



Graduate School of Biomedical Science

Course Catalog

2021-2022

Cedars-Sinai
Graduate School of Biomedical Science
Graduate Research Education (GRE)

Every effort has been made to ensure the accuracy of the information presented in the Cedars-Sinai Graduate School Course Catalog. However, all courses, course descriptions, instructor designations, curricular degree requirements, and fees described herein are subject to change or to deletion without notice. For additional questions, please contact the Graduate School at 310-423-8294 or gradprogram@csmc.edu.

Accreditation:

Cedars-Sinai Medical Center is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges (WASC), 985 Atlantic Avenue, #100, Alameda, CA 94501, 510-748-9001.

Western Association of Schools and Colleges
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Letter from the Associate Dean of the Graduate School of Biomedical Science

It gives me great pleasure to introduce you to Graduate School of Biomedical Science. Cedars-Sinai has designed and initiated the programs within the Graduate School which differ fundamentally from existing programs. The programs are housed within a world class medical center and teaching hospital and is then delivered by a faculty comprised of non-medical scientists and medical doctors.

Faculty members are committed to assist our students in networking with local and outside clinical leaders in an effort to allow outstanding students to flourish in academic clinical settings or in appropriate business or community environments relevant to medical research.

I believe that the quality of the education and the research you will experience at Cedars-Sinai is of the finest. The additional support you will receive from Cedars-Sinai and the benefit of being a member of a large, vibrant, intellectually curious and innovative institution will help ensure that your time here is enjoyable, productive and rewarding.

I hope that your application to the Graduate School is successful and I look forward to welcoming you.

A handwritten signature in black ink, appearing to read "Wm Parks". The signature is fluid and cursive.

William C. Parks, PhD
Associate Dean, Graduate School of Biomedical Science
PhD Program Director in Biomedical and Translational
Science

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About Cedars-Sinai

The Cedars-Sinai Graduate School in Biomedical Science offers unique graduate programs located in one of the country's most distinguished clinical settings, Cedars-Sinai in Los Angeles.

Since its beginning in 1902, Cedars-Sinai has evolved to meet the healthcare needs of one of the most diverse regions in the nation, continually setting new standards in quality and innovation in patient care, research, teaching and community service.

Today, Cedars-Sinai is widely known for its national leadership in transforming healthcare for the benefit of patients.

Cedars-Sinai is one of the largest nonprofit academic medical centers in the U.S. with 886 licensed beds, 2,100 physicians, 2,800 nurses and thousands of other healthcare professionals and staff. Clinical programs range from primary care for preventing, diagnosing and treating common conditions to specialized treatments for rare, complex and advanced illnesses. In addition, Cedars-Sinai serves the community through its Medical Network, which includes the highly rated Cedars-Sinai Medical Group and Cedars-Sinai Health Associates

Cedars-Sinai has consistently been named one of America's Best Hospitals by U.S. News & World Report, has received the National Research Corporation's Consumer Choice Award 18 years in a row for providing the highest quality medical care in Los Angeles, and has the longest running Magnet designation for nursing excellence in California.

Cedars-Sinai also impacts the future of healthcare through education programs that encompass everything from highly competitive medical residency and fellowship programs to a PhD program in Biomedical and Translational Sciences, a Master of Science in Magnetic Resonance in Imaging (MSMRM) a Master's Degree in Healthcare Delivery Science (MHDS), advanced training for nurses and educational opportunities for allied health professionals.

Graduate research in education is conducted in the state-of-the-art laboratories under the supervision of faculty mentors, whose interests cover a wide range of basic biomedical science and its application to 21st century medicine.

The graduate programs add an important new element to the profile of Cedars-Sinai by expanding the dimension of its education and training mission as embraced in its mission statement as follows:

Cedars-Sinai Health System, a nonprofit, independent healthcare organization, is committed to:

- Leadership and excellence in delivering quality healthcare services
- Expanding the horizons of medical knowledge through biomedical research
- Educating and training physicians and other healthcare professionals
- Striving to improve the health status of our community

Mission

It is the mission of the Graduate School to:

- Educate biomedical science students in a spirit of self-learning, creativity and independence, so as to optimize their opportunities and success in their chosen career pathways.
- Provide an understanding of the relevance of basic biomedical science to human disease through an exploration of the foundations of translational and clinical research and through interactions with medical practitioners.
- Instill the ability to communicate scientific information accurately and effectively to professional and non-professional audiences, in both verbal and written formats.

The curriculum of the educational programs emphasize research training and closely mentored instruction within a human disease-focused framework. All of the graduate programs are designed to prepare students for successful careers by training them as well-rounded scientists with a strong foundation of knowledge in research design, methodology, presentation and the skills necessary to compete for research funding.

Cedars-Sinai takes the approach to graduate education that emphasizes small-group, mentored learning and critical analysis of primary literature. Beginning with discussions with scientists and clinicians on real medical problems, students will learn how to research the background, analyze existing literature, and develop productive research plans. Our curriculum has been designed to take specific advantage of the outstanding resources, clinical and research expertise found at Cedars-Sinai.

PhD Program Objectives

- Effective integration of scientific information into an understanding of its relationship to human disease.
- Effective oral communication of scientific information.
- Proficiency in conducting scientific research using modern research, methodologies and design to critically test hypotheses and draw appropriate conclusions.
- Superior skills in grant writing and research presentations.
- Collaborative interactions with peers in a laboratory setting.
- Sound knowledge of modern day biomedical science and the potential to translate the knowledge to medicine.

Master of Health Delivery Science (MHDS) Degree Objectives

- Explain key operational functions of the US health system.
- Identify healthcare delivery models and digital health innovations that can improve the quality, safety and value of care.
- Use quantitative and qualitative research methods to evaluate the effectiveness and economic impact of healthcare interventions.
- Demonstrate the leadership skills to successfully manage a project that involves people from diverse disciplines.

- Communicate effectively about healthcare delivery interventions with diverse stakeholders.

Master of Science in Magnetic Resonance in Imaging Degree Objectives

- Effective integration of scientific information into an understanding of its relationship to human disease.
- Effective oral communication of scientific information.
- Proficiency in conducting scientific research using modern research, methodologies and design to critically test hypotheses and draw appropriate conclusions.
- Superior skills in grant writing and research presentations.
- Collaborative interactions with peers in a laboratory setting.
- Sound knowledge of modern-day biomedical science and the potential to translate the knowledge to medicine.

Research

Discovery is central to Cedars-Sinai’s mission. The institution’s laboratories and clinics generate ideas, therapies, devices and systems that contribute to biomedical progress around the world. More than 1,500 research projects currently underway explore the genetic underpinnings of disease, exploit the potential of stem cells, leverage nanotechnology, parse big data, and assess how gender and metabolism impact health. Cedars-Sinai’s investigators push the frontiers of biomedicine with studies in cardiac care, cancer, digestive health, the neurosciences, women’s health and more. Cedars-Sinai has earned its position as a research leader through an ever-expanding effort to promote health, reduce suffering and improve human life.

Student Code of Ethics

Students in the Cedars-Sinai Graduate School are expected to behave in a courteous and ethical manner at all times. The attitudes and habits developed as a student form the core of future professional behavior. As such, students are expected to set an example of the highest caliber for those who work with them.

To promote these behaviors within the student body, students use the principles of honesty, integrity, respect and professionalism as personal, academic, and professional guides.

HONESTY:

- Understand the Cedars-Sinai Graduate School policies on academic integrity and practice them as a part of student life.
- Honor personal obligations to be sincere and forthright by dealing fairly and truthfully with others.

INTEGRITY:

- Maintain beliefs and values despite changing circumstances and challenging environments.
- Respect personal reputation and that of Cedars-Sinai Medical Center and the Graduate School by avoiding unethical behaviors and the circumstances that encourage them.

RESPECT:

- Embrace the diverse perspectives and accomplishments of others, knowing that it is the personal and cultural variations among people that enrich us individually and as a society.
- Take pride in Cedars-Sinai and the Graduate School by protecting our facilities and their surroundings.

PROFESSIONALISM:

- Maintain the highest standards of performance, conduct, and cooperation with fellow students, faculty, staff, and co-workers.

Perform duties with due diligence and make a continuous effort towards improvement.

Graduate Research Education Leadership and Contact Information

The Graduate School in Biomedical Science is under the Graduate Research Education department and is headed by the Vice- Dean of Graduate Research Education, the Director of Graduate Research Education and each respective Program Director.

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The Graduate School in Biomedical Science is located on the 5th Floor of the Pacific Design Center, 8687 Melrose Ave, West Hollywood, CA 90069

PhD Admission Requirements

Undergraduate Preparation

Prospective students are required to have a Bachelor's degree (BA or BS) usually in a biomedical discipline or an MD degree. Strong undergraduate preparation would include at least one year of general biology, two years of chemistry (general, organic and physical chemistry), and additional advanced coursework in such areas as biochemistry, biophysics, mathematics, computer science, cell biology, genetics, microbiology, molecular biology, immunology and/or neurobiology.

Prerequisites

The following are the prerequisites for admission to the Graduate Programs:

- One year each of general biology and biochemistry
- Two years of chemistry (general and organic), including laboratory
- One year of mathematics
- One year of general physics, including laboratory.
- Significant experience in a research laboratory

Additional recommended courses for the PhD and MSBSTM include the following:

- Microbiology
- Immunology
- Genetics
- Cell physiology
- Developmental biology
- Neurobiology

Curriculum Vitae/Resume

A curriculum vitae or resume indicating your scientific work experience is required. Please indicate your years of study, location, years of scientific work and locations.

Graduate Record Examination GRE

The Graduation Record Exam (GRE) general test is not required for all prospects applying to the PhD Program. For those individual who feel they need to strengthen their application, the program will accept GRE scores within a 5-year range.

Letters of Recommendation

Three (3) letters of recommendation should be submitted from persons who have supervised the applicant's research or academic work and who can evaluate their intellectual ability, creativity, leadership potential, and promise for productive scholarship. If laboratory supervision was provided by a postdoctoral or graduate student, the letter should carry the signature of the faculty member in charge of the research project.

Personal Statement

Each applicant must submit a Statement of Purpose (3 double-spaced pages maximum) detailing his/her reasons for pursuing graduate study in the chosen program, including applicable experiences and preparation, and long-term goals.

English Language Proficiency

The program provides instruction in English only. Proficiency in written and oral English is therefore essential. The institution will admit qualified students from foreign countries. The requirements for admission of such students will be the same as for all other students, except that, to ensure proficiency in the English language, "Test of English as a Foreign Language" (TOEFL) scores are required.

Application Fee/Fee Waivers

An application fee of \$55 is required at the time of application. The Graduate Programs Office will waive the application fee for applicants who are participants or who have participated in one of the programs listed below for at least a year. The fee waiver is a one-time offer for eligible applicants.

- Americorps
- Annual Biomedical Research Conference for Minorities Students (ABRCMS)
- Bill and Melinda Gates Millennium Scholarship
- Careers Opportunity Research/NIMH (COR/NIHM)
- Currently serving in the U.S. Military
- Institute for Recruitment of Teachers (IRT)
- Ronald McNair Postbaccalaureate Achievement Program
- Mellon Minority Undergraduate Fellows Program
- Minority Access Research Careers (MARC)
- Minority Biomedical Research Support Program (RISE)
- National Association of African American Honors Program (NAAAHP)
- Peace Corps
- Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

- Teach for America
- Jackie Robinson Foundation

You will be required to submit a letter from the coordinator of the program. Please email this letter to gradprogram@csmc.edu prior to submitting an online application to the Graduate Program.

MHDS Admission Requirements

The admissions process of the Master's Degree in Health Delivery Science (MHDS) program is competitive; the process allows for consideration of students who demonstrate exceptional potential to succeed in graduate study. The admissions committee is seeking students who have a high level of academic achievement, including an excellent grasp of empirical and social sciences.

Given the high number of applications, we are not able to grant in-person interviews for all candidates. Applications are judged on the basis of test scores, grades, statement of purpose in the program and career goals, writing ability and letters of recommendation. Admitted students are given the opportunity to visit in person, meet with program leadership and tour the campus as needed prior to making final enrollment decisions.

Completed Online Application, including payment of \$55 application fee.

Personal Statement: Three double-spaced pages maximum (about 1,000 words), detailing the applicant's reasons for wanting to pursue the MHDS. The essay must demonstrate enthusiasm for the curriculum and highlight specific ways in which the MHDS will help support the applicant's career development. The Admissions Committee reviews the personal statement for writing skills as well as content. The personal statement should be submitted as part of the online application.

Resume or CV: Generally, three years or more of work experience in the healthcare industry (hospital, health system, physician group, post-acute care facility, health plan, pharmaceutical or biotech company, clinical research, etc.), or an MD, PharmD, DPT or MSN is required. Exceptional candidates with less experience who can demonstrate specific interest in healthcare delivery will also be considered.

Letters of Recommendation: A minimum of 2 letters must be submitted from persons who have supervised the applicant's academic work or job performance. These letters must be written on letterhead and accompanied by the recommendation form found on the website. The letters and forms should be mailed directly to the MHDS Admissions Office or emailed to gradprogram@csmc.edu by the person writing the letter.

The GRE is not required for applicants with a degree from a U.S. institution. Individuals who do not have a strong academic record in math, science or economics courses may wish to submit GRE or equivalent (MCAT, GMAT) scores to strengthen their application. Applicants with an advanced degree from a non-U.S. institution should inquire regarding their eligibility for a GRE waiver.

Bachelor's Degree: Bachelor's degree (BA or BS) from an accredited institution with a grade-point average (GPA) of 3.0 or higher. Those with a lower GPA but outstanding career achievement will be considered. Degrees earned outside the U.S. should be equivalent to a four-year U.S. baccalaureate degree. Although we anticipate most competitive applicants will have a degree in a biomedical field or other quantitative discipline, we will consider applicants with any BA or BS degree.

Official Transcripts from every college or university attended, sent directly to the graduate program office. (See button below for transcript request form.)

TOEFL Scores: Successful applicants will be highly proficient in spoken and written English. TOEFL scores may be required for applicants whose primary language is not English and who do not have a post-secondary degree from a U.S. institution.

VISA: The MHDS program is designed for working professionals who hold full time jobs. Therefore, it is considered a part-time program, and we cannot accept applicants on F-1 or J-1 student visas.

Additional Requirements: During the application process, all applicants will need to confirm that they have:

- Ability to attend five 3-day in-person sessions on the Cedars-Sinai campus
- A computer with the following hardware requirements:
 - Webcam
 - Microphone and speakers
 - Microsoft Office and a web browser installed on their computer
 - Reliable, high-speed internet access
 - A quiet location to attend classes

Basic computer and internet skills (e.g., manage files, install software, use a web browser, receive and send emails, use basic functions in Microsoft Word, Excel and PowerPoint)

MSMRM Admission Requirements

Prospective students with a bachelor's degree in engineering or physics who demonstrate exceptional potential for graduate studies in magnetic resonance in medicine are eligible to apply. Imaging technologists or imaging healthcare providers who have a solid foundation in physics and mathematics also are considered for admission. A complete application consists of:

- **Application Form:** The online application includes a personal statement and will require a \$55 fee to submit. Please contact us at msmrm@csmc.edu if you would like to be considered for a fee waiver.
- **Academic Transcripts:** Official transcripts for all undergraduate studies must be sent directly to the MSMRM office.
- **Letters of Recommendation:** Two letters must be submitted from persons who are familiar with the applicant's academic and/or research work. The letters must accompany a completed recommendation form and be mailed or emailed directly from the recommender to the MSMRM office.
- **GRE Scores:** Official GRE general test scores (Verbal, Quantitative, Analytical) are not required but may be submitted. These must be sent directly from ETS to the Cedars-Sinai Graduate Office (GRE institution code 5739).
- **TOEFL Scores:** For students whose first language is not English, official TOEFL scores are required. These must be sent directly from ETS to the Graduate Program Office (TOEFL institution code 5739).

The Doctoral Degree

The PhD Program focuses on the individual student. The curriculum is designed to stimulate creative as well as critical thinking in research. Students are required to attend clinical rotations as well as laboratory rotations and co-curricular activities, allowing each student to gain intimate knowledge of the translational aspects of biomedical science. This greatly enhances a student's knowledge of research and its clinical applications.

During the first two weeks of the first academic year a series of orientation meetings will be held for the students at which they will be able to meet faculty from all disciplines at Cedars-Sinai and hear presentations on the research being done by different research groups. This will be an important opportunity to make laboratories visible to new graduate students who will shortly be selecting those laboratories through which they wish to rotate.

PhD Requirements

The PhD Program in Biomedical and Translational Sciences grants a doctoral PhD degree upon completion of all the requirements, which include coursework, laboratory rotations, clinical observation rotations, qualifying examination, dissertation research, and dissertation defense. Each requirement is described in more detail under the assigned heading in this catalog. Students in the program are devoted to full-time study and research.

During the first year, students must complete the core curriculum, which is comprised of lecture classes and up to three laboratory rotations. Students will complete three trimesters taken during the first year; Immunology/Infectious Diseases, Genomics/Genetics and Developmental and Cell Biology. In addition, students are expected to complete a course in Biostatistics/Bioinformatics.

Students are expected to spend half of their time on coursework and half of their time in the rotation laboratories. Students are required to participate in up to three laboratory rotations to increase their exposure to different areas of research study and to ensure that students select a thesis laboratory that matches their research interest.

Students must have passed all relevant requirements with a "B" average prior to taking the Qualifying Examination. The goal of this examination is to rigorously test the ability of the student to design a research plan, present the proposal in a formal seminar and discuss the material presented. Students are required to pass the Qualifying Examination for advancement to doctoral candidacy.

Beginning at the advancement to candidacy, students will meet with their chosen Doctoral Committee annually. This will ensure the student's progress is on track and that the student's thesis project is completed in a successful and timely manner. The final requirements for the doctoral degree are the thesis manuscript and the oral defense of the thesis. The oral defense will be held in front of a panel of faculty members and an external expert in the field who is outside of the Cedars-Sinai community.

PhD Core Curriculum

All students entering the program will participate in the “core curriculum” during their first year (3 trimesters). The course will be organized as a series of three “Core Modules” (each Core runs the length of the 16-week trimester) focused on three areas of expertise here at Cedars-Sinai. Core Module instruction will take place three times a week (e.g. MWF) in 1 ½ hour blocks of instruction. Students are also expected to attend a weekly Journal Club, with active participation, including presenting, occurring in the second year.

At the end of each laboratory rotation students are expected to give a 15-minute oral presentation describing the results of their project(s). These presentations are peer reviewed.

Qualifying Examination

At the end of year one/beginning of year two, each student will prepare a written and an oral presentation that will be submitted to the chosen Dissertation Committee for evaluation. The written portion of the Examination is submitted to the Committee followed by an Oral Examination based upon the proposal. The Qualifying Examination must be completed by the end of year two.

Advancement to Candidacy

Once the rotations, course work, and the qualifying exam are completed successfully, the student is advanced to PhD candidacy. It is expected that a student will have a minimum of 43.5 credit hours prior to advancing to candidacy.

Dissertation Research

At the end of the first year, students select one of the laboratories in which they rotated, for their dissertation research. Laboratory selection is based on student choice, with the consent of the laboratory head. In cases where suitable matches cannot be made, additional rotations into the second year may be required. While most the student’s time will be spent in the laboratory, ongoing clinical exposure relevant to the student’s research will be included. This exposure will assist the student in understanding the potential translational aspects of their research and facilitate communication with clinical investigators.

Doctoral Dissertation

The PhD program requires the completion of an approved dissertation that demonstrates the student’s ability to perform original, independent research and constitutes a distinct contribution to knowledge in the principal field of study. Students will spend years three to graduation completing dissertation research, writing their dissertation, and presenting a defense of the dissertation. Students will meet annually with their Doctoral Advisory Committees and will participate in ongoing workshops, seminars, and journal clubs. It is the express job of the Doctoral Committees to look out for the best interests of the students with the goal towards graduating students with PhD degrees who will be uniquely qualified to take on their next jobs (postdoctoral fellowships, educational or industrial posts, etc.). The Doctoral Committees will base their decisions on a balanced evaluation of

academic growth and maturity, problem solving skills, writing and presentation skills, and publication record.

Doctoral Committee

The mission of the Doctoral Committee is to assess each student's dissertation research progress and to award the PhD in Biomedical and Translational Sciences to qualified students.

The Doctoral Committee will meet twice a year to evaluate student progress and student plans. The committee will then evaluate the completed dissertation, conduct the oral defense and vote to certify the dissertation.

Membership of the Doctoral Committee will consist of six (6) members, chosen by each student. The membership is defined and approved by the PhD Program Director.

Master Degree in Health Delivery Science Overview

The Cedars-Sinai MHDS program is designed to train tomorrow's healthcare leaders; its unique curriculum prepares graduates for a successful career in emerging healthcare fields, including digital health science, mobile health, health technology assessment, big data analytics, performance improvement and health economics. Students are embedded within teams operating in Cedars-Sinai — the largest hospital in the Western United States and a member of the 2018-2019 *U.S. News & World Report* Best Hospitals Honor Role. A structured capstone project affords unparalleled opportunities to gain applied skills that reinforce classroom didactics. Deep exposure to digital health science and access to the Cedars-Sinai/Techstars Healthcare Accelerator provide students with the first-hand experience and know-how for applying biomedical innovations in healthcare. In contrast to a typical University-based curriculum, students in the MHDS program work closely with practitioners in the forefront of health delivery science, are embedded directly within a major healthcare system, and culminate their work with an applied capstone project that they present to hospital leadership.

Targeted Learners

The degree is for students seeking to develop foundational skills and knowledge in health delivery science with an aim to become leaders in healthcare organizations. The program is ideal for students who may be considering a more traditional degree in public health yet are seeking deeper exposure to modern analytic techniques and applied skills. Or, for students contemplating an MBA, but who are interested in the business of healthcare delivery. The program is also well suited for pre-health students who seek additional experience in healthcare before starting an MD, RN, PharmD, or other clinical degree. Many of our students are already healthcare professionals who are now exploring how to expand their influence within and beyond their organizations

MHDS Program Duration and Schedule

Because many of our students are actively employed, we developed an executive-style schedule for the MHDS program. Most classes are taught Tuesday, Wednesday and Thursday evenings. Classroom didactics fit within the first 12 months of the program. The remaining time is spent on the capstone project and twice monthly journal clubs. Students can conduct their capstone project off site as approved by the program leadership, and the journal club is transmitted via web conferencing for those who cannot be on campus for that session. The full program, including classroom didactics and capstone project, spans 20-months.

MHDS Capstone Project

For the capstone project, students will be paired with a peer-student with whom they will work throughout the capstone project. While the final deliverables are received and graded separately for each student in a pair, students are expected to work together on the identification of the project and to help each other throughout the course of the capstone period. We created this format because it mirrors how people work in real life; we tend to work with others rather than operating as individuals. This format will allow you to gain deep insights from a classmate and vice versa. Ultimately, however, you will each be evaluated on your own work and final deliverables.

In 204B, each student will select an area of opportunity within the organization in which value could be improved and perform a literature review on the subject. In 204C students will perform a stakeholder analysis and develop an analytic plan for their quantitative analysis, and in 204D, students will execute their quantitative analysis. The final deliverable will be a report and a presentation in which the student describes the results of their analysis and a set of recommendations for improvement.

MHDS faculty will pair students based on their roles within the Cedars-Sinai system. We aim to match clinicians with non-clinicians and to match students who work in different settings with each other. Please bear in mind that there is often not a “perfect” match; the goal of pairing is mainly to provide one another with a sounding board and another perspective as you progress through your capstone project. You will ultimately be responsible for your own work but having a partner will help you think about your project and guide progress along the way, and vice versa for your partner.

Standards of Scholarship

Cedars-Sinai requires that students maintain at least a ‘B’ (3.0) average in all courses taken during their graduate status in the program. Students may be placed on probation if their work in any two consecutive terms falls below a ‘B’ (3.0) average. Each Program Director and the Vice-Dean of Gradu-

ate Research Education will determine a student's eligibility to continue graduate study. If granted the ability to continue in probationary status, the student is required to make expeditious progress in improving their scholastic status. If the student does not make substantial progress towards improvement, the student may be subject to dismissal from the program. This will be determined by each Program Director and the Vice-Dean for Graduate Research Education (GRE).

Academic Residence/Transfer Credits

All coursework and research must be completed at Cedars-Sinai Medical Center, unless approved by the Vice-Dean for GRE. The program currently offers no advance placement credit for prior experience or academic accomplishments. Students with prior extensive post-graduate biomedical education may appeal to the Curriculum Committee for exemption from specific courses, which may be granted if the committee concludes that the training would duplicate previous coursework.

Normal Progress to Degree (PhD)

During the journey towards a PhD degree, a doctoral student is expected to maintain "normal progress toward the degree." "Normal progress" is moving through the series of steps in the program necessary to obtain a PhD degree at a realistic pace and with the level of performance required of our doctoral students. The steps are as follows:

- A. Maintain a 3.0 grade point average in all core coursework; reasonable progress in completing required coursework.
- B. Selection of a laboratory dissertation mentor and a Doctoral Committee; initial steps of PhD dissertation work at beginning of second half of the second year.
- C. Successful completion of both the written and oral portion of the Qualifying Examination by the end of the second year of graduate study.
- D. Successful completion of dissertation research, a written dissertation and an oral presentation defending the dissertation to the Doctoral Committee.
- E. Annual meetings with the Director of Graduate Research Education and Graduate Program Director.
- F. Bi-annual meetings with the Doctoral Committee.

PhD Degree Completion Time Limit

It is the expectation of the program that students will complete their doctoral degree within four to five years of registration. A student has a maximum of seven calendar years from the date of first registration in the PhD Program to complete the doctoral degree.

Credits

The PhD Program is a full-time commitment. Nevertheless, progress through this commitment is typically measured in course credits completed. Students need to complete forty-three and half (43.5) credits to advance to candidacy and need to complete a minimum of sixty-four (64) credits to graduate. The curriculum credits for the first year are shown below.

PhD Course Descriptions

BMS 600: Laboratory Rotations

(6 credits)

Students are required to complete three (3) laboratory rotations during the first year of the program. Laboratory rotations give graduate students an opportunity to experience several laboratory environments, research opportunities and laboratory mentors that they may be considering for their dissertation research. These rotations also allow the faculty to evaluate students in a research setting and get to know the students. Laboratory rotations run congruent with the academic trimesters.

Students are expected to fully partake in the laboratory activities including: group laboratory meetings, discussion groups and laboratory projects. Students are expected to arrange independently each of their three rotations with the Cedars-Sinai mentoring faculty who are actively participating in the program. A list of active faculty members can be procured from the Program Coordinator.

Laboratory rotation arrangements between students and laboratory needs cannot be made prior to four weeks before the rotation is scheduled to begin. Students and laboratory heads may not pre-book their laboratory rotations in advance. Students must complete the "Rotation Agreement" form and have the mentor, in whose laboratory they will be rotating, sign it. This form should be turned into the Graduate School no later than two (2) weeks prior to the start of the new rotation.

BMS501-Immunology, Infection & Inflammation

(4.5 credits)

Immune cells play key roles in diverse processes throughout the body, including defense against pathogens, maintenance of tissue homeostasis, and tissue repair following injury. Immune deficiency or immune suppression can result in susceptibility to pathogens and tumors. Dysregulated immune responses can cause inflammatory and autoimmune diseases and contribute to degenerative pathologies and loss of organ function. This course will provide students with a solid knowledge of fundamental immunological concepts, upon which they can then build an understanding of the diverse roles of the immune system in human disease and the application of immune-based therapeutic strategies in the clinic.

BMS502 Genetics/Genomics
(4.5 credits)

This course will cover the human genome and its impact on phenotype. Topics covered include the study of genetic mechanisms in rare disorders and the role of genetics in multi-factorial, complex disorders. Students who complete this course will understand how genes influence human development and phenotypes as well as how genetics and environment interact to dictate phenotype. This course will allow the student to utilize research tools used in gene discovery and define the errors that occur in genes and gene expression that impact human disease. Students will produce an oral presentation on a specific genetic disorder as well as complete a written final exam.

BMS 507-Developmental and Cell Biology
(4.5 credits)

This course provide instruction in fundamental mechanisms of developmental and cell biology and how these impact tissue organization and disease pathogenesis, such as in cancer. The course topics center on cellular processes, such as adhesion, cytoskeletal dynamics, and unfolded protein response, that are critical for homeostasis and are dysregulated in a range of disease processes. The course format consists of factual led presentations and weekly journal clubs covering timely, relevant literature.

BMS510-Biostatistics & Bioinformatics
(3 credits)

This course introduces methods and concepts of statistical analysis. Sampling situations are utilized with special attention to those occurring in biological sciences. Topics include distributions, tests of hypotheses, estimation, types of error, significance and confidence levels, power and sample size.

BMS514- Journal Club/Research in Progress
(3 credits)

This course is a continuation of the journal clubs within the core curriculum and is required during the student's 1st through 4th year, all 3 trimesters. This class refines the student's knowledge of scientific literature as well as presentation skills.

Course BMS802-Dissertation Laboratory
(18 credits)

This course is taken throughout the academic year and includes the completion of an approved dissertation that demonstrates the student's ability to perform original, independent research and constitutes a distinct contribution to knowledge in the principal field of study. Students will spend years 2 through 4 on completing thesis research, writing a dissertation, and presenting a defense of the dissertation. Students will meet regularly with their thesis advisory committees during this course.

MHDS Course Descriptions

HDS 200A - Health Analytics: Identifying, Collecting and Analyzing Big Data in Healthcare (2 credits)

This course will introduce students to the evolving concepts of big data and review how networks of data inform healthcare analytics in ways never previously possible. Students will review health analytic techniques, including data acquisition and management from data warehouses, data manipulation in Excel, and techniques to visualize data to tell a narrative and generate insights. Students will study examples of data convergence, consider vignettes where healthcare analytics made a difference, recognize the important limitations of health analytics, and think creatively about how to parlay analytic techniques to transcend how things are “usually done,” and instead build a future for how healthcare should be optimally analyzed and delivered. These topics will be supported by readings from the assigned textbooks, along with related articles and chapters posted on the class website.

The overarching goal of HDS 200A will be for students to gain familiarity with modern health analytic techniques. For some of these techniques the objective will be to develop mere familiarity and knowledge about how the technique is used, what questions it can answer, and who to talk to if students ever want to employ the technique – i.e. ATLAS.ti coding of text data and performance of computerized conjoint analysis. For other techniques, the objective will be to acquire hands-on skills – i.e. data importing, analysis, visualization and reporting using Microsoft Excel and Tableau. In all cases, students will think critically about how to use these techniques to build a more efficient, more effective, and less expensive healthcare system.

HDS 200B - Introduction to Biostatistics (2 credits)

The goal of the HDS 200B is to train investigators to become a more knowledgeable user of and publisher in this literature by acquainting students with the statistical methods and arguments employed. Knowledge of study design and statistical methods helps one to better design and analyze one’s own studies, judge the validity and quality of a study and distinguish conclusions based on strong evidence from claims based on weak, inconsistent or inconclusive evidence. The course will cover the statistics most often used in biomedicine, elementary probability theory, confidence intervals, hypothesis testing, power and sample size, elementary survival analysis, comparisons of means and proportions and an introduction to multiple linear and logistic regression. If time permits, overviews of proportional hazard (Cox) regression, classification trees and factor analysis will be presented. The course will include lab sessions to become familiar with using statistical software programs. Student evaluations in HDS 200B will be based on final presentation, coupled with take home problems based on lectures, readings, and post-ed datasets.

HDS 201A - Principles and Practice of Digital Health Science (2 credits)

HDS 201A will begin by focusing on the revolution in remote patient monitoring made possible by ubiquitous broadband networks and wide penetration of smartphones across socioeconomic strata. Over 80% of the US population now owns a smartphone. Of this majority, 91% keep their phone within 3 feet of their body, 24 hours a day – a striking statistic that has produced novel data collection strategies for patients via digital devices. The ubiquity of smartphones offers a digital portal for patients to collect data about their symptoms and quality of life, also called patient-reported outcomes (PROs). In addition, it is now possible to supplement PROs with additional patient-reported informatics (PRIs), such as data from wearable biosensors transmitted through smartphones. Advances in micro-computing have enabled development of wearable biosensors for everyday use to measure a wide range of physiologic parameters. Off-the-shelf devices such as Fitbit, Jawbone Up, Withings, and the Apple Watch, among many others, enable convenient acquisition of free-range activity data among large patient populations, including step counts, stairs climbed, caloric expenditures from exercise, heart rate, and sleep parameters. Specialized, medical-grade sensors are increasingly FDA approved and useful to monitor a wide range of physiologic data, from glucose levels, to brain function, to medication adherence.

*HDS 201B – Clinical Informatics Journal Club and Seminar Series
(1 credits) Elective*

Success as a data scientist requires constant awareness of the current literature, the ability to discuss current topics critically, and the ability to interact meaningfully with other scientists on diverse topics. The Structured Journal Club is designed as a monthly gathering of students with their peers for the purpose of discussing current literature in health informatics and health delivery science. Students will discuss a broad range of health informatics and HDS topics, including data-to-knowledge transfer, EHRs, clinical decision support (CDS), medical errors and patient safety, health information exchanges, data standards, health information security, health informatics ethics, consumer health informatics, application of evidence based medicine, public health informatics, patient portals and patient-generated data, and e-research principles. Student evaluations will be based on their presentation and active participation and discussion of the assigned materials.

*HDS 202A - Healthcare Financing and Value
(2 credits)*

In HDS 202A, students will receive an overview about how healthcare is financed in post-ACA America. The class will review the major payer sources (Medicare, Medicaid, VA, Private Health Insurance, self-pay), review traditional and alternative payer models, compare volume-based vs. value-based payment systems, and discuss how accountable care organizations (ACOs) deliver and finance population health. Students will then learn about basic healthcare cost accounting principles, including comprehending and creating budgets, applications of cost accounting, and construction of healthcare financial statements (e.g. net income and cash flow statements, ratio analysis, pro forma statements). Students will learn basic financial mathemat-

ics, including capital budgeting and return on investment calculations. Students will be evaluated based on take-home problem sets, class participation, a group case project, and a final examination.

HDS202B - Principles and Practice of Cost-Effectiveness Analysis and Budget Impact Modeling
(2 credits)

In HDS 202B, students will receive an introduction to decision analysis and cost-effectiveness analysis. The class will provide students with a global introduction to the theory, techniques, and practical issues surrounding model development for health economic analysis, with a focus on development and testing of decision trees. Other topics will include systematic review and meta-analysis, health status measurement with utilities, budget impact modeling, and quality assessment of health economic models. The class will consist of interactive didactic lectures supported by hands-on laboratories and reading assignments to become familiar with TreeAge decision analysis software. The course will provide tools to determine how best to balance limited resources with demands to deliver high quality care.

HDS 202B will survey the fields of statistics, psychometrics, decision analysis, information technology, epidemiology and medicine to illustrate how employing decision science can allow us to make the best healthcare decisions possible when the stakes are high. These skills are fundamental to modern healthcare delivery science.

HDS203A - Quality, Safety and Performance Improvement
(2 credits)

HDS 203A will explore issues related to quality and safety in healthcare. Three scientific disciplines will be presented: (1) quality measurement, (2) quality improvement, and (3) program evaluation. The class will also explore contextual factors that influence quality of care, including health policy and payment incentives (drawing themes from HDS 202A/B), health information technology (drawing themes from HDS 201A/B), and controversies such as physician autonomy in an increasingly systematized healthcare environment. Course material will be closely linked to real-world applications with examples drawn from ongoing hospital, health system, and policy initiatives from around the country. Students will learn via interactive didactic lectures, “journal club” sessions critiquing relevant articles, homework assignments, and an in-depth course project.

HDS203B - Program Evaluation and Applied Epidemiology
(2 credits)

In HDS 203B, class topics will include using epidemiological methods to assess the utilization and quality of medical care, evaluation and economic analysis of interventions, and health policy analyses. The class will begin by defining the field of outcomes research, addressing how healthcare systems measure outcomes and why it matters. Students will then explore the difference between randomized controlled trials (RCTs) and pragmatic controlled trials (PCTs),

explore the pros and cons of cohort studies, and distinguish these designs from case-control trials. HDS 203B will then explore quasi experimental designs frequently required for program evaluation, such as time series and difference-in-difference designs. The course will also explore the influence of bias on data interpretation (e.g. selection bias, information bias, confounding, interactions and effect modification). Students will learn from guest speakers who present case studies that highlight use of the techniques taught in the class, along with interactive didactic sessions to critique sample studies from the literature. Students will be evaluated using a combination of problem sets, in-class participation, a midterm and final exam.

HDS 203C Qualitative Research
(1 credit hour)

Introduces students to the field of qualitative research. The course aims to build understanding of the traditions of qualitative research, and provide hands-on training in designing rigorous qualitative research, conducting data collection, and interpreting qualitative findings. To achieve these aims, students will develop “mock” qualitative research projects focusing on different qualitative methods.

HDS204A – Topics in Healthcare Leadership
(1 credit hour)

In this introductory course, students will be prepared for the leadership role they will assume within their capstone project in the later stages of the 204 series (204B-D). In 204A, students are expected to attend bi-weekly seminar series in which leaders from diverse areas of the organization will share their experience and expertise. The seminars are held on Tuesday evenings on campus. The goal of the leadership seminar is to develop healthcare professionals’ personal leadership skills while providing the practical knowledge and support to design and conduct a rigorous capstone project. The seminar series consists of highly engaging, interactive didactic sessions that promote discussion and learner engagement. Sufficient time will be reserved for Q&A and students are highly encouraged to research the speaker’s background in advanced and to prepare questions.

HDS 204(B, C, D) -Applied Capstone Project Series
(18 credits)

HDS204B – Team Science/Applied Capstone Series
(4 credit hours)

The objective of this introductory course is to help students develop the skills to analyze and address management challenges and opportunities as they lead change in and through teams. The course will cover theory, research, and selected applications on topics such as managing diversity, work motivation, power and leadership, group dynamics, and organizational change. Classes are mixed-format in nature and consist of lectures, interactive activities and discussions. Activities will include group work, video-based discussions, cases, presentations, and other experiential activities.

*Capstone Project I (204B): Project identification and literature review
(4 credit hours)*

Students will be paired with a peer-student with whom they will work throughout the capstone project. They will then collaboratively identify areas of opportunity in which value could be improved within their departments. Students will each choose an area of opportunity to analyze for their capstone project. This can be an area of opportunity identified in your own department, your peer-student's department, or another area within the organization; it's up to you. The project can be related to (1) quality and safety; (2) health-economic value improvement; or (3) digital health/health IT. For students working in research departments, the project can be related to the translational potential of the research performed in the department. All projects should address a health delivery problem.

Capstone Project II (204C). Stakeholder analysis and development of quantitative analysis plan

During 204C students will do a stakeholder analysis and will develop an analytic plan for a quantitative analysis to be executed in 204D.

The stakeholder analysis can include quantitative and qualitative analyses and should include at least one element of primary data collection (e.g., interviews, survey) and at least one component of secondary data analysis (e.g., analysis of information on websites or social media, analysis of existing datasets). The stakeholder analysis should also include an evaluation of different payment models and their associated effects on the identified stakeholders.

Capstone Project III (204D): Execution of project and final report

Students will execute their quantitative analysis plan during 204D.

The final deliverable for 204D will be a final project presentation for Cedars-Sinai leadership and a written final report. The report should include a background section including the results of the literature review, the rationale for the selection of the area of opportunity analyzed, a project description, the stakeholder analysis, the quantitative methodology used, the findings, and a discussion and recommendations. Students will review each other's report and provide written feedback. Students will also practice their presentation together and will provide feedback to each other prior to the final presentation.

The final grade will be a letter grade based on the report, the presentation, and the quality of the feedback you provide to your peer

MSMRM Course Descriptions

MRM 510 – Seminar/Journal Club Series

(1 credit hour)

This course is repeated each term and allows the student to present and discuss relevant journal articles related to their course of study. Students are expected to present at least once per term as well as participate in discussion each week.

MRM 511 - Introduction to Human Physiology and Anatomy

(3 credit hours)

This course is an introduction to the structure and function of the human body with an emphasis on anatomy. Body structure will be studied by organ systems and will involve a balance between gross anatomical study and physiology. Study of the structure and function of human anatomy, including the circulatory systems, nervous system, musculoskeletal, digestive, urinary, reproductive, and respiratory. Content may be either integrated or specialized.

MRM 512 - Introduction to Biomedical Imaging

(3 credit hours)

This course will introduce the fundamental physical principles of biomedical imaging commonly used clinically and in biomedical engineering research and applications. It will provide an overview of the physical principles and techniques of biomedical imaging, including x-ray photon generation, x-ray imaging, computed tomography, position emission tomography (PET), single photon emission computed tomography (SPECT), ultrasound imaging, and magnetic resonance (MR) imaging, and fluorescence optical imaging.

MRM 513 - Principle of Biomedical Signals and Imaging

(3 credit hours)

This course will cover the classical “signals and systems” theory taught using images instead of electrical or mechanical signals and systems. The course provides a basic theoretical background on digital signal processing and an overview of linear system theory with emphasis on medical imaging systems. The course will cover discrete-time modeling of imaging systems with examples in biomedical imaging applications. The concepts of imaging resolution, point-spread function, and noise in imaging systems will be described. Finally, analytical aspects of image artifacts and image quality assessment will be covered. The basic theory of image reconstruction in tomographic medical imaging systems (e.g., CT) and Fourier-based imaging systems (MRI) will be covered.

MRM 521 - MR Imaging: Clinical Applications

(3 credit hours)

This course will build on Physics of Magnetic Resonance Imaging by surveying select MRI approaches that have found practical applications in biomedical or clinical imaging. Blood-Oxygen-Level-Dependent (BOLD) MRI, Diffusion MRI, Perfusion/flow/angiography, Functional MRI of

the brain, MR spectroscopy and molecular MRI methods will be covered from basic principles to cutting approaches. This course will provide a solid theoretical basis of how MRI is used to examine key physiological processes with comparison to other imaging modalities (PET, SPECT, Ultrasound, and CT) as needed.

*MRM 624 - MR Technical Developments and Advanced Imaging
(3 credit hours)*

This course will first introduce the basic physics of MRI, including Physics of Magnetic Resonance Imaging, as well as Advanced MR Imaging. This course will introduce advanced MR imaging including pulse sequence development and imaging reconstruction, as well as advanced MR engineering topics such as coil development. This course will be a combination of lectures, hands on practice, as well as opportunities for modifying and testing MR pulse sequences and associated reconstruction routines.

MRM 527 - MRI Lab Rotations I (6 credit hours)

MRM 537 - MRI Lab Rotations II (6 credit hours)

Throughout the program, students will enroll in a variable amount of research credits depending upon their stage in their graduate career. Students will have the opportunity to perform cutting-edge research in various areas, including ultra-high field MRI, parallel transmission, cardiac MRI, multinuclear MRI, diffusion MRI, neuroimaging, MR spectroscopy, MR engineering and molecular imaging.

*MRM 533 – Advanced Imaging & Artificial Intelligence
(3 credit hours)*

The aim of the course is to show how to extract, model, and analyze information from medical imaging data and applications to help diagnosis, treatment and monitoring of diseases through computer science. The course includes major topics in medical image analysis: segmentation, registration, statistical modeling, and applications of computational tools for medicine. It will also include selected topics relating to medical image formation. It will be application oriented. The course will provide the participants with an up to date background in current state-of-the-art in medical image analysis and imaging.

MRM 538 - Clinical Rotation I (2 credit hours)

MRM 618 - Clinical Rotation II (2 credit hours)

This clinical course will introduce the master student to the day-to-day operations of clinical practice. The first part of the course will be spent introducing the student to the clinical area and assisting the MR technologists. Students may observe MRI studies on patients under the direct supervision of a qualified technologists. In addition, this course will provide a basic understanding of skills needed to allow the student to work comfortably and safely with patients.

*MRM 535 – MRI: Experimental Design and Planning
(3 credit hours)*

This course provides students with an overview of the different processes and players involved in planning, construction, and managing MR sites. This course also focuses on professional practices, patient management/care and MRI safety. This course will introduce the basic principles of experimental design as applied to research and enrich the student's knowledge and understanding of the statistical method as it pertains to the design and analysis of experiments in imaging. The course will also introduce basic imaging concepts and terminology necessary for a basic understanding of imaging applications. The course will also introduce basic imaging concepts necessary to understand the implementation of imaging methods, including structural and functional human anatomy, and experimental design. An introduction to important topics in medical statistical concepts and reasoning will be introduced. Each topic will be introduced with examples from published clinical research papers; and expose learner to hands-on data analysis using real-life datasets.

*MRM 627 - Internship Rotation
(2 credit hours)*

This course provides real world experience and an integral part of engineering education. It enables correlation of class room learning with its application in industry and broadens understanding of the types of employment available in the field. This course will allow the students to discover their individual interests and builds resume credentials for the students; and develops relationships between Biomedical Imaging Research Institute and Industrial Firms.

*MRM 619 - Thesis/Project I (8 credit hours)
MRM 629 - Thesis/Project II (13 credit hours)*

The purpose of the Master's Thesis is to provide a student an opportunity to demonstrate they have successfully mastered the intellectual and performance requirements necessary to obtain their Master's Degree in Magnetic Resonance in Medicine. Successful completion and defense of the Master's Thesis is a requirement of all students in the Master's Degree program.

Physicians in Doctoral Research (PDR) Track – PhD Program

The PhD program offers a Physicians in Doctoral Research (PDR) Track with consideration given for course-work completed during training of the MD degree; the duration of the graduate training may be shorter in appropriate cases. Special consideration will be given by the Director of the PDR Track upon review of previous training.

Admission

Applicants to the PDR track are required to have a Medical Doctor (MD) degree or its equivalent and will apply to the PDR Track as part of a standard Graduate Program application with evaluation by the Admissions Committee. The PDR Track Director participates candidate interviews as well as in the student selection committee meeting.

Student Stipend

Financial support for the PDR Track students must originate from either the mentor laboratory or the student's home clinical department. A commitment letter of funding must be provided as part of the application and signed by the PDR Track Director.

Coursework

Applicants for the PDR Track who have already completed rigorous graduate level training in areas covered by the Cedars-Sinai Graduate Program coursework do not need to repeat the coursework as part of their PhD program. Transcripts from medical school are required. Where these are not available, written testimony that the relevant material has been covered previously must be provided by the applicant and endorsed by the PDR Program director. The decision of which program courses can be excused, and which are still required, will be made on an individual case-by-case basis with consideration of the type and rigor of courses taken before. Final decisions of coursework required must be made and signed by the PDR Program Director.

Laboratory Rotations

The PDR Track candidates must perform three laboratory rotations and present the results of the rotation formally as well as receive an evaluation from the laboratory mentor. Projects in the two laboratory rotations can relate to the dissertation project, but still must be performed in the other laboratories.

Qualifying Examination

The PDR Track candidates in the Graduate Program must form a Qualifying Examination committee, submit a written proposal and successfully defend it orally on a topic that is separate from the dissertation project.

Dissertation:

It is understood and expected that PDR Track students will previously have prior research experience and publications, taken graduate level coursework, and be highly goal oriented with well-developed time management skills.

Within the PDR Track, a submitted first author manuscript to a respected peer reviewed journal is a strong indicator of a successful thesis project. A minimum of four years of participation and research activity is required for graduation. Participation in Structured Journal Club is mandatory. It is the responsibility of the PDR Program Director to formally attest that the PDR student has completed the requirements for graduation in conjunction with the student's Doctoral Committee.

Career Progression / Funding:

A key goal of the PDR Track is to prepare physicians in training as physician-scientists for careers in academic medicine. It is the expectation that new research oriented clinical faculty have extramural funding. Graduates of the PDR Track are encouraged to submit career development award applications (e.g. NIH K08, K23, K99/R00, fellow-to-faculty transition awards) by the end or soon thereafter of the doctoral program.

MHDS Tuition

The cost is \$600 per credit hour. Students are encouraged to contact the Student Financial Advisor at their earliest convenience to receive information regarding tuition assistance.

MSMRM Tuition

Tuition for the MSMRM program is \$75.00 per credit hour.

Academic Integrity

Integrity and honesty are fundamental to the pursuit of truth and knowledge at any academic institution. These core values are essential to the function of the academic community at a research institution such as Cedars-Sinai. Only by maintaining the highest standards of integrity are the conduct of research, the evaluation of a student's academic performance and the ultimate award of a degree meaningful.

The following information is intended to assist graduate students at Cedars-Sinai in understanding and abiding by the Institution's standards for academic honesty. The definitions and clarifications are informational and meant to provide examples of these behaviors. They are not intended to be all-inclusive. Questions regarding this policy or requests for additional clarification can be directed to the Director of Graduate Program or to the Vice-Dean for Graduate Research Education or his designee.

Plagiarism

Books, published papers, written documents, and electronic information (including words, data, drawings, and photographs) are the intellectual property of the persons who created them and are the legal property of the parties named in the copyright notice. Students who, in their written academic work, incorporate the ideas of others, whether as direct quotation or as paraphrase, are obligated to credit the source through appropriate citation. Likewise, information used in academic projects or in oral presentations must be credited to the source.

Examinations

Any use of external unauthorized assistance during an examination is considered academically dishonest. This includes, but is not limited to, any use of written or electronic information such as books, notes, or calculators unless expressly authorized by the teacher responsible for administering the examination. Likewise, communication with another student or any other person during an examination will be considered a violation of the integrity of that examination.

Fabrication

The invention or alteration of data, information or citation in any academic exercise constitutes a violation of academic integrity. This includes fabrication of material submitted for lab assignments, class projects or other assignments, whether wholly or partially falsified. Fabricated

information constitutes work representing neither the student's own effort nor the truth concerning a particular line of investigation or study.

Fair Treatment of Human and Animal Subjects in Research

Graduate students will participate in laboratory research in which human and/or animal research subjects are utilized. Cedars-Sinai Medical Center has created mission statements to address the fair treatment of research subjects and all graduate students are expected to uphold these standards. Any student found not in compliance with the following mission statements may be subject to disciplinary action.

CSMC IRB Mission Statement:

The CSMC IRB (Institutional Review Board) operates under a Federal-Wide Assurance (FWA) approved by the Department of Health and Human Services, Office of Human Research Protection, which requires CSMC to conduct human subjects' research in accordance with the Belmont principles of respect for persons, beneficence and justice. The mission of the CSMC IRBs is to protect the rights and welfare of human subjects involved in research at CSMC. In order to accomplish this mission, the IRBs conduct thorough reviews of each research study prior to its initiation, and at regular intervals thereafter to ensure that the research conforms to and abides by all applicable ethical principles and federal, state, and institutional regulations. In addition, the IRBs monitor the conduct of research after approval.

CSMC IACUC Mission Statement:

The mission of the IACUC (Institutional Animal Care and Use Committee) is to promote the humane care and use of animal subjects involved in research and training activities at CSMC. In order to accomplish this mission, the IACUC operates under an Animal Welfare Assurance approved by the Office of Laboratory Animal Welfare at the National Institutes of Health, which commits the CSMC IACUC to perform thorough review of all proposed research prior to its initiation and at regular intervals thereafter to ensure that the research conforms to, and abides by all applicable regulations, policies, and standards. In addition, at least once every six months, the IACUC reviews the institutional animal care and use program and inspects all animal facilities and animal study areas at CSMC to certify institutional compliance with all applicable regulations, policies, and standards.

Student Grievances

The student is encouraged to seek resolution of complaints and other concerns relating to his/her appointment or responsibilities.

The student is urged to first discuss complaints and similar concerns with his/her mentors, teachers or members of the Doctoral Committee wherever possible and appropriate. Issues can best be resolved at an early stage and every effort should be made to achieve a mutually

agreeable solution. After thorough discussion, if the complaint or concern is not adequately addressed to the reasonable satisfaction of the student, the student may present the complaint or concern to the Graduate Program Director for the purposes of achieving a mutually agreeable solution. Notwithstanding the foregoing, in situations in which the complaint or concern is related to Faculty Members or the student's Doctoral Committee and the student believes that a fair resolution cannot be attained by presenting the complaint or concern to these individuals, the student may present the complaint or concern directly to the Graduate Program Director.

If the complaint or concern is still not resolved to the reasonable satisfaction of the student after discussions pursuant to the foregoing provisions, the student may present the complaint or concern, in writing, to the Director of Graduate Research Education for the purposes of achieving a mutually agreeable solution. In addition to the foregoing, in situations where the complaint or concern relates to both the student's mentors or teachers or the Graduate Program Director and the student believes that a fair resolution cannot be attained by presenting the complaint or concern to those individuals, the student may present the complaint or concern in writing directly to the Director of Graduate Research Education.

I (Incomplete) Grades

A student will receive a grade of 'I' (incomplete) when his/her work is of passing quality but is incomplete for a good cause. A student may remove the Incomplete and receive credit(s) and a grade if he/she satisfactorily completes the work of the course by the end of the next trimester in which the student is enrolled. If the student fails to complete the appropriate course work by the end of the next trimester, the 'I' grade will automatically be replaced with the grade 'F' or 'U' (unsatisfactory) as appropriate.

In cases where the work for a course was not completed and the student's 'I' was replaced with an 'F' or 'U', with permission from the instructor, the student may complete the course in a subsequent trimester and the appropriate earned grade will be assigned to the record. Until that time the 'F' or 'U' will appear on the student record and the 'F' will be calculated into the grade-point average. Once the student completes the course during the subsequent trimester and the grade has been assigned by the instructor, the 'F' or 'U' will be replaced with the earned grade.

Leaves of Absence

A leave of absence may be granted by each degree program to continuing graduate students in good standing. Request for Leave of Absence forms are available from the Graduate School. All leaves must be requested through the program director and GRE Manager and paperwork must be submitted to the Registrar prior to taking the leave. Additional information may be found in the GRE/Graduate School Policy Handbook.

Leave may be granted for a period of two weeks without loss of stipend for the PhD students. Leaves may be extended for a total of one year at the request of the student, on the recommendation of the department and/or laboratory involved, and with the approval of each program's director. If the student fails to return to the program after being on official leave of absence or leaves the program without an official leave of absence, the student must apply for readmission to the graduate program from which the student left.

PhD students: Time spent on an officially approved leave of absence is not counted in the seven-year time limit on degree completion.

Withdrawal

If a student is considering withdrawing from any one of the graduate degree programs, we strongly urge that they first discuss this with the program's leadership. If the student decides to withdraw, he/she should communicate that decision in writing by completing a Withdrawal Form and returning it to the Registrar once it has been completed and has required department signatures. All Cedars-Sinai property must be returned to the appropriate departments within thirty (30) days of withdrawal.

Upon withdrawing from the PhD program the student's stipend will cease from the date of the withdrawal. Upon withdrawing from a master degree program, any unused funds will be refunded to the student within 90 days of the withdrawal date.

STUDENT LIFE

Unique Setting

Cedars-Sinai Medical Center has evolved to become the largest non-profit hospital in the western United States, one that is internationally renowned for the best patient care that modern medicine has to offer. Today, Cedars-Sinai Medical Center is committed to providing superior outpatient, acute and sub-acute patient care, breakthrough biomedical research, graduate and undergraduate medical education and community service. Cedars-Sinai Medical Center's physicians and scientists are leaders in basic and clinical research, bringing advances in medicine directly from the laboratory to the bedside. It is in this unique environment in which the Graduate Program educates future biomedical researchers and scientists.

As a major community medical center and tertiary referral center, Cedars-Sinai offers unparalleled opportunity for translational studies. The research buildings which house the graduate program are surrounded by cutting-edge centers of excellence in a wide range of medical disciplines. The program's faculty includes clinicians who interact daily with patients in hospital and clinic settings. Similarly, basic scientists who work in Cedars-Sinai's research community are focused on uncovering new knowledge that will directly advance patient care.

Students are taught by and interact among the medical and research faculty of Cedars-Sinai. The medical center's campus houses several research institutes including, the Burns and Allen Research Institute, the Board of Governor's Gene Therapeutics Research Institute, the Heart Institute, the Inflammatory Bowel and Immunobiology Research Institute (IBIRI), the Maxine Dunitz Neurosurgical Institute (NSI), the Medical Genetics Institute (MGI), the Regenerative Medicine Institute, the Samuel Oschin Comprehensive Cancer Institute, the Center for Outcomes Research and Education, the Women's Cancer Research Institute, and the Women's Guild Lung Institute. Students may choose to rotate among these research institutes during their education.

Diversity

Cedars-Sinai values diversity and inclusion, and it is committed to building and sustaining a diverse academic community. Diversity is one of the institutional values guiding the pursuit of the Cedars-Sinai vision: to enhance its position as the leading healthcare provider in the Los Angeles area and to rank highly among the nation's most respected, admired and trusted healthcare organizations.

Cedars-Sinai Medical Center is dedicated to having a diverse student body and encourages more culturally diverse students to select Cedars-Sinai as their site for clerkships, residency training and graduate education and to provide special mentoring of the culturally diverse physician-in-training.

One of the Cedars-Sinai's highest priorities is to advance the diversity of its student body and encourages underrepresented minorities to apply to the program.

Housing

Students are responsible for arranging their own accommodations. The Graduate School does not offer on-campus housing. For additional information regarding housing in the areas surrounding the medical center, please contact the Graduate Education Center.

PhD Program Stipend

PhD students are not responsible for any course fees. PhD students will receive an annual stipend of \$41,000 plus the benefits specified below.

Benefits (PhD)

Students enrolled in the PhD program at Cedars-Sinai are eligible to participate in the following group benefits for graduate students. Note: carriers for the medical, dental, and vision plans are subject to change at the institutions sole discretion.

- Medical Plan – Anthem Blue Cross, there are two choices: HMO or PPO
 - HMO – Students and spouses, dependents, domestic partners are fully covered (free)

- PPO – Students and spouses, dependents, domestic partners pay a monthly premium.
- Dental Plan – Delta Dental (PPO) or DeltaCare USA Plan (similar to an HMO plan)
- Vision Plan – Vision Service Plan (VS)

Leave Benefits

Students are entitled to leave benefits as follows:

- Family Leave, available upon request
- Medical Leave, available upon request
- Personal Leave, available upon request

Work and Life Matters

Managing busy academic and personal lives can be more challenging than ever in our complex world. The good news is - you don't have to do it alone. As a Cedars-Sinai graduate student, you may use the confidential services of *Work and Life Matters* specialists for assistance with:

- Family and personal problems
- Emotional concerns (depression, anxiety, stress, grief, etc.)
- Alcohol, drugs (prescription or other), and/or gambling concerns
- Academic/work relationship issues
- Problems arising from financial, legal or health difficulties
- Customized child-care referrals
- Parenting issues and concerns
- Creative ways to balance busy work and personal lives
- Career Concerns
- Housing /Relocation

Work and Life Matters Parent Services, EAP (Employee Assistance Program) and Career Services are staffed by licensed mental health professionals, child development and childcare referral specialists. All contacts with the *Work and Life* staff are confidential and there is no charge to Cedars-Sinai Graduate Program participants for services provided.

The program is conveniently located on campus or you can talk by phone or teleconferencing. To make an appointment, please call *Work and Life Matters* at 310-423-6447 or email workandlifematters@cshs.org.

Student Travel Support (PhD)

The PhD Program encourage students to get involved in the scientific community through attending scientific conferences and seminars. There will be assistance with funding for student travel during the course of study.

Medical Library

The Medical Library is a resource center available to Cedars-Sinai medical staff, employees and students in the Medical Center's training programs. Registered users may access library information and electronic resources on the Cedars-Sinai Intranet or through the proxy server. Copyright and licensing restrictions do not permit the Medical Library to offer access to electronic resources to the public at this site.

Services

As the hub for medical information, the Library provides many resources and services including:

- Electronic and print journals and books
- Document delivery
- Education and consulting
- Links to other libraries and resources
- Computers for searching databases and the Internet

The Medical Library is located in the South Tower on the Plaza level, room 2815.

Hours of Operation

Monday thru Friday: 8am – 8pm

Saturday and Sunday: Closed

Helpful Phone Numbers

Library Front desk (310) 423-3751

Library Fax (310) 423-0138

Interlibrary Loan & Document Delivery (310) 423-3647

Databases, online books, online journals and other Library resources are available anytime from computers connected to the Medical Center's intranet.

Parking

Parking is available to all new students on a first come first serve basis, depending on availability and your personal schedule.

If you choose to park in a Cedars-Sinai lot, the monthly fee will be automatically deducted from your paycheck if you are a PhD student. Those students enrolled in master degree programs who are not current Cedars-Sinai employees will pay a one-time fee. The parking fee varies for students. The fee varies depending upon the proximity of the selected parking lot to the main Medical Center.

Parking at Cedars-Sinai is voluntary and you may choose to park elsewhere. If you choose, the parking fee may be waived or reduced through the Rideshare program.

For additional parking information, please contact 310.423.5535 between the hours of 7:30am-4:00pm, Monday through Friday.

Cedars-Sinai Shuttle Service

Cedars-Sinai has buildings located off site from the main campus. You can access these sites by taking the Cedars-Sinai shuttle service, free of charge, with employee ID. For shuttle schedules and real time access please go to: <http://www.cshsshuttle.com/>.

Rideshare

Rideshare is an alternative transportation option that can save you money as well as contribute to clean air. The following are alternative modes of transportation to CSMC:

Carpooling

Definition: Two (2) to Six (6) people traveling together between their residence and their worksites, for the majority of the total trip. Commuting with a child between both residence and day care facility/school is included within this definition as long as they are in the same vehicle for the majority of the total trip distance.

All carpoolers who participate in the Rideshare Program are eligible for a monthly parking fee refund when minimum rideshare requirements are met. Parking reimbursements are refunded according to the schedule provided annually by the Payroll Department. Schedules may be obtained from the rideshare office.

All eligible participants in the Rideshare Program must obtain a Rideshare Validation Card (RVC) from the Rideshare Office

Ridematching

The CSMC Rideshare Program offers Ridematching. Ridematching will assist students who are interested in carpooling but do not have a carpool partner.

The Ridematch Database will match CSMC you with other CSMC employees who reside in the same area and work the same schedule. Receive a personalized list of possible carpool partners. Your information is confidential and your home address, if provided will never be disclosed.

Rides to Riches

Bicycle, Carpool, Shuttle, or Walk! Eligible participants begin earning points from their date of enrollment. Enrollment is not retroactive.

Students that meet rideshare requirements are eligible to participate in this program. Earn 100 daily Award Points for each day you commute by an alternative mode of transportation to work. Points become inactive if there is no activity within ninety (90) days.

Vanpooling

Vanpool Fares are deducted monthly through a student stipend. Fares are calculated according to the vanpool route and full-time vanpool passengers are not eligible for parking privileges however, all vanpool passengers are entitled to One Day Parking Passes that will be issued as needed.

One Day Parking Passes are accepted on Lot 4, Lot 7 and the Mark Goodson Parking Structures. Parking Lot 4 and Lot 7 is located on Sherbourne between Gracie Allen & 3rd Street.

The Vanpool Program welcomes part-time riders when seat/s are available on any of the vans. Part-time riders are encouraged to keep in frequent contact with the Rideshare Coordinator to maintain their interest or seat availability.

Part-time riders must purchase a vanpool script prior to commuting on the van. Part-time riders who unexpectedly arrive at the park and ride without notice or script/s may not be able to commute on the vanpool.

Metro Corporate Transit Pass

All Cedars Sinai Medical Center Employees who commute to work by Public Transit are eligible to purchase a monthly Metro Corporate Transit Pass.

MTA EZ Pass: Cedars-Sinai also offers students the EZ Pass. The EZ Pass makes it easy to ride from Bus to Bus, Bus to Rail, Rail to Dash and City to City.

Metro Bus & Rail Schedules can be obtained at the Rideshare Office.

The MTA Monthly Pass is sold on the twenty-fifth (25th) of each month through the fifth (5th) of the following month. The MTA Monthly Voucher/Pass is sold Monday through Friday however the pass is not issued or sold after 3:00 p.m.

For additional information regarding parking options, please contact:
Rideshare at x35789 or visit Room 1603 in the South Tower, Street Level, Monday - Friday
7:00am - 3:30pm

Parking Office Location: Employee Parking Lot 8, room 100 Phone: x35535 Hours: Monday - Friday 7:00am - 4:00pm. For additional information on parking options, please contact:

1. Rideshare website: <http://web.csmc.edu/administrative/rideshare/rideshare.aspx>
2. Rideshare at x35789 or visit Room 1603 in the South Tower, Street Level, Monday - Friday 7:00am - 3:30pm
3. Parking Office Location: Employee Parking Lot 8, Room 100. Phone: x35535. Hours: Monday - Friday 7:00am - 4:00pm.

