# CLINICAL AND TRANSLATIONAL SCIENCE (CTSC) - PROFESSIONAL MASTER'S

- M. Hassan Murad, M.D.,Program Director

The Professional Master's in Clinical and Translational Science is a rigorous and comprehensive program designed for individuals who want to deepen their expertise in translating basic research into clinical applications.

This master's program equips professionals with the theoretical knowledge and practical tools to bridge the gap between laboratory discoveries and effective healthcare solutions. The curriculum emphasizes critical competencies in study design, data analysis, research ethics, team science, and the regulatory environment of translational research.

The program is ideal for individuals who seek to advance their careers in clinical and translational research without the necessity of conducting a thesis or independent research.

Scholars in the Professional Master's Degree Program in Clinical and Translational Science will gain competencies through carefully selected didactic coursework and a custom final project (non-thesis). Optionally, program electives can be focused in one of five concentration areas including:

- Biomedical Ethics
- Clinical Trials
- Individualized Medicine
- Mixed Methods Research
- Quantitative Research Methods

## 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**#with maintenance of at least a 3.0 GPA are required for graduation.

| Code | Title | Hours |
|---|---|---|
| **Required foundational courses** | | |
| MGS 6000 | Responsible Conduct of Research | 1 |
| CTSC 5005 | Foundations of Clinical and Translational Science | 1 |
| CTSC 5020 | Regulatory Issues in Clinical Research | 1 |
| CTSC 5100 | Academic Publishing | 1 |
| Select one of the following: | | 1-2 |
| CTSC 5110 | Grant Writing in the Sciences | |
| CTSC 5120 | | |
| CTSC 5370 | Introduction to Epidemiology | 2 |
| CTSC 5390 | Advanced Applied Epidemiological Methods | 2 |
| CTSC 5600 | Introduction to Statistics in Clinical and Translational Research | 3 |
| Select one of the following: | | 1 |
| CTSC 5602 | Introduction to Utilizing Statistical Software in Clinical and Translational Research | |
| CTSC 5603 | Introduction to R Programming in Clinical and Translational Research | |
| CTSC 5610 | Statistics in CTR: Linear Regression Concepts, Interpretation, and Statistical Software | 3 |
| CTSC 6100 | Mechanisms of Human Disease | 3 |
| CTSC 6120 | Case Studies in Translation | 2 |
| **Selective foundational courses** | | **1** |
| CTSC 5710 | Practical Data Collection | |
| CTSC 5810 | Qualitative Research Design, Methods, and Analysis | |
| CTSC 5820 | Introduction to Survey Research | |

| | | |
|---|---|---|
| **Required capstone courses** | | |
| MGS 6400 | Master's Capstone Project | 6 |
| **Concentrations and Elective Credits** [1] | | **17** |
| **Total Hours** | | **45-46** |

[1] Seventeen additional elective credits are required within the 45-credit program. Scholars can customize a curriculum that best meets their individual professional goals or choose to focus their elective credits in aconcentration area.

Scholars are encouraged to fulfill electives with clinical and translational science courses (CTSC). Other Mayo Clinic Graduate School of Biomedical Sciences (MCGSBS) courses may be considered. Consult with yourCCaTS#education coordinator or specialist for further information.

## Concentration Requirements

### Biomedical Ethics (BET)

| Code | Title | Hours |
|---|---|---|
| CTSC 5261 | Theoretical and Historical Foundations of Biomedical Ethics | 2 |
| CTSC 5262 | Health Policy and Biomedical Ethics | 1 |
| Select 2 credits of the following: | | 2 |
| CTSC 5210 | Ethical Issues in Regenerative Medicine | |
| CTSC 5263 | Ethical Issues in Population Health | |
| CTSC 5340 | Ethical Issues in Individualized Medicine | |
| CTSC 5350 | Ethical Issues in Artificial Intelligence and Information Technologies | |
| **Total Hours** | | **5** |

### Clinical Trials (CLTR)

| Code | Title | Hours |
|---|---|---|
| CTSC 5025 | Introduction to Regulatory Science | 1 |
| CTSC 5650 | Advanced Statistics in CTS Research: Survival Analysis with Statistical Software | 1 |
| CTSC 5720 | Clinical Trials Design and Conduct | 1 |
| Select 2 credits of the following: | | 2 |
| CTSC 5640 | Statistics in Clinical and Translational Research: Logistic Regression with Statistical Software | |
| CTSC 5761 | Evidence-Based Medicine for Clinical Researchers | |
| CTSC 5770 | Diagnostic Testing Strategies | |
| CTSC 5820 | Introduction to Survey Research (excluded if taken as a foundational cr.) | |
| **Total Hours** | | **5** |

### Individualized Medicine (IDVM)

| Code | Title | Hours |
|---|---|---|
| CTSC 5340 | Ethical Issues in Individualized Medicine | 1 |
| CTSC 5400 | Introduction to Bioinformatics Concepts and Core Technologies for Individualized Medicine Approaches | 1 |
| CTSC 6160 | Genomic Analysis and Data Interpretation for Rare and Undiagnosed Diseases | 2 |
| CTSC 5410 | Molecular Variant Evaluation | 2 |
| **Total Hours** | | **6** |

### Mixed Methods Research (MIXM)

| Code | Title | Hours |
|---|---|---|
| CTSC 5810 | Qualitative Research Design, Methods, and Analysis (excluded if taken as a foundational credit) | 1 |
| CTSC 5815 | Qualitative and Mixed Methods Research for Translational Science | 2 |
| CTSC 5820 | Introduction to Survey Research (excluded if taken as a foundational credit) | 1 |
| CTSC 5900 | Introduction to Health Services Research | 1 |
| **Total Hours** | | **5** |

### Quantitative Research Methods (QUAN)

| Code | Title | Hours |
|---|---|---|
| CTSC 5640 | Statistics in Clinical and Translational Research: Logistic Regression with Statistical Software | 1 |
| CTSC 5650 | Advanced Statistics in CTS Research: Survival Analysis with Statistical Software | 1 |
| Select 3 credits of the following: | | 3 |
| CTSC 5500 | Genomic Analysis of Complex Traits | |
| CTSC 5641 | Observational Studies & Causal Inference | |
| CTSC 5710 | Practical Data Collection (excluded if taken as a foundational credit) | |
| CTSC 5715 | Publication Quality Tables and Figures | |
| CTSC 5740 | Systematic Reviews and Meta-Analysis | |
| CTSC 5815 | Qualitative and Mixed Methods Research for Translational Science | |
| CTSC 5820 | Introduction to Survey Research (excluded if taken as a foundational credit) | |
| CTSC 5940 | Secondary Data Analysis | |
| **Total Hours** | | **5** |

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.