human Investigation Track

Total number of credits must be at least 40 (this includes the 9 credits that are transferred into the Program). 3 credits total of Clerkship, 6 credits total of Master's Research.

BI 505 Topics in Biomedical Chemistry**		3
PR 522 General Pharmacology**	3	
CB 570 Pathologic Aspects of Disease**		3
GC 510 Database Design & Management		2
GC 630 Fundamentals of Clinical Trials	3	
GC 640 Research Ethics and Responsible Conduct	1	
GC 650 Economic Analysis of Healthcare Interventions		3
GC 654 Pharmacoepidemiology	2	
GC 660 Biostatistical Methods of Data Analysis		3
GC 690 Regulatory Issues in Scientific Affairs	2	
MI 580 Epidemiology	3	
PR 525 Clinical Pharmacology	3	
PR 810 Laboratory Clerkship	1-3	
PR 820 Laboratory Clerkship	1-3	
PR 830 Laboratory Clerkship	1-3	
PR 870 Master's Research	1-6	
PR 880 Master's Research	1-6	
PR 890 Master's Research	1-6	

\*\*This track is for residents and fellows doing post-graduate clinical training. Nine credits are transferred in from their medical school/clinical education. We transfer credit for these courses, which are typically taken as part of a medical school curriculum:

- GC 630—prerequisite is GC 660
- MI 580- prerequisite is GC 660
- PR 654—prerequisite is MI 580 and GC 660

# **Graduate Certificate Programs**

## **Certificate Program in Clinical Research & Trials: Implementation**

The Certificate Program in Clinical Research & Trials: Implementation is an introduction to the field of clinical research. It is well-suited for career changers or those with minimal experience in the field.

Qualified professionals are needed for clinical trial positions to meet the needs of rapidly expanding pharmaceutical and biotechnology industries. The Certificate Program in Clinical Research & Trials: Implementation provides the core competencies and skills needed by professionals in the field of clinical trials. The Program trains individuals in administration, coordination and management of clinical research studies focused on developing new drugs, medical devices and treatment regimens. This certificate is complementary to the certificate in Human Clinical Investigation: Theory.

### **Program Objectives**

- Introduce the roles and responsibilities of investigators and sponsors
- Educate on the regulations governing clinical research
- Train for managing clinical trials

### **Qualified Applicants**

Persons with scientific/medical background or experience who are interested in careers in clinical research may apply for our Certificate Program in Clinical Research & Trials: Implementation. Persons who may benefit from University study in this program include:

- Study coordinators
- Clinical trial center staff
- Physicians
- Medical directors
- Biomedical scientists
- Research scientists
- Nurses and allied health professionals
- Statisticians
- Pharmacists
- IRB monitors
- Others seeking to enhance or develop their clinical and research skills

Pharmaceutical, biotechnology and device industry personnel who desire a career in clinical research may also find this program useful.

## **Curriculum**

Students will take a total of 15 credits to complete the program.

### **Core Courses (10 credits)**



Course Title and Credits

GC 625 Drug Development OR	
GC 617 Management of Pharmaceutical Drug Development Projects	2
GC 630 Fundamentals of Clinical Trials (GC 660 is pre-req)	3
GC 635 Fundamentals of Clinical Trial Management	2
GC 660 Statistical Methods of Data Analysis	3

Suggested Electives (select 5 credits)\*

Course Title Credits

GC 510 Database Design and Management	2
GC 610 Strategic Management: Increasing R&D Productivity by Creating Value	2
GC 615 Grants and Contracts Management	2
GC 640 Research Ethics and Responsible Conduct	1
GC 650 Economic Analysis of Healthcare Interventions	3
GC 720 Scientific Writing	2

\*Other courses may be substituted upon approval.

## Certificate Program in Clinical Research: Operations

The Certificate Program in Clinical Research: Operations trains individuals in the administration, coordination and management of clinical research studies. Expansion in the field of clinical research and trials has also expanded the need for trained administrators and managers.

Clinical research and trials has become a major source of revenue for universities and hospital systems. Individuals who are trained in the finance and management are needed as administrators in this expanding field of clinical research. The management of human research is complex and requires an understanding of funding sources, regulatory issues, and the ability to manage data generated. Careers available to graduates of this program include: monitors, coordinators, and associates.

The Certificate in Clinical Trials: Operations will provide students with all of these foundations in addition to an essential overview of the clinical trials process.

### Program Objectives

- Train students in the financial and data management of clinical research and trials
- Educate on the regulations and ethical issues in human subject research
- Provide a foundation of the clinical trials process

### Qualified Applicants

Prospective students with an interest in learning how to operate and manage clinical research and trials should also be:

- Current clinical researchers looking to expand their skill sets
- Graduates of baccalaureate programs in basic sciences, nursing, health professions, engineering, or business
- Graduates or students of professional programs (medicine, dentistry, veterinary medicine, law)
- Graduates or students of doctoral or post-doctoral programs.

## Curriculum

Students will take a total of 18 credits to complete the program.

### Core Courses (15 credits)

#### Course Title and Credits

GC510 Database Design and Management	2
GC615 Grants and Contracts Management	2
GC620 Financial Management OR	
GC631 Comparative Effectiveness & Patient Centered Outcomes Research	3

GC635 Fundamentals of Clinical Trials Management	2
GC640 Research Ethics	1
GC660 Statistical Methods OR	
PBH504* Basic Public Health Statistics	3
GC690 Regulatory Issues in Human Subject Research	2
Core Total	15

Electives (select 3 credits)

Course Title and Credits	
AHE509* Epidemiology for Outcomes Research	3
GC630 Fundamentals of Clinical Trials (GC660 is pre-req)	3
GC650 Economic Analysis of Health Care Interventions	3
Elective Total	3
Certificate Total	18

\*courses offered through Jefferson College of Population Health

## **Certificate Program in Human Clinical Investigation: Theory**

The Certificate Program in Human Clinical Investigation: Theory prepares clinicians (residents, fellows, faculty) for careers in academic medicine, the pharmaceutical industry, and government regulatory agencies by providing a strong foundation for the design and implementation of modern clinical and translational research.

Clinicians trained in the basics of human clinical investigation are needed to design and initiate clinical trials in academic medicine and in the pharmaceutical industry.

The Certificate Program in Human Clinical Investigation: Theory provides the core competencies and skills needed for those interested in clinical research or careers in academic medicine. This program is designed for clinicians, but could be taken by others interested in understanding the theory behind clinical trial design.

This certificate focuses on the theory rather than the implementation. This certificate program is the didactic component of the MS Pharmacology Program, Human Clinical Investigation track. No thesis is required for the certificate.

### **Program Objectives**

- Provide the theory behind the design of human clinical studies and appropriate design and use of databases

- Educate on the ethics and regulations governing clinical research

- Provide a background in statistics and epidemiology necessary for human clinical investigation

### **Qualified Applicants**

Persons with scientific/medical background or experience who are interested in careers in clinical research may apply for our Certificate Program in Human Clinical Investigation: Theory. This certificate is most relevant to individuals with clinical backgrounds who are interested in being involved in human clinical research and leading research teams.

## **Curriculum**

Students will take a total of 17 credits to complete the program.

### **Core Courses (14 credits)**

Course Title and Credits

GC 660 Statistical Methods of Data Analysis 3

GC 630 Fundamentals of Clinical Trials (GC 660 is pre-req) 3

MI 580 Epidemiology (GC 660 is pre-requisite) 3  
GC 510 Database Design and Management 2  
GC 640 Research Ethics and Responsible Conduct 1  
GC 690 Regulatory Issues in Human Subject Research 2

Suggested Electives (select 3 credits)\*

Course Title and Credits

PR 525 Clinical Pharmacology 3  
GC 650 Economic Analysis of Healthcare Interventions 3  
GC 654 Pharmacoepidemiology (GC 660, MI 580 are pre-requisites) 2  
PR 810, 820, 830 Pharmacology Clerkship Credits\*\* 1-3

\*Other courses may be substituted upon approval. However, no substitutions can be made for clinicians wanting to transfer these credits into the Human Clinical Investigation track of the Master of Science in Pharmacology.

\*\*Only available for clinicians starting in the Pharmacology MS program and changing to the Certificate program.

## Graduate Certificate in Infectious Disease Control

The curriculum for the Graduate Certificate in Infectious Disease Control is built from core courses and expertise in microbiology and immunology. We emphasize the key areas: Microbiology of Antimicrobial & Antiviral Agents, Vaccinology & Immunotherapeutics, Epidemiology and Management skills.

Be part of this exciting new graduate certificate focused on the needs of the working healthcare professional.

The curriculum for this graduate certificate is built on core courses and Thomas Jefferson University faculty members' expertise in microbiology and immunology. The required 15 credits emphasize key areas such as:

Microbiology of Antimicrobial & Antiviral Agents  
Vaccinology & Immunotherapeutics  
Epidemiology  
Management skills courses, clerkship/internship or other selected electives

### Curriculum

Students will take a total of 15 credits to complete the program.

#### Core Courses (11 credits)

Course Title	Credits
GC 660 Statistical Methods in Data Analysis	3
MI 540 Microbiology of Antimicrobial and Antiviral Agents	2
MI 580 Epidemiology (GC 660 is a suggested prerequisite)	3
MI 521 Vaccinology and Immunotherapeutics	2
MI 718 Infectious Disease Rounds	1

#### Suggested Electives (select 4 credits)

Course Title	Credits
GC 510 Database Design and Management	3
GC 525 Information Management	3
GC 645 Genomics and Bioinformatics	3
GC 640 Research Ethics	1
GC 720 Scientific Writing	2
MI 530 Microbial Pathogenesis	2
MI 532 Medical Mycology	2
MI 590 Introduction to Clinical Virology	2
PBH 501 Introduction to Public Health	3

PBH 606 Advanced Epidemiology 2  
PR 530 Biosafety 2

## **Graduate Certificate in Patient-Centered Research**

The Graduate Certificate in Patient-Centered Research is designed to train students in the principles and methods of patient-centered outcomes research (PCOR) and comparative effectiveness research (CER). Students in the Program may come from clinical or scientific backgrounds.

Investigators trained in patient-centered outcomes research (PCOR) and comparative-effectiveness research (CER) are needed to carry out studies that improve health outcomes and reduce health disparities in society. This research is conducted at academic health centers, in healthcare systems, in the pharmaceutical industry and in the private sector and is funded by agencies such as Agency for Healthcare Research and Quality (AHRQ) and Patient-Centered Outcomes Research Institute (PCORI).

The Graduate Certificate Program in Patient Centered Research is designed to train students in the principles and methods of patient-centered outcomes research (PCOR) and comparative effectiveness research (CER). Students in the program may come from clinical or scientific backgrounds.

### **Program Objectives**

The objectives of this certificate are to educate and train the next generation of health service researchers in the principles and methods of:

- Patient-centered outcomes research (PCOR)
- Comparative effectiveness research (CER)

### **Qualified Applicants**

Persons with an undergraduate degree who want to expand their knowledge base and career opportunities in patient-centered research should consider this certificate. Students may come from clinical or scientific backgrounds. Faculty, medical fellows and residents and employees engaged in basic, clinical and translational research would benefit from this training.

This certificate introduces students to the methods associated with comparative effectiveness research and patient-centered outcomes research. It would be relevant for individuals who want to be involved in patient-centered research, either as an investigator or a team member. No thesis research is required for the certificate.

This certificate is being jointly offered by the Jefferson College of Biomedical Sciences and the Jefferson College of Population Health. Courses offered through the Jefferson College of Population Health are noted with (JCPH). Courses may be taken in either school. Most courses are offered on location, and some are offered as distance learning. Registration for the Program is through the Jefferson College of Biomedical Sciences. Courses taken as part of this certificate may be transferred into other programs. Please consult your academic adviser.



## Curriculum

Students will take a total of 18 credits to complete the program.

### Core Courses (15 credits)

#### Course Title and Credits

GC 660 Statistical Methods of Data Analysis	3	OR	
PBH 504 Basic Public Health Statistics	3		
MI 580 Principles of Epidemiology	3	OR	
AHE 509 Epidemiology for Outcomes Research	3		
AHE 506 Subjective Outcomes in Healthcare Evaluation	3		
GC 631 Comparative Effectiveness & Patient-Centered Outcomes Research			3
GC 652 Decision Support and Shared Decision Making in Health Care	2		

### Electives (select 3 credits)

#### Course Title Credits

HQS 503 Healthcare Quality & Safety: Measurement and Outcomes Analysis	3
PBH 515 Cultural Humility and Competence	3

# **Postbaccalaureate Pre-Professional Program**

## **Postbaccalaureate Pre-Professional Program (P4)**

The Postbaccalaureate Pre-Professional Program (P4) is designed for individuals seeking to complete their basic science requirements in preparation for entrance to medical and other health-professional schools.

We offer educational and professional development in the health professions, for academically competitive individuals with non-science undergraduate and graduate degrees—all within a supportive, collaborative and welcoming environment.

Upon successful completion of the program, students will earn a Certificate in Post-Baccalaureate Pre-Health Studies.

### Linkage Agreements

The P4 program currently has linkage agreements with the following medical schools:

Sidney Kimmel Medical College  
Philadelphia College of Osteopathic Medicine

Moving forward, we will be partnering with other medical/professional schools to increase these opportunities for our students.

Once accepted, students take classes and testing preparation courses (MCAT) and also participate in academic and professional development opportunities with other P4 students.

1-year (accelerated) and 2-year tracks are available for P4 students. 38 credits required. Available elective courses include Anatomy & Physiology, Microbiology and Genetics

### Contact Us

Postbaccalaureate Pre-Professional Program  
Dolores Byrne, PhD, Director  
1020 Locust Street  
Jefferson Alumni Hall, Suite M60  
Philadelphia, PA 19107  
Phone: (215) 503-6905 (215) 955-2163

## Professional Development, Advising Support & Clinical Experiences

The Art & Science of Healthcare course is designed to provide students with the knowledge on how to reach their goals as a healthcare professional. The series can include workshops and networking opportunities, such as:

- Managing academics and personal life during your academic career
- Connecting with medical students and graduates from medical and professional programs
- Developing a healthcare profession school application with an overview on healthcare community and leadership activities
- Enhancing interviewing skills
- Exposure to visiting admission officers from the following professional schools: dental, medical (allopathic & osteopathic), podiatry, optometry, physician assistant, physical therapy and occupational therapy

## General Schedule Information

Courses and other program activities will be held most weekdays. There may be occasional evening or weekend activities, but these will be scheduled with adequate advance notice. There is time to complete outside healthcare community, volunteer and shadowing opportunities.

## Certificate Completion Requirements

Students successfully complete our program by:

- Completing basic science and elective courses, finishing with a cumulative GPA of 3.0 or higher
- Earning a passing grade for Art & Science of Healthcare by participating in activities and satisfactorily completing related assignments
- Participating fully in the MCAT preparation course, including the comprehensive review

Upon successful completion of the program requirements, a student will earn a Certificate in Post-Baccalaureate Pre-Health Studies.

## **Curriculum**

### Certificate in Postbaccalaureate Pre-Health Studies 38 Credits –1-year Accelerated Program

#### Summer 2016

CHEM101: General Chemistry Lecture/Lab	4 Credits
CHEM 102: General Chemistry Lecture/Lab	4 Credits

Fall 2016

BIO101: General Biology Lecture/Lab 4 Credits  
CHEM 201- Organic Chemistry 4 Credits  
PHYS 101 - Physics 4 Credits  
ASH100: Art & Science of Healthcare 3 Credits  
MCAT Prep

Spring 2017

BIO102: General Biology Lecture/Lab 4 Credits  
CHEM 202- Organic Chemistry 4 Credits  
PHYS 102 - Physics 4 Credits  
CHEM 301- Biochemistry 3 Credits  
MCAT Prep

Summer 2017

Electives

Certificate in Postbaccalaureate Pre-Health Studies  
38 Credits for 2-year program

Fall 2016

BIO101: General Biology Lecture/Lab 4 Credits  
CHEM101: General Chemistry Lecture/Lab 4 Credits  
ASH100: Art & Science of Healthcare 3 Credits

Summer 2017

Electives

Fall 2017

CHEM 201- Organic Chemistry 4 Credits  
PHYS 101 - Physics 4 Credits  
Electives  
MCAT Prep

Spring 2017

BIO102: General Biology Lecture/Lab 4 Credits

CHEM102: General Chemistry Lecture/Lab 4 Credits  
Electives

Summer 2017

Electives

Spring 2018

CHEM 202- Organic Chemistry 4 Credits

PHYS 102 - Physics 4 Credits

CHEM 301- Biochemistry 3 Credits

MCAT Prep