

VIROLOGY AND GENE THERAPY (VGT) - PROFESSIONAL MASTER'S

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There are two pathways to choose from:

The **Regulatory/Translational Pathway** student will gain a broad scope of gene therapy and will learn how to develop a gene based therapeutic from an idea to a validated product. Various gene therapy strategies will be considered in relation to a broad spectrum of human diseases illustrating how genes can be used for gene replacement, tissue engineering, destruction of unwanted tissues, or immune stimulation. Stages in the development of gene-based drugs & biologics will be studied from vector design through preclinical proof of efficacy, clinical protocol development, product manufacture, pharmacology and toxicology testing, analysis of clinical trial outcomes, regulatory affairs, patenting and partnering with industry. The Regulatory/Translation pathway is designed for those learners who desire to conduct or participate in research that will identify therapies/devices that will move into manufacturing facilities.

The **Research Pathway** student will learn from and work alongside faculty members who have primary interests in virology, viral vectors and gene therapy and will develop research skills in conducting or participate in vaccine and gene therapy discovery. These areas overlap with the fields of biochemistry, cell and molecular biology, genetics, and immunology and regulatory science. The Research pathway is designed for learners who desire to be an informed member of a research team conducting or participating in Virology and Gene Therapy research.

Application

Candidates must complete a Professional Master's Degree Application form. This form is available on the MCGSBS Master's Programs intranet site. Supporting documents include a program fee agreement form, transcripts from previous colleges and two letters of recommendation - one preferred from your direct supervisor/manager.

Eligibility

Enrollment is restricted to current Mayo employees/appointees and is available at all three sites: Arizona, Florida, and Minnesota, as well as the Mayo Clinic Health System. Visiting clinicians, research trainees, and research collaborators are not eligible.

Applicants must have received a bachelor's degree from an accredited college or university, must have taken appropriate undergraduate science courses to adequately prepare for the Master's program, must have a minimum undergraduate grade point average that demonstrates a record of academic excellence.

Time Requirement

Time to completion can vary by student (three to five years), but all requirements for the Master's degree must be completed within five years. The five-year period begins on the start date of the term the

student is appointed to. If the student's Mayo employment ends prior to completion of the program, the MCGSBS appointment will also end.

Registration Requirement

At least 75% of the coursework for the Master's degree must be completed in MCGSBS.

Minimum Credit Requirements

Students must complete a minimum of 45 credits, including MGS 6000 Responsible Conduct of Research. Didactic credits may vary by track - refer to specific program requirements for details.

Transfer Credits

A total of 9 didactic credits may be transferred into the Professional Master's Program. For more details, see the Credit Conversion, Transfer, Waiver and Substitution Policy on the MCGSBS intranet site.

Course Requirements

A total of 45 credits to be completed over two to four years with maintenance of at least a 3.0 GPA are required for graduation.

Code	Title	Hours
MGS Courses		14
BMB 5100	Chemical Principles of Biopolymer Systems	
VGT 5700	Virology and Gene Therapy	
MGS 6000	Responsible Conduct of Research	
MGS 5050	Critical Thinking and Scientific Writing	
MGS 6400	Master's Capstone Project	
Journal Club		2
VGT 6740	Viruses and Vectors Journal Club (1 cr./yr.)	
VGT 6745	Current Topics in Virology and Gene Therapy (1 cr./yr.)	
Track Requirements		
Select 7 or 5 credits based on chosen pathway		5-7
Regulatory/Translation Pathway (details below)		
Research Pathway (details below)		
Advanced Coursework		
Select 24 or 22 credits based on chosen pathway ¹		24-22
Total Hours		45

¹ Any courses approved for graduate credit; select in consultation with your mentor.

Track Requirements

Regulatory/Translation Pathway

Code	Title	Hours
CTSC 5020	Regulatory Issues in Clinical Research	1
CTSC 5025	Introduction to Regulatory Science	1
CTSC 5300	Foundations of Epidemiology	1
CTSC 5600	Introduction to Statistics in Clinical and Translational Research	3

CTSC 5040	Introduction to the Principles of Current Good Manufacturing Practices (cGMP)	1
Total Hours		7

Research Pathway

Code	Title	Hours
IMM 5100	Basic Graduate Immunology	3
VGT 6888	Molecular Therapy Tutorial	2
Total Hours		5

Program milestones are included in the Academic Progress and Graduation Requirements for Masters Programs Policy. See below for VGT-specific program highlights and instruction.

Students are expected to make continuous and successful academic and professional progress toward graduation requirements for the M.S. degree. The concept of satisfactory progress mandates monitoring of a students' academic and professional performance through items including, but not limited to:

- Complete Degree Planning Tool (DPT)
- Project Advisor Selection
- Pass Written Qualifying Exam
- Masters Capstone Project
- Meet any program specific competencies as defined by track

Full details are included in the Academic Progress and Graduation Requirements for Masters Programs Policy on the MCGSBS intranet site.

Minimum Grade Requirements

Students are expected to maintain a grade point average of 3.0 in didactic course work. Students whose performance falls below this standard in a given quarter will be placed on academic probation, as described in the Deficiencies and Unsatisfactory Progress Policy and Warning, Probation, Dismissal and Appeal Policy outlined on the MCGSBS intranet site.

Degree Planning Tool

The use of a Degree Planning Tool (DPT) is required and allows students to list the course work to fulfill degree requirements, including transfer credits. The DPT must be completed during the first academic year and should be updated as courses are completed throughout the training program. A final completed DPT must be submitted to the school when a tentative defense date has been determined to be cleared to graduate.

Project Advisor Selection

Project Advisor is selected with counsel from Program Director, done at any time during training but no later than end of year. A list of Faculty with Privileges can be found on the MCGSBS intranet site.

Written Qualifying Examination

The written qualifying examination will test the breadth of biomedical knowledge, and analytic and critical reasoning skills. The content and format of the examination is determined by each track. The written qualifying examination must be passed before the Master's final project review may be scheduled.

For more details, see the Written Qualifying Exam Procedure on the MCGSBS intranet site.

Masters Capstone Project

This is required for all students in the Professional Master's Program and serves as the final academic milestone of the degree. Students will complete a scholarly project that demonstrates mastery of their chosen track and area of interest. Projects may take the form of a critical review article, original research manuscript, case study, or another approved scholarly product suitable for presentation or publication. Students must register for MGS 6400 Masters Capstone Project during their final quarter in the program. The course may only be taken once for credit. Students must register with the Program Director for their track as the course director.

Course Sequence

This is a suggested sequence based on a summer term start. Individual course plans may vary depending on true start date, program, employment/ personal commitments, and research interests. Be sure to confirm you have met your requirements using your degree planning tool. Course offerings may vary slightly. Current course offerings are posted in the course catalog.

Research Pathway

Code	Title	Hours
First Year - Summer Term		
MGS 5050	Critical Thinking and Scientific Writing	2
MGS 6000	Responsible Conduct of Research	1

Code	Title	Hours
First Year - Fall Term		
BMB 5100	Chemical Principles of Biopolymer Systems	2
IMM 5100	Basic Graduate Immunology	3

Code	Title	Hours
First Year - Winter Term		
VGT 5700	Virology and Gene Therapy	3
Electives		

Code	Title	Hours
First Year - Spring Term ^{1, 2}		
VGT 6888	Molecular Therapy Tutorial (Even years)	2
Electives		

Code	Title	Hours
Second Year - Summer Term ³		
Electives		

Code	Title	Hours
Second Year - Fall Term		
VGT 6740	Viruses and Vectors Journal Club	1
VGT 6745	Current Topics in Virology and Gene Therapy	1
Electives		

Code	Title	Hours
Second Year - Winter Term		
Electives		

Code	Title	Hours
Second Year - Spring Term		
Electives		

Code	Title	Hours
Third Year - Summer Term		
Electives		

Code	Title	Hours
Third Year - Fall Term		
Electives		

Code	Title	Hours
Third Year - Winter Term		
Electives		

Code	Title	Hours
Third Year - Spring Term		
Electives		

Code	Title	Hours
Fourth Year - Summer Term		
MGS 6400	Master's Capstone Project	6
Electives		

¹ Written Qualifying Examination due by end of term unless you do not take VGT 5700

² Suggested to take VGT 6886 and 6888 as electives during this term in odd years

³ Mentor Selection Suggested by End of Term

Regulatory/Translational Pathway

Code	Title	Hours
First Year - Summer Term		
MGS 5050	Critical Thinking and Scientific Writing	2
MGS 6000	Responsible Conduct of Research	1

Code	Title	Hours
First Year - Fall Term		
BMB 5100	Chemical Principles of Biopolymer Systems	2
CTSC 5300	Foundations of Epidemiology	1

Code	Title	Hours
First Year - Winter Term		
VGT 5700	Virology and Gene Therapy	3
CTSC 5020	Regulatory Issues in Clinical Research	1

Code	Title	Hours
First Year - Spring Term ^{1,2}		
Electives		

Code	Title	Hours
Second Year - Summer Term ³		
CTSC 5025	Introduction to Regulatory Science	1

CTSC 5040	Introduction to the Principles of Current Good Manufacturing Practices (cGMP)	1
Electives		

Code	Title	Hours
Second Year - Fall Term		
VGT 6740	Viruses and Vectors Journal Club	1
VGT 6745	Current Topics in Virology and Gene Therapy	1
Electives		

Code	Title	Hours
Second Year - Winter Term		
CTSC 5600	Introduction to Statistics in Clinical and Translational Research	3

Code	Title	Hours
Second Year - Spring Term		
Electives		

Code	Title	Hours
Third Year - Summer Term		
Electives		

Code	Title	Hours
Third Year - Fall Term		
Electives		

Code	Title	Hours
Third Year - Winter Term		
Electives		

Code	Title	Hours
Third Year - Spring Term		
Electives		

Code	Title	Hours
Fourth Year - Summer Term		
MGS 6400	Master's Capstone Project	6
Electives		

¹ Written Qualifying Examination due by end of term unless you do not take VGT 5700

² Suggested to take VGT 6884 (even), 6886 (odd) and 6888 (odd) as electives during this term

³ Mentor Selection Suggested by End of Term