

**THE UNIVERSITY OF TEXAS  
GRADUATE SCHOOL OF BIOMEDICAL  
SCIENCES AT HOUSTON**

**THE UNIVERSITY OF TEXAS  
HEALTH SCIENCE CENTER AT HOUSTON  
AND**

**THE UNIVERSITY OF TEXAS  
M. D. ANDERSON CANCER CENTER**

**2012 – 2014 CATALOG**

**GENERAL INFORMATION SECTION**

The University of Texas Health Science Center at Houston (UTHealth) is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award certificate, baccalaureate, masters, doctoral, and professional degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of The University of Texas Health Science Center at Houston.

The University of Texas MD Anderson Cancer Center is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACS) to award baccalaureate, masters, and doctoral levels. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4501 for questions about the accreditation of The University of Texas MD Anderson Cancer Center.

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## Message from the UT Health Science Center President



Welcome to The University of Texas Health Science Center at Houston (UTHealth). As the most comprehensive academic health center in The University of Texas System, we educate the largest number of healthcare professionals – more than 5,000 a year.

Our six institutions educate all members of today’s healthcare team: our School of Dentistry is 100 years old and rich in tradition; our Graduate School of Biomedical Sciences offers a unique curriculum of postgraduate training in partnership with The University of Texas MD Anderson Cancer Center; our Medical School is the seventh largest medical school in the nation; our School of Biomedical Informatics offers an exceptional curriculum critical to improving healthcare and healthcare delivery; our School of Public Health has a statewide presence with regional campuses; and our School of Nursing is ranked among the top 5 percent in the nation.

Located in the renowned Texas Medical Center, our students have access to an incredibly broad patient population and opportunities to collaborate with students and faculty of all six of our UT schools in addition to our affiliated partners and neighboring institutions. As you move forward in your professional education, look to your faculty, staff, and peers for support and guidance. With your drive and determination within this UTHealth environment and infrastructure, you cannot fail.

Sincerely,

Giuseppe N. Colasurdo, M.D.  
President  
The University of Texas Health Science Center at Houston

## Message from the UT M. D. Anderson Cancer Center President



Welcome to The University of Texas MD Anderson Cancer Center (MD Anderson). We are proud to be partners with UTHealth to offer programs at The University of Texas Graduate School of Biomedical Sciences. Through this unique collaboration, opportunities abound for graduate students to explore fascinating areas of research, to learn from exceptional faculty members and to become strong contributors to ongoing — and future — biomedical science advances.

At MD Anderson, we are uniquely positioned to move science forward to improve the human condition, and we will need the best prepared and most dedicated people working together to achieve the great gains we expect. Because research is at the core of our institutional mission and the future of cancer science, developing the finest possible educational programs and recruiting top students – who are training to become the next generation of research scientists – are among my highest priorities as president. Our Graduate School of Biomedical Sciences is key to our success.

As a graduate student here, you can be an important part of our *Making Cancer History*<sup>®</sup> mission at a critical time, when the field of cancer medicine is changing rapidly. We are poised to make a decisive assault on this disease as there is a powerful confluence of knowledge, cancer genomes, computational firepower and the ability to manipulate genes. We welcome your contribution while we will strive to achieve the ultimate goal of conquering cancer.

Offering Doctoral and Master's degrees in 16 diverse concentrations, the University of Texas Graduate School of Biomedical Sciences enables you to develop your course work, research training and to study with scientists in the field that best meets your interests and goals. MD Anderson faculty collaborate with colleagues from UTHealth across multidisciplinary programs providing you with a great environment in which to learn and the resources and mentoring you will need to advance.

Please take advantage of all you have at your fingertips. We look forward to hearing about the discoveries you make as you progress toward your degree and the launch of an independent, impactful career.

Ronald A. DePinho, M.D.  
President  
The University of Texas MD Anderson Cancer Center

## Welcome!

I welcome you to The University of Texas Health Science Center at Houston (UTHealth). As a current or potential student, interested parent, or member of the public it is important to know that our university provides a rich and stimulating environment that promotes learning, nurtures creativity, and fosters discovery. The combination of our six schools, multiple research institutes and centers, and hospital partners and clinics provides a wealth of opportunities for personal and professional growth.



Our vision of “Excellence Above All” guides all that we do in our mission of education, research, patient care and community service throughout the university.. As a result of our commitment to this vision and mission, you will find that:

- We are rigorous in our *recruitment* of faculty and students who share our goals and commitment to excellence and we *investment in leadership*, both current and future.
- We highly value *diversity* and the contributions of every individual in our university community, including students, faculty and staff. We respect the individuals in each of these groups as well as our patients.
- We believe that *scholarship* is the foundation of all our activities, - in learning, in discovering new knowledge, and in teaching, integrating and applying that knowledge.
- We believe that *service* is an obligatory extension of our scholarship as members of our university community translate and apply their knowledge and skills to care for patients, to prevent disease, and promote health, and to improve public policies related to education, research, and health care. Our services are provided at the local, state, national and international levels.
- Our *location* and *research activities* benefit every one of our educational programs. Our presence in the Texas Medical Center, in five regional campuses across Texas, in community hospitals, in clinics, and in local schools supports scholarly activity and helps apply new knowledge for the public good. Our *physical plant* includes more than 4 million gross square feet of space for education, basic science and clinical research, inpatient and ambulatory health care, and student housing, services, and recreation.
- The *quality* of our faculty and the *number and breadth* of our educational, research and patient care programs provide opportunities second to none for students to achieve their full potential. Our 19 academic degree and certificate programs employ cutting-edge technology and innovative educational approaches to student learning.
- We value both the *individual* and *teamwork*. Students learn to work with each other as well as faculty, learning from the knowledge, skills and experiences of both. We value one another, recognizing and celebrating the talents, creativity, potential, and character of each member of the team.

As a proud, longtime UTHealth employee I have seen first-hand that that our university provides an outstanding environment for all individuals to grow through learning, discovery, and service. I am confident that those who join us will have a positive experiences that will enrich their lives, contribute to the mission and reputation of our university, and benefit our community and society.

George M. Stancel, Ph.D.  
Executive Vice President for Academic Affairs and Research



## Welcome...

The University of Texas M. D. Anderson Cancer Center (MD Anderson) has enjoyed a long association in education and research with our sister institution in the Texas Medical Center, The University of Texas Health Science Center at Houston (UTHealth). We are particularly proud of our partnership with The University of Texas Graduate School of Biomedical Sciences at Houston. Essentially, M. D. Anderson's entire Basic Science Faculty and many of our Clinical Faculty teach, participate in committees and mentor students in the school. Education is one of our main missions at M. D. Anderson Cancer Center, and our faculty, staff, and administration are committed to your career development and success in wherever your professional path takes you.



MD Anderson is an acknowledged leader among the nation's comprehensive cancer centers. We excel in research as attested by our leading the nation in the number of individually awarded grants and total funding received from the National Cancer Institute. Our excellence in collaborative and multidisciplinary research is also shown by our receipt of more Specialized Programs of Research Excellence (SPORES) than any other institution. For graduate students, these facts mean many opportunities to participate in, and add to, interesting and innovative biomedical research.

MD Anderson also has over 100 training grants and individually awarded fellowships for research training. These are awarded because other scientists and clinicians across the United States recognize the quality of the research training and education environment at MD Anderson. We also recognize that learning about how to do innovative research is only one facet of a successful professional career.

We have created one of the foremost professional development programs in the United States to aid in your academic progress. Each year we provide over 100 seminars, workshops and other programs designed to help you learn about manuscript and grant writing, presentation skills, laboratory and personnel management, organizational and time management skills, work and life balance, managing stress, conflict management and negotiation skills, and many more. We are committed to providing the finest possible resources to ensure your success and look forward to your time in our graduate school and at MD Anderson and UTHealth.

Raymond DuBois, M.D., Ph.D.  
Executive Vice President and Provost

## Board of Regents

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### Officers

**Wm. Eugene “Gene” Powell**  
Chairman

**Paul L. Foster**  
Vice Chairman

**James D. Dannenbaum**  
Vice Chairman

**R. Steven “Steve” Hicks**  
Vice Chairman

**Francie A. Frederick**  
General Counsel to the Board of Regents

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### Members

*Terms Expire February 1, 2013*

**James D. Dannenbaum**  
Houston

**Paul L. Foster**  
El Paso

**Printice L. Gary**  
Dallas

*Term Expires May 31, 2013*

**Ashley M. Purgason** (Student Regent)  
*Student Regent serves a one-year term*

*Terms expire February 1, 2015*

**R. Steven “Steve” Hicks**  
Austin

**Wm. Eugene “Gene” Powell.**  
San Antonio

**Robert L. Stillwell**  
Katy

*Terms expire February 1, 2017*

**Alexis “Alex” Cranberg**  
Austin

**Wallace L. Hall, Jr.**  
Dallas

**Brenda Pejovich**  
Dallas

## Administrative Officers

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### The University of Texas System

**Francisco G. Cigarroa, M.D.**  
Chancellor

**Scott C. Kelley, Ed.D.**  
Executive Vice Chancellor for Business Affairs

**Kenneth I. Shine, M.D.**  
Executive Vice Chancellor for Health Affairs

**Pedro Reyes, Ph.D.**  
Executive Vice Chancellor for Academic Affairs

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### The University of Texas Health Science Center at Houston

**Giuseppe N. Colasurdo, M.D.**  
President

**George M. Stancel, Ph.D.**  
Executive Vice President for Academic  
and  
Research Affairs

**Kevin Dillon, M.B.A., C.P.A.**  
Senior Executive Vice President  
Chief Operating and Financial Officer

**John A. Valenza, D.D.S.**  
Dean  
School of Dentistry

**Roberta B. Ness, M.D., M.P.H.**  
Dean  
School of Public Health

**Giuseppe N. Colasurdo, M.D.**  
Dean  
Medical School

**Jiajie Zhang, Ph.D.**  
Interim Dean  
School of Health Information Sciences

**Michael Blackburn, Ph.D.**  
**Michelle Barton, Ph.D.**  
Deans  
Graduate School of Biomedical Sciences

**Patricia L. Starck, D.S.N., R.N.**  
Dean  
School of Nursing

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## The University of Texas M. D Anderson Cancer Center

**Ronald A. DePinho, M.D.**  
President

**Thomas W. Burke, M.D.**  
Executive Vice President and  
Physician-in-Chief

**Raymond DuBois, M.D., Ph.D.**  
Executive Vice President and Provost

**Oliver Bogler, Ph.D.**  
Senior Vice President, Academic Affairs and  
Vice President, Global Academic Programs

**Gerard J. Colman, M.H.A.**  
Senior Vice President and  
Chief of Clinical Operations

**R. Dan Fontaine, J.D.**  
Senior Vice President for Business Affairs

**Robert C. Bast Jr., M.D.**  
Vice President, Translational Research

**John Bingham**  
Vice President, Process Improvement and  
Chief Quality Officer

**Barbara Bowman, J.D.**  
Vice President, Patient Services

**Christopher Capelli, M.D.**  
Vice President, Technology Transfer

**Eduardo Diaz, Jr., M.D.**  
Vice President, Global Clinical Programs

**Lewis E. Foxhall, M.D.**  
Vice President, Health Policy

**Ernest Hawk, M.D.**  
Vice President for Cancer Prevention

**Amy Hay**  
Vice President *ad interim*  
Global Business Development

**Mien-Chie Hung, Ph.D.**  
Vice President, Basic Science

**Joel D. Lajeunesse, M.S., R.P.H.**  
Vice President and Head of Pharmacy

**Adrienne C. Lang, M.A.**  
Vice President, Executive Operations

**Paul Mansfield, M.D.**  
Vice President, Acute Care Services

**Matthew A. Masek, J.D., LL.M.**  
Vice President and Chief Legal Officer

**Mark A. Moreno**  
Vice President for Governmental Relations

**Dwain Morris**  
Vice President and Chief Financial Officer

**Patrick B. Mulvey, M.P.A.**  
Vice President, Development

**J. Michael Peppers**  
Vice President and Chief Audit Officer

**Jessica Quinn, J.D.**  
Vice President and Chief Compliance Officer

**Alma Rodriguez, M.D.**  
Vice President for Medical Affairs

**Stephen C. Stuyck, M.D.**  
Vice President, Public Affairs

**Barbara L. Summers, Ph.D.**  
Vice President and Chief Nursing Officer and  
Head of the Nursing Division

**Frank Tortorella, M.B.A., J.D.**  
Vice President, Clinical Support Services

**Shibu Varghese**  
Vice President, Human Resources

**Shirley Richmond, Ed.D.**  
Dean, School of Health Professions

**Michelle Barton, Ph.D.**  
**Michael Blackburn, Ph.D.**  
Deans, Graduate School of Biomedical Science

## Mission and Vision Statements

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### Teaching, Searching, Serving

#### Mission Statement

As a comprehensive health science university, the mission of The University of Texas Health Science Center at Houston is to educate health science professionals, discover and translate advances in the biomedical and social sciences, and model the best practices in clinical care and public health.

We pursue this mission in order to advance the quality of human life by enhancing the diagnosis, treatment, and prevention of disease and injury, as well as promoting individual health and community well-being.

#### To fulfill our mission, UTHealth:

1. Educates health professionals and scientists in a diverse interdisciplinary academic community.
2. Creates and evaluates new knowledge – through basic science and applied research – as it relates to disease prevention, treatment, and cure
3. Provides leadership and advances scholarship in biomedical sciences, health professions, health promotion, public health policy and health care delivery.
4. Models appropriate and compassionate clinical care.
5. Addresses the health needs of the community at large through public health expertise, information, outreach and service.
6. Develops the expanding field of health information science.

#### Vision Statement

**“Excellence above all” in the quest to be an acknowledged leader in the collaboration to treat, cure, and prevent the most common diseases of our time through education, research and clinical practice.**

The University of Texas Health Science Center at Houston aspires to be a leader in the collaborative effort to treat, prevent, and cure the most common diseases of our time by:

1. Utilizing the distinctive capabilities of its schools, clinics, institutes, and centers;
2. Collaborating with colleagues in The University of Texas System, the Texas Medical Center, and throughout the world;
3. Being an academic health science center that is nationally and internationally recognized in teaching, research, and service;
4. Serving as a home for the visionaries and scholars who will lead the way in defining and creating the future of the health sciences; and
5. Providing a diverse work environment that is ethically-based, service-oriented, and community-sensitive.

## Mission, Vision & Core Values of MD Anderson

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### Eliminating cancer in Texas, the nation and the world

#### Mission

The mission of The University of Texas MD Anderson Cancer Center (MD Anderson) is to eliminate cancer in Texas, the nation and the world through outstanding programs that integrate patient care, research and prevention, and through education for our undergraduate and graduate students, trainees, professionals, employees and the public.

#### Vision

We shall be the premier cancer center in the world, based on the excellence of our people, our research-driven patient care and our science. We are Making Cancer History™.

#### Core Values

##### Caring

By our words and actions we create a caring environment for everyone.

- We are sensitive to the concerns of our patients and our co-workers.
- We are respectful and courteous to each other at all times.
- We promote and reward teamwork and inclusiveness.

##### Integrity

We work together to merit the trust of our colleagues and those we serve.

- We hold ourselves, and each other, accountable for practicing our values.
- We communicate frequently, honestly and openly.
- By our actions, we create an environment of trust.

##### Discovery

We embrace creativity and seek new knowledge.

- We help each other to identify and solve problems.
- We seek personal growth and enable others to do so.
- We encourage learning, creativity and new ideas.

## General Information

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### History of The University of Texas System

The idea of a University of Texas is as old as the State. The Texas Declaration of Independence lists as one of its main indictments against the government of Mexico the fact that “it has failed to establish any public system of education...” Several early attempts were made to establish a state university, but they were not successful because of the Civil War and subsequent Era of Reconstruction. Establishment of a state university for Texas was provided first by act of the State Legislature in 1881. It provided for the location of the institution by popular vote and for appointment of a Board of Regents to be entrusted with its organization and governance. By results of an election in September 1881, the site of the main university was designated as Austin and Galveston was chosen as the location for the Medical Branch. An undergraduate college and law school was established and The University of Texas formally opened on September 15, 1883.

Since then numerous campuses, schools, colleges, divisions and branches have been added to The University of Texas System at several locations throughout the state. The System now includes academic campuses in Arlington, Austin, Brownsville, Dallas, El Paso, Midland/Odessa (UT Permian Basin), San Antonio, Tyler and Edinburg. The health science centers are located at Dallas, Galveston, Houston, and San Antonio. A health center (hospital) is located in Tyler. The University of Texas MD Anderson Cancer Center is located in Houston.

Other components of the System include the Institute of Texas Cultures (at San Antonio), the Institute of Humanities in Medicine (UT Medical Branch, Galveston), the Environmental Science Park near Smithville (UT M.D. Anderson Cancer Center), the Marine Science Institute in Port Aransas (UT Austin), the McDonald Observatory at Fort Davis (UT Austin), and the Shriners Burn Institute (in conjunction with UT Medical Branch, Galveston).

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### The University of Texas Health Science Center at Houston

The University of Texas Health Science Center at Houston (UTHealth) was established in late 1972 to administer and provide for the operation of the several biomedical and health-related units located in the city through the integration and coordination of functions and activities. The Health Science Center presently includes, by order of establishment:

- 1905 School of Dentistry (originally as the Texas Dental College)
- 1963 Graduate School of Biomedical Sciences
- 1967 School of Public Health
- 1970 Medical School
- 1972 School of Nursing
- 1973 School of Biomedical Informatics (originally as the School of Allied Health Sciences)
- 1990 Harris County Psychiatric Center
- 1995 Brown Foundation Institute of Molecular Medicine for the Prevent of Human Diseases

As a component of The University of Texas System, UTHealth is subject to the The University of Texas System Board of Regents -- *Rules and Regulations* for the governance of The University of Texas System.

The official name of the institution is The University of Texas Health Science Center at Houston. It is informally termed UTHealth or the Health Science Center.

Today, UTHealth employs more than 1,538 faculty, 3,926 staff and has 4,600 students enrolled in various health and biomedical disciplines at its component schools and regional campuses.

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## UTHealth Addresses\*

**School of Dentistry**

7500 Cambridge St.  
Houston, TX 77054

**Medical School**

Medical School Building  
6431 Fannin  
Houston, TX 77030-1503

**Graduate School of Biomedical Sciences**

6767 Bertner Ave., Rm 3.8344  
Houston, TX 77030

**School of Biomedical Informatics**

(University Center Tower)  
7000 Fannin, Suite 600  
Houston, TX 77030

**School of Nursing**

6901 Bertner  
Houston, TX 77030

**School of Public Health**

(Reuel A. Stallones Building)  
1200 Herman Pressler  
Houston, TX 77030-3900

**Child Development Center**

7900 Cambridge  
Houston, TX 77054-5500

**Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases**

1825 Herman Pressler St.  
Houston, TX 77030

**Student Financial Services**

(University Center Tower)  
7000 Fannin, Suite 2220  
Houston, TX 77030

**Student Health Services**

6410 Fannin, Suite 1010  
Houston, TX 77030

**UT Counseling/Worklife Services**

(University Center Tower)  
7000 Fannin, Suite 1670  
**Houston, TX 77030**

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## UTHEALTH CENTERS, PROGRAMS AND INSTITUTES

A variety of interdisciplinary centers, institutes and programs have been created to enrich the primary programs of the schools of UTHealth. In general, they focus on specific service and research efforts while the institutes provide opportunities for special multidisciplinary educational projects. These efforts reinforce UTHealth's commitment to providing a means



through which the health professions may join with each other and with society to consider health-related issues.

Listed below are a few of UTHealth's centers. A more comprehensive listing can be found at [www.uthouston.edu/index/institutes-centers.htm](http://www.uthouston.edu/index/institutes-centers.htm).

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### **The Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases**

Advances in molecular and cell biology have enormous potential for innovative medical research and the future practice of medicine with more novel therapies. These approaches have been most successfully used to determine the causes of infectious disorders and genetic diseases. However, it is clear that molecular and cell biology will play a major role in clarifying the causes of many unsolved problems of modern medicine: heart disease, hypertension, vascular disorders, major mental illnesses, and inflammatory and immunologic diseases. The Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases (IMM) houses nine research centers and several support laboratories, each exploring the genetic and molecular aspects of biological processes significant to explain the basis of human diseases.

The long-term goals of the IMM are to set the example for research excellence and collaborations locally, nationally, and internationally. Scientifically, the IMM is on the verge of a new frontier of expansion and collaborations. The IMM has two major objectives: discovery through medical advancements driven by breakthrough discoveries which give new insight into disease that lead to new solutions; and patient benefit from such solutions. New diagnostics and therapies are a derivative of discovery. The IMM has organized Texas talent in the Texas Therapeutics Institute to achieve this goal of patient benefit from discovery.

The IMM Center for Cardiovascular Genetic Research (CCGR) studies heart disease, stroke and atherosclerosis. Established in 2006, the Center focuses on elucidation of molecular genetics and pathogenesis of cardiovascular diseases in humans. The research activities entail human molecular genetic studies as well as studies in genetic models of human heart disease.

The Research Center for Cell Signaling investigates the role of cell signaling in vascular biology, inflammation in the gastrointestinal tract and other tissues, and diseases such as cancer and diabetes.

The Research Center for Diabetes and Obesity research focuses on noninsulin-dependent diabetes, the most common form of the disease affecting our population today. By investigating the genes responsible for risk factors such as obesity, high blood pressure and high cholesterol, we may provide physicians with the new tools to help diagnose and treat diabetes long before debilitating complications can arise, or even before the disease itself can strike.

Hans J. Müller-Eberhard and Irma Gigli Center for Immunology and Autoimmune Diseases studies allergies, autoimmunity, asthma, infectious lung disease, skin, and kidney diseases.

Human Genetics addresses a range of diseases including heart disease, stroke, hypertension, diabetes, atherosclerosis, and cerebrovascular disorders.

Molecular Imaging develops and engineers new imaging instrumentation, algorithms, and agents for in vivo molecular imaging in small animals. The Center uses in vivo imaging of unique animal models to answer key biological questions of collaborators. It also focuses upon translating scientific discoveries and new imaging approaches into the clinic such as the current trials of

near-infrared fluorescence lymphatic imaging and non-invasive PET and optical imaging for nodal staging of cancer.

Neurodegenerative Diseases investigates the development of the brain and the entire nervous system; we hope to discover the genetic and molecular causes of neurodegenerative diseases, including various forms of dementia such as Alzheimer's disease, amyotrophic lateral sclerosis and multiple sclerosis.

Proteomics and Systems Biology connects research efforts across the university in systems biology, clinical and translational sciences, protein chemistry, genomics, and proteomics, bringing together people to promote intellectual exchange and the transfer of expertise in these key fields and beyond.

- Protein Chemistry examines the structural analysis of protein while addressing a range of diseases including neurodegenerative diseases.
- Proteomics seeks to understand cellular regulation, elucidate disease processes, and identify drug targets using the detailed characterization of proteins achievable through mass spectrometry and array technologies.
- Laboratory for Systems Biology develops a first class, high visibility research program on proteogenomics, the synthesis of genomics and proteomics, using advanced algorithms for signal processing, data analysis and information handling.
- Proteomics Core Laboratory of the Center for Clinical and translational Sciences provides proteomics analysis services such as protein identification, analysis of differential expression and post-translational modifications of protein, as well as analysis and interpretation of results.

The Research Center for Stem Cell Research explores the mechanisms behind stem cell self-renewal and differentiation with plans to expand current studies to develop stem cell lines designed to benefit transplantation medicine and the regeneration of tissues, and to provide vectors for gene therapy with direct implications for the treatment of a wide range of chronic diseases.

Senator Lloyd and B.A. Bentsen Center for Stroke Research promotes research and collaboration leading to the prevention of stroke, a medical problem affecting countless individuals and families. With three-quarters of a million new or recurrent strokes each year in the U.S., research is vital to better understand, treat and help people avoid strokes. Researchers involved in the Bentsen Center – in areas including stem cell therapy, genetic predictors of stroke, induced hypothermia/hibernation, molecular imaging of the vascular system, and others – will have tremendous impact on the medical field as the Center goes forward.

Core Facilities and Other Laboratories:

Laboratory for Developmental Biology

Automated DNA Sequencing Core

Flow Cytometry & Cell Sorter Core

Protein Chemistry Core

Website: <http://www.uthouston.edu/imm/>

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### **Children's Learning Institute**

The University of Texas Medical School at Houston's Children's Learning Institute (CLI) combines data and studies from the fields of psychology, neurodevelopment, education, medicine and child development to provide proven learning solutions derived from and supported by documented research. The mission of CLI is to create a quality learning environment for all children through classroom curriculum, teaching mentoring, clinical programs and applied research. CLI's goal is to make sure every child is equipped to learn and able to excel. Through CLI's clinical component, the Dan L. Duncan Children's Neurodevelopmental Clinic, CLI provides continuing care for the developmental, psychological and educational needs of infants, children and young adults. CLI's research and programs are supported by the National Institute of Child Health and development, the Office of educational research Improvement, the Texas Education Agency, private foundations and generous individuals.

Website: [www.childrenslearninginstitute.org](http://www.childrenslearninginstitute.org)

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### **Center for Cardiovascular Biology and Atherosclerosis Research**

The Center provides a platform in which physicians and research scientists conduct research in cardiovascular biology and diseases that alters the function of hearts and blood vessels. Cardiology Research projects and interests include the studies of molecular and cellular mechanisms underlying the development of atherosclerotic coronary disease, ischemic heart failure thrombolysis and myocardial infarction, the development of left ventricular assist pumps, new PTCA procedures, artificial blood vessels, atherectomy devices and quantitative arteriography to evaluate coronary restenosis and the progression of atherosclerosis. Additionally, clinical research in cardiac imaging is being pursued with positron emission tomography and SPECT gamma imaging. Electrophysiology studies are evaluating new antiarrhythmic drugs, intelligent pacemaker cardioverters, implantable defibrillators, and the effect of ablation procedures. Clinical trials for cardiovascular stem cell therapies have been also conducted at phase I or II. Basic science research is underway in molecular and cell biology, particularly with regard to endothelial aspects of atherosclerosis, smooth muscle apoptosis in atherosclerotic lesions and vascular aneurysms, and ischemic myocardial damage and repair.

Website: <http://www.uth.tmc.edu/cbar/>

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### **Center for Infectious Diseases**

The Center for Infectious Diseases (CID) was created by the Texas Legislature in 1989. It is housed in The University of Texas School of Public Health at Houston and consists of offices and research laboratories. The Center's mission is to address the problems of emerging infectious diseases in Texas and abroad, especially food-borne, water-borne, and mosquito borne infections and sexually transmitted diseases. The Center strives to develop fundable and sustaining research programs. Current programs include studies in hepatitis viruses, parasitic infections, traveler's and bacterial viral and parasitic diarrhea, HIV/AIDS and sexually transmitted diseases, zoonotic diseases, and respiratory diseases. Although the research program is of primary importance, the Center is also dedicated to educating and training public health professionals by involving students and trainees in laboratory research projects. CID members consist of public health and medical researchers brought together for a multidisciplinary approach to infectious disease problems. Center investigators are also involved in a number of international studies and collaborations in the US-Mexico border area and at other non-US sites with the recognition that immigration and travel have introduced a variety of non-endemic diseases into the state. In this respect, the Center has established a global network of infectious disease research and training in Africa, Asia, Latin America and the Caribbean. These studies have direct applications to Texas where residents travel to Mexico and other international settings and in view of the migration of international populations to our state. Through a strong program of research and education, CID

scientists are working to find ways in which to identify, control, and prevent infectious diseases that threaten the public health.

Website: <https://sph.uth.tmc.edu/research/centers/cid/>

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### **Center for Laboratory Animal Medicine & Care (CLAMC)**

The Center for Laboratory Animal Medicine and Care (CLAMC) is a program accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC-International), and meets all standards mandated by the Animal Welfare Act, Center for Disease Control, National Research Council Guide for the Care and Use of Laboratory Animals and the Public Health Service Policy on Humane Care and Use of Laboratory Animals. CLAMC is responsible for the management and operations of all animal care and use programs for UTHealth. CLAMC includes six physically separate animal facilities and numerous satellites on the Texas Medical Center campus. The program provides professional veterinary, surgical, and animal care services in support of principal investigators' animal use studies. The CLAMC is an integral part of UTHealth's research and teaching mission and provides the highest standards possible for ensuring the health and well-being of laboratory animals used in biomedical research. CLAMC staff includes five veterinarians, one veterinary resident, seven veterinary technicians, and approximately 30 animal care and support personnel.

Website: <http://www.uthouston.edu/animal-research/clamc.htm>

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### **Center for Membrane Biology**

The Center for Membrane Biology, located in The University of Texas Medical School at Houston,, is dedicated to advancing our understanding of the structure, function, evolution, and biomedical aspects of biological membranes in cells and organelles. The mission of the Center is to conduct biomembrane research on the cutting edge, stimulate and coordinate graduate education in membrane biology, and foster career development of biomembrane scientists in a world-class center of research excellence.

The Center, housed in the Department of Biochemistry & Molecular Biology, also includes participating faculty members from the Departments of Integrative Biology & Pharmacology and Microbiology & Molecular genetics. Currently 11 faculty members provide career opportunities for new students, post-doctoral researchers , and new faculty members.

Website: <http://www.uth.tmc.edu/cmb/>

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### **Center for the Study of Emerging & Reemerging Pathogens**

The Center for the Study of Emerging and Reemerging Pathogens (CSERP) is a university-based inter-departmental collaborative unit that targets molecular biology, genetics and therapeutics of infectious diseases. The scientific goals of CSERP are to determine how microorganisms cause disease, how they resist host defenses, and what microbial targets are crucial for survival in the infected host. The long-range goal is to use this information to develop strategies for preventing or treating these diseases. Educational activities include the Molecular Basis for Infectious Diseases data club (an interdisciplinary monthly seminar with presentations from clinical and basic scientists), an associated training grant for graduate students and summer undergraduate trainees, an annual retreat with nationally recognized speakers and poster presentations from schools in the south Texas area, and, co-sponsored with the Department of Microbiology and Molecular Genetics, a new course:, Bioterrorism Preparedness and Response. The Center provides graduate students, postdoctoral fellows, and other trainees with a day-to-day exposure to clinical disciplines as well as the basic sciences in order to establish a broad-based foundation in microbial virulence and its consequences. Major projects of CSERP investigators include enterococcal virulence, pathogenesis mechanism of B anthracis, antibiotic resistance, Lyme

disease and syphilis projects, microbial genome analysis, host immune response, immune evasion by microbes, mycology research, new antimicrobial targets, cryptosporidia, and HIV clinical trials.

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### **Human Genetics Center**

Originally organized in 1972, the Human Genetics Center is a research and teaching facility that aims to better understand the nature and extent of man's burden of hereditary disease and disability. Research interests of the faculty involve the study of the mechanisms and forces that contribute to the distribution of genotypes and traits among individuals, families, and populations. Implementation of these interests requires both analytic and laboratory approaches in addition to field work in Texas and elsewhere. Currently, major efforts are underway in the Center to localize and characterize genes contributing to the common chronic diseases, including blindness, coronary heart disease, stroke, and diabetes. Also, Faculty in the Center are also actively engaged in studying the fundamental evolutionary mechanisms underlying human genetic variation. In order to accomplish these objectives, high through-put DNA sequencing and analysis are a major focus of the Center's efforts. The Center maintains a field office in Starr County, Texas, as part of efforts to study the major contributions to ill health in the Mexican-American community.

Website: <https://sph.uth.tmc.edu/research/centers/hgc/>

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### **John P. McGovern, M.D., Center for Humanities and Ethics**

Established in 2004, The John P. McGovern, M.D. Center for Humanities and Ethics promotes excellence in scholarship and teaching in the medical humanities and ethics. It provides an interdisciplinary forum where scholars, students, physicians, and other health care professionals examine questions of value and meaning in search of ethically sound and spiritually informed patient care. Appropriately, the Center bears the name of John P. McGovern, M.D. (1921-2007) who founded the American Osler Society and throughout his lifetime championed the importance of the compassionate art of medicine.

The McGovern Center is housed in the Medical School but serves all six schools at UTHealth. Drawing from bioethics, medical history, health law, spirituality, literature and the arts, the Center offers courses, lectures, research seminars, faculty workshops and consultation. It provides opportunities for collaborative research and professional development for students, residents and faculty. The Center collaborates closely with other academic institutions in Houston including Rice University, UT M.D. Anderson Cancer Center, and the University of Houston, as well as the Museum of Fine Arts and the Jung Center.

The Center established a Medical Humanities Certificate Program in 2006. This four-year program enriches medical students' education through additional study and involvement in the humanities, including participation in elective courses, seminars and ethics grand rounds, community outreach opportunities, writing workshops and directed research, leading to a Certificate in the Medical Humanities.

In 2009, the Center launched a Campus-Wide Ethics Program to enhance the ethics and professionalism curricula at each of the six schools of UTHealth. Beginning in 2011, all UTHealth students are required to take an introductory ethics and professionalism curriculum called "The Brewsters." The Brewsters is a choose-you-own adventure, on-line, three-part module where students immerse themselves as characters caught up in ethical dilemmas.

Website: <http://www.uth.tmc.edu/hhhs/>

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### Laboratory for Molecular Diagnosis of Inherited Eye Diseases

The Laboratory for Molecular Diagnosis of Inherited Eye Diseases was inaugurated on September 1, 1994, and is a joint project of the Cizik Eye Clinic, the Richard S. Ruiz, M.D. Department of Ophthalmology and Visual Science, and the Human Genetics Center at the School of Public Health. The purpose of the laboratory is to provide genetic testing as a service for patients with inherited eye diseases and for ophthalmologists treating those patients. At present, the principal diseases tested are inherited forms of retinal degeneration such as retinitis pigmentosa and macular dystrophy. The laboratory also conducts research in the molecular causes of inherited eye diseases and has a role in training students and faculty in molecular techniques.

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### Neuroscience Research Center

The Neuroscience Research Center (NRC) facilitates interdisciplinary and interinstitutional research in the neurosciences. More than 300 faculty members from UTHHealth schools and departments are involved in multidisciplinary investigations that address multiple aspects of the neurosciences from the molecular to the whole organism level, including translational research. These studies should hold the key to understanding, treating, and eventually preventing neural and behavioral disorders such as dementia, mental retardation, developmental disabilities, mental illnesses, substance-abuse problems, and loss of cognitive functions due to aging or traumatic brain injury. The Neuroscience Research center publishes a quarterly newsletter and a monthly news sheet identifying ongoing research efforts and activities in the neurosciences and organizes various neuroscience lectures, including a Distinguished Lecture Series. The NRC also sponsors a course in The Graduate School of Biomedical Sciences at Houston, hosts an annual Neuroscience poster session, and fosters the exchange of information and discussion of new initiatives. As the structural foundation of its activities, the NRC utilizes the resources of the six Health Science Center schools, creating a rich and unique environment for research that spans both the clinical and basic science fields of inquiry. Departments with significant research activities within the Medical School include Neurobiology and Anatomy, Neurosurgery, Psychiatry and Behavioral Sciences, Ophthalmology and Visual Sciences, and Integrative Biology and Pharmacology. Clinical departments utilize the facilities of Memorial Hermann Hospital, the major teaching hospital for the Medical School and The University of Texas M.D. Anderson Cancer Center, a renowned oncology referral hospital and research institution. Other institutions include The Institute for Rehabilitation and research, St. Joseph's Hospital, Shriner's Hospital, Texas Children's Hospital, St. Luke's Hospital, a private hospital, the UT Harris County Psychiatric Center, a 250-bed psychiatric hospital, and Lyndon Baines Johnson General Hospital, a full-service county hospital.

Website: <http://nba.uth.tmc.edu/nrc/>

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### Structural Biology Imaging Center

Molecular mechanisms in cells are orchestrated by the cooperative activities of molecular machines built from amino and nucleic acids. Efforts to resolve the molecular architecture and functional design of these molecular machines are essential for an understanding of normal biological processes as well as the structural basis of disease states. Structural biology is the evolving branch of basic science that aims to provide detailed three-dimensional structures of molecular machines. The importance of structural biology will be amplified as researchers are challenged to identify the structures of proteins encoded by the tens of thousands of human genes.

The Center focuses on excellence in the three primary methods for resolving molecular structures – nuclear magnetic resonance, electron microscopy and x-ray crystallography. The Center will be a focal point for structural biology research at the Medical School and within the Graduate School of Biomedical Sciences. In this way, the Center and its faculty provide UTHHealth

with a valuable and much needed resource for research and training in structural biology. Many collaborative projects with UTHealth faculty are anticipated thus significantly enhancing the Health Science Center's overall research enterprise.

Website: <http://www.uth.tmc.edu/sbrc/>

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### **Trauma Research Center**

The Trauma Research Center was established in 1988, and it was the first in the United States to concentrate on the role of the gastrointestinal tract in multiple organ failure. The Center, which is multi-departmental and multi-institutional, is funded by the National Institutes of Health and has successfully been implemented over twenty years. Since its creation, the focus of the research has evolved and is now aimed at the role of plasma in hemorrhagic shock. In 2001, a formal postgraduate training program was added to the Center. Currently, three trainees (with a Ph.D. or M.D.) devote themselves for two years to basic science, bench, and clinical research. The Medical School investigators represent the departments of surgery, integrative biology and pharmacology, internal medicine, biochemistry and pediatrics as well as academic computing, the Center for Laboratory Animal Medicine and Care, and the Center for Translational Injury Research.

Website: <http://utsurg.uth.tmc.edu/trauma/>

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### **Center for Clinical and Translational Sciences**

The goal of the Center for Clinical and Translational Sciences (CCTS) is to facilitate clinical and translational research at The University of Texas Health Science Center at Houston, The University of Texas M. D. Anderson Cancer Center, and the Memorial Hermann Hospital System. The CCTS is one of the original 12 such centers funded by the National Institutes of Health's Clinical and Translational Science Awards (CTSAs) and is also a member of the Texas CTSA Consortium.

According to the NIH, "(t)ranslational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans (T1 translation). The second area of translation (T2 translation) concerns research aimed at enhancing the adoption of best practices in the community."

The CCTS is comprised of a series of component programs and services designed to assist investigators and their teams in the development and performance of translational research projects. These components include: Biobank, Bioinformatics, Biostatistics and Design, Clinical Research Units, Community Engagement, Core Labs, Ethics and Advocacy, and Regulatory. In addition, the CCTS T32 program provides stipends for PhD students whose dissertation research is clearly translational or addresses a problem that has direct clinical implications and provides didactic courses, seminars, and other training activities. The program also supports the training and career development of postdoctoral fellows within UTHealth and MD Anderson Cancer Center. The goal of the program is to train truly interdisciplinary researchers by a meaningful blending of programs and disciplines that have been traditionally operated as stand-alone entities within schools of the UTHealth or units within MD Anderson.

Website: <http://ccts.uth.tmc.edu/>

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### **The University of Texas MD Anderson Cancer Center**

Celebrating more than seven decades of Making Cancer History®, The University of Texas MD Anderson Cancer Center (MD Anderson) is located in Houston on the sprawling complex of the Texas Medical Center. It is one of the world's most respected centers devoted exclusively to cancer patient care, research, education and prevention.

MD Anderson was created by the Texas Legislature in 1941 as a component of The University of Texas System, and has over 1,900 faculty (M.D. and Ph.D.). MD Anderson is one of the nation's original three Comprehensive Cancer Centers designated by the National Cancer Act of 1971 and, today is one of 41 Comprehensive Cancer Centers.

For eight of the past 10 years, including 2011, MD Anderson has ranked No. 1 in cancer care in the "best hospitals" survey published by *U.S. News & World Report*.

### **Patient Care**

Since 1944, almost 900,000 patients have turned to MD Anderson for cancer care in the form of surgery, chemotherapy, radiation therapy, immunotherapy or combinations of these and other treatments. This multidisciplinary approach to treating cancer was pioneered at MD Anderson. Because they focus only on cancer, experts here are renowned for their ability to treat all types of cancer, including rare or uncommon diseases.

In 2011, more than 105,000 people with cancer received care at MD Anderson, and about 34,000 of them were new patients. 9,700 of these patients were treated on 1,009 active clinical protocols. Approximately one-quarter of these patients came from outside Texas seeking the research-based care that makes MD Anderson so widely respected.

MD Anderson holds accreditation from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). In 2006 and 2010, the American Nurses Credentialing Center renewed the Magnet Nursing Services Recognition designation at MD Anderson, the highest international award for nursing excellence.

### **Research**

At MD Anderson, important scientific knowledge gained in the laboratory is rapidly translated into clinical care. In 2011, the institution spent more than \$623 million in research, an increase of approximately 40% in the last four years. MD Anderson now ranks first in the number of grants awarded and total amount of grants given by the National Cancer Institute. MD Anderson holds 10 NCI Specialized Programs of Research Excellence (SPORE) grants: brain, bladder, endometrial, head and neck, leukemia, lymphoma, myeloma, melanoma, ovarian and prostate. The research program is considered one of the most productive efforts in the world, aimed solely at cancer.

Seven new research centers are grouped together in the Red and Charline McCombs Institute for the Early Detection and Treatment of Cancer focusing on cancer metastasis, immunology, molecular markers, proton therapy, diagnostic imaging, targeted therapy and drug development, and RNA Interference and non-coding RNAs. Located on the 116-acre South Campus about 1.5 miles south of the main campus, the McCombs Institute houses approximately 25% of M. D. Anderson's research activities.

### **Education**

More than 7,000 students take part in educational programs each year, in which physicians, scientists, nurses, and many health professionals participate. MD Anderson offers bachelor's degrees in eight allied health disciplines.

In addition, more than 1,100 clinical residents and fellows come to MD Anderson each year to receive specialized training in the investigation and treatment of cancer. More than 500 graduate students are working on advanced degrees, jointly offered with The University of Texas Health Science Center at Houston's Graduate School of Biomedical Sciences. More than 1,600 research fellows are being trained in MD Anderson's laboratories.



Thousands more participate in continuing education and distance learning opportunities sponsored by MD Anderson, sharing knowledge around the globe. Likewise, MD Anderson provides public education programs to teach healthy individuals about cancer symptoms and risk factors, and how to make critical health care decisions when necessary.

### **Prevention**

Recognizing that, ultimately, prevention is the best way to eliminate the threat of cancer, MD Anderson has initiated a multifaceted effort. Expanded research efforts in epidemiology and behavioral sciences complement achievements made in the clinical cancer prevention arena. Laboratory activities support developmental and practical applications of cancer prevention. A new research program focuses attention on the differences in health outcomes among minorities and the medical underserved. The Cancer Prevention Center provides comprehensive cancer screening services, including cancer risk assessment, screening exams based on age and gender, personalized risk-reduction strategies, genetic testing, chemoprevention, tobacco cessation programs, and nutrition counseling.

### **Human Resources**

MD Anderson employs more than 18,750 people and enjoys a volunteer workforce of more than 1,100 trained volunteers contributing more than 200,000 hours of service each year. Faculty, staff, and volunteers are dedicated to the core values of Caring, Integrity and Discovery. Together, they work toward fulfilling the MD Anderson mission of eliminating cancer as a major health threat.

### **Facilities**

The majority of the MD Anderson-owned facilities in Houston are located on the North Campus (formerly known as main campus) and the South Campus. The annual operating budget for the institution exceeds \$3 billion and over \$623 million was spent on research in 2011.

MD Anderson leadership is committed to providing an infrastructure that supports all aspects of our mission, including provision of necessary space and facilities appropriate for research and education in each program area. Testimony to that commitment is the opening of new facilities and the construction that is currently underway. In the past seven years, 10 new buildings have opened at MD Anderson – the Ambulatory Clinical Building, the Cancer Prevention Building renamed the Dan L. Duncan Building, the George and Cynthia Mitchell Basic Sciences Research Building, the South Campus Research Buildings 1, 2, 3, 4, the Proton Therapy Center, the T. Boone Pickens Academic Tower, and the Mid Campus Building 1. MD Anderson's Texas Medical Center campus presently exceeds 11 million gross square feet.

MD Anderson leadership is also committed to facilitating the application of laboratory findings to the areas of prevention, diagnosis, and treatment of cancer. Exchanges between basic scientists and clinical investigators are facilitated so the discoveries of the former may be applied to the observations of the latter. In planning facilities, MD Anderson has placed clinical and basic science investigators in close proximity. This approach further augments and fosters interdisciplinary collaborations..

Several support activities, such as the UT Police are joint activities of MD Anderson and UTHealth.

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**MD Anderson Addresses****The University of Texas MD Anderson Cancer Center (Street Address)**

1515 Holcombe Blvd.  
Houston, Texas 77030

**The University of Texas MD Anderson Cancer Center (Mailing Address)**

P.O. Box 20334  
Houston, Texas 77225-0334

**The University of Texas Graduate School of Biomedical Sciences at Houston**

Office of the Dean  
6767 Bertner Ave.,  
Rm 3.8344  
Houston, Texas 77030

## MD ANDERSON CENTERS AND PROGRAMS

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### Center for Advanced Biomedical Imaging Research

**Better Detection of Cancer & Heart Disease:** Current imaging processes can identify diseased organs, but often not until the disease is advanced and harder to treat. Likewise, because small changes that reflect early response to therapy cannot be easily distinguished, it can be difficult to determine whether a treatment is effective early on.

The center's researchers and physicians will overcome these problems by developing and applying new, more sensitive molecular imaging agents for positron-emission tomography (PET), contrast computed tomography (CT), and magnetic resonance imaging (MRI) techniques.

GE Healthcare is contributing sophisticated technology and instrumentation, including a cyclotron to produce radionuclides. Scientists will use probes to seek out cancer cells with specific molecular abnormalities and image them with PET scanning and other technologies.

**Rapid Measurement of Treatment Effectiveness:** Advances in imaging allow physicians to select appropriate treatments and determine within hours or days (instead of many months) the effectiveness of cancer therapy.

Website: <http://www.mdanderson.org/cabir>

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### Center for Biological Pathways

The Center for Biological Pathways at MD Anderson focuses on laboratory research to understand how molecular pathways function and how their dysregulation causes cancer, and makes cancer cells spread.

Cancer is caused by the abnormal functioning of critical genes. The tools and methods of basic science research are the key to discovering and understanding how the fundamental processes that go wrong in cancer work. MD Anderson is well positioned to not only bring the key questions from the clinic to basic cancer research, but also to translate laboratory discoveries back into clinical trials. New information from basic science—such as studies of the underlying cellular and molecular structures and processes of life, DNA, genes and alterations, stem cells, cell metabolism and signaling pathways—bring together the pieces of the cancer puzzle when combined with clinical insights.

A molecular pathway is a series of interactions between molecules in a network that lead to a change in the state of the cell. Such a pathway can trigger the assembly of new molecules, such as a fat or protein, or it can turn genes on and off, or prompt a cell to move.

All parts of the human body, from individual cells to entire organs, must work together to promote normal development and function and so sustain health. This feat of biological teamwork is made possible by an array of intricate, interconnected pathways that facilitate communication among genes, molecules and cells. It is critical to fully understand the molecular and cellular mechanisms of biological pathways to develop effective treatments, preventative agents, and diagnostic and prognostic markers.

To reach this goal, the Center for Biological Pathways coordinates the interaction of Center members, all of whom work to unravel novel molecular and cellular pathways within their oncologic specialty. This coordination expedites the translation of laboratory discoveries into clinical research. The Center provides state-of-the-art shared resources and an intellectual environment in the form of seminars and retreats to facilitate interactions, stimulate genius, and expedite research outcomes.

Website: <http://www.mdanderson.org/cbp>

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### Center for Biomolecular Structure and Function

The mission of the Center for Biomolecular Structure and Function (CBSF) is to provide a focal point, scientific expertise and resources to researchers allowing the understanding of the underlying biochemical, chemical and structural mechanisms of complex biological processes.

Typically the CBSF serves basic scientists and clinicians from MD Anderson, the Texas Medical Center and the wider Gulf Coast Consortia, an organization of several local research institutions promoting collaborative research.

Goals of the CBSF

- To transform the scientific understanding of biological problems to incorporate the detailed mechanistic understanding that results from structural and biophysical data input.
- To allow collaborating scientists to undertake high risk, high reward projects with minimal negative consequences to their research programs.
- To serve as a mechanism to attract outstanding structural biologists/biophysicists, chemists and biochemists to MD Anderson and the Texas Medical Center.
- To enhance the reputation of MD Anderson (and the Texas Medical Center) basic science and to bring recognition to the institutions involved regarding their involvement in cutting edge, high profile structure-chemistry-function studies.

Website: <http://www.mdanderson.org/cbsf>

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### Center for Cancer Epigenetics

The Center for Cancer Epigenetics (CCE) brings together faculty members focused on epigenetics, the study of heritable and acquired changes that affect gene expression and cellular differentiation without DNA sequence alteration. The CCE is directed by Sharon Dent, Ph.D.

Epigenetic changes are now thought to be just as important as gene mutations in cancer development. The ultimate goal of the center is to define the full spectrum of epigenetic changes that occur in cancers, to discover the molecular causes of these changes, and to translate that newly gained knowledge into the clinic in the form of novel, epigenetic based therapies. Members of the center include faculty from several basic research and clinical departments at MD Anderson, including our Smithville campus, as well as Baylor College of Medicine. Information and ideas are exchanged through weekly seminars and a monthly Distinguished Lecturer series.

Website: <http://www.mdanderson.org/cancer-epigenetics>

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### Center for Cancer Immunology Research

Using knowledge gained during the past two decades of how to "educate" the immune system, our investigators are creating potent new cancer vaccines. A vaccine developed by Jeffrey J. Molldrem, M.D., was used in a clinical trial for patients with advanced acute leukemia who had failed all forms of chemotherapy. The vaccine induced complete responses in half of the patients. The news received national attention because it was the first time a vaccine had induced complete responses in patients. The Department of Immunology provides information about the research in progress, graduate programs and profiles of the faculty. The major obstacle to using the immune system and its various components to prevent or treat human cancer has been a lack of understanding of the fundamental mechanisms that govern the immune response. These include the mechanisms by which cells of the immune system recognize antigens, expand and

differentiate, find and destroy atypical cells and pathogens, and die or become inactive when no longer needed.

Some major advances in our understanding of the immune system have come from Human Genome Project discoveries of previously unknown genes and the coding involved in regulating inflammatory and immune responses. Other insights have been gained from studies of how the immune system defends the host against microbial pathogens.

The Center for Cancer Immunology Research collaborative strategy is key to applying the new findings and concepts in immunology to the problem of cancer without delay and shortening the time to move laboratory results into the clinic for patients.

Website: <http://www.mdanderson.org/ccir>

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### **Center for Environmental and Molecular Carcinogenesis**

The Smithville-based Center for Environmental and Molecular Carcinogenesis conducts collaborative research focusing on the molecular biology of cancer. The overall goal of the first area of research, Mechanisms of Environmental Carcinogenesis, is to elucidate the fundamental mechanisms of cancer induced by carcinogens in the environment. This research emphasizes cellular responses to environmental stress, pro-survival and pro-death mechanisms, genomic instability incited by exposure to environmental agents such as radiation and chemicals, and the etiologies of specific environmentally induced cancers. In the second area, Diet, Energy Balance and Cancer Risk, research is conducted to gain an integrated understanding of how nutrition, genetics and environmental carcinogens participate in cancer causation and progression. The primary goal of the third area of research, Genetics and Epigenetics of Early Life Exposures, is to understand how early life exposures to environmental agents in the womb and during childhood change the epigenome and impact susceptibility to cancer in adulthood. The innovative results of the above research areas will be translated into new cancer prevention and intervention strategies.

Website: <http://www.mdanderson.org/cemc>

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### **Center for Genetics and Genomics**

The Center for Genetics and Genomics is an emerging center focused on our goal to establish critical mass and synergy in genetics and genomics research at MD Anderson.

One of the mechanisms to accomplish this is to bring together researchers to present and discuss current research, exchange ideas for future funding and goals, including the development of much-needed genomics core facilities, and to disseminate pertinent data and genetic models that emphasize MD Anderson's unique research environment. Members are asked to attend regular meetings and to present current work in this setting.

The Center for Genetics and Genomics is one of seven centers within the Institute for Basic Science at MD Anderson. Each center, including the Center for Genetics and Genomics, works on a research theme that encourages participation and interaction among basic, translational and clinical faculty members.

Website: <http://www.mdanderson.org/cgg>

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### **Center for Inflammation and Cancer**

The Center for Inflammation and Cancer (CIC) was established in late 2008 and is one of several interdisciplinary research centers in the MD Anderson Institute for Basic Science. Inflammation has been closely linked with various cancers. The goal of the CIC is to provide an interactive

platform across MD Anderson and the Texas Medical Center to study cross-regulation of inflammatory cell types and tumor microenvironments and the underlying molecular mechanisms using both animal models and patient samples.

Website: <http://www.mdanderson.org/cic>

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### **Center for RNA Interference and Non-Coding RNAs**

The Center for RNA Interference and Non-Coding RNAs (RNA Center), established under the Red and Charline McCombs Institute for the Early Detection and Treatment of Cancer, is a unique collaborative initiative among MD Anderson Cancer Center, Baylor College of Medicine, the University of Texas Health Science Center at Houston, Rice University and the University of Houston that will focus on gaining insights into the roles of newly discovered RNAs in cancer initiation, progression and dissemination.

Website: <http://www.mdanderson.org/rnacenter>

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### **Center for Stem Cell and Developmental Biology**

The Center for Stem Cell and Developmental Biology (CSCDB) provides a platform for interactions between researchers interested in the biology of normal and aberrant (cancer) stem cells, regeneration and differentiation. The members of the center take diverse approaches toward a thorough understanding of stem cells, with an ultimate goal of therapeutic attack on cancers. These efforts are not limited to the 40-plus laboratories across 15 different departments of the UT MD Anderson Cancer Center, but are being coordinated across the Texas Medical Center to include researchers at Baylor College of Medicine and the Institute for Molecular Medicine, as a HouSTEM community.

The Center for Stem Cell and Developmental Biology has three major goals: to understand how tumor-derived stem cells become aggressive cancers, to develop stem cells for use in regenerative therapies, and to determine basic mechanisms of differentiation and development.

Website: <http://www.mdanderson.org/scdb>

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### **Center for Targeted Therapy**

The center's goal is to produce or identify drugs that treat the carcinogenic, genetic and molecular changes that lead to cancer. The Department of Experimental Therapeutics, the building block for the new program, is already working on a number of new chemotherapeutic and biologic agents and novel therapies.

**The Next Frontier—Drugs for Cancer Prevention:** The designer drugs produced by this team of 15 scientists will attack defects in cancer cells and in pre-cancerous cells. Molecular and genetic defects in cancer cells can reveal targets specific to each patient, which will be the object of drugs designed to destroy the malignant cells. These targets will also be the next frontier in cancer prevention, allowing physicians to correct or destroy cells with defects before they become a health threat.

**A Head Start Advantage:** Progress in technologies such as genomics and proteomics and sophisticated bioinformatics analyses has provided the tools and knowledge needed to enhance the design and application of novel cancer therapeutics.

Some of the genetic "abnormalities" found in individual tumors and blood can serve as "cancer markers" that will help researchers identify the genetic profile of each patient's cancer and develop an individualized approach that will be both more effective and less toxic.

Website: <http://www.mdanderson.org/ctt>

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### **Duncan Family Institute for Cancer Prevention and Risk Assessment**

The Duncan Family Institute for Cancer Prevention and Risk Assessment integrates our prevention and population sciences programs from basic research to clinical studies to community-based research. The Institute's resources help to accelerate the transfer of discoveries in prevention, and genetic and lifestyle risk factor research to the clinical arena, and involves the many collaborating faculty members drawn from a number of disciplines.

Website: <http://www.mdanderson.org/duncanfamilyinstitute>

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### **Institute for Applied Cancer Science**

The Institute for Applied Cancer Science is a new organizational construct at MD Anderson that will integrate tremendous drug discovery and functional genomics capabilities to increase the probability of discovering effective cancer therapies.

The institute will enhance and complement many other programs at MD Anderson, spanning basic, translational and clinical research. It also will foster collaborative interactions with pharmaceutical industry research and development groups. The institute will provide a framework and collaborative environment for delivering new therapeutics to patients. The institute aims to radically improve the survival statistics of several major cancers in the next 10 years. The institute will radically improve the survival probability for patients with selected cancers by accelerating the translation of fundamental biological discoveries into novel targeted therapeutics.

The institute's unique model will integrate the best attributes of academic and pharmaceutical science to accelerate translation and drive development of innovative oncology medicines.

Teams of top-notch scientists with diverse backgrounds, from cancer genomics to cell and animal biology to synthetic organic chemistry, will work collaboratively to identify new drugs that will be effective in treating tumors based on their genetic fingerprints. Career advancement and recognition of achievements for institute scientists will be based on their ability to work collaboratively to achieve significant impact on the disease types under study.

In addition to investing in its own portfolio of projects, the institute will enhance the impact of its findings and leverage additional capabilities by actively collaborating with other non-profit and pharmaceutical research and development organizations

The institute will drive the translation of basic discoveries to therapeutic endpoints by achieving the following goals:

- Discover basic scientific knowledge specific to cancer and cancer therapy
- Develop efficient means of testing the impact of these discoveries on cancer dependency and select targets possessing the highest potential for effective therapeutic intervention
- Develop an internal drug discovery program to advance unprecedented targets for orphan indications and high medical needs
- Conduct pre-clinical trials to enable rational selection of optimal drug candidates for human testing

- Work with an internal business team and governmental, pharmaceutical and biotechnology partners to move viable drug candidates into clinical trials.

Website: <http://www.mdanderson.org/applied-cancer-science>

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### **Institute for Basic Sciences**

MD Anderson promotes a nurturing environment to enhance collaboration between clinicians, physician scientists and basic scientists.

To that end, the Institute for Basic Sciences was established in 2008. The goal of the Institute is to accelerate scientific discoveries by recruiting outstanding laboratory scientists and creating a collaborative environment in which our faculty have access to state-of-the-art core facilities and participate in theme- and/or disease-oriented symposia and retreats. The Institute serves as a catalyst for faculty to exchange ideas and to solve critical problems that apply to fundamental aspects of cancer biology, and lead clinical aspects in treating patients.

In the few years since its launch, the Institute has consistently grown and flourished. Through various recruitment packages affiliated with the Cancer Prevention Research Institute of Texas (CPRIT) and funding from the University of Texas Science and Technology Acquisition and Retention (STARs) program, all affiliated centers continue to actively recruit faculty at all levels to enrich the centers' research programs.

The vision of the Institute is to promote basic science research at MD Anderson to world-renowned recognition. Investigators focus on tackling basic fundamental puzzles in cancer biology. Their findings could lead to clinical aspects in treating cancer patients.

Dr. Mien-Chie Hung, preceded by Dr. Sharon Dent (2008-2010), serves as the Institute's director. The Institute has seven Centers for Research Excellence. The director, co-directors and members of the Centers for Research Excellence of the are faculty in basic science departments at MD Anderson, including the Departments of Biochemistry and Molecular Biology, Cancer Biology, Carcinogenesis, Genetics, Immunology, and Molecular and Cellular Oncology. To enhance our interactions with other centers and institutes at MD Anderson, the directors meet quarterly with the Metastasis Research Center (Dr. Lee Ellis), the Center for Advanced Biomedical Imaging Research (Dr. John Hazle) at the McCombs Institute, the Cancer Genome Atlas (TCGA) Genome Data Analysis Center (Dr. John Weinstein), and the animal facility (Dr. Peggy Tinkey).

Institute investigators are also actively involved in graduate education programs at The University of Texas Graduate School of Biomedical Sciences (GSBS) in Houston –ranked among the best in the nation in the 2009 National Research Council assessment. For example, among 123 programs in the category of Cell and Development Biology, the Ph.D. Cancer Biology Program was ranked second (along with Harvard, Johns Hopkins and Stanford University), and the Genes and Development Program was sixth. Many faculty members in the IBS are an integral part of the two programs.

Website: <http://www.mdanderson.org/basicsci>

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### **The Institute for Cancer Care Excellence**

The Institute for Cancer Care Excellence is a collaborative organization composed of select divisions, departments and centers that contribute to the following major areas of research concentration: cancer economics, patient safety and quality improvement, information technology, education and outreach development. To provide guidance, an Internal Advisory Council, composed of MD Anderson's senior operations team and other clinical leaders, oversees the Institute's strategic and operational plans and provides collaborative research direction. To



accomplish the mission, the Institute is comprised of project teams dedicated to each of the primary focus areas. These project teams are led by clinical and administrative leaders as well as practicing clinicians from a variety of disciplines. The Institute's business model and infrastructure harness all of MD Anderson's unique capabilities to enhance the value of cancer care throughout the world.

Website: <http://www.mdanderson.org/icce>

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### **Institute for Personalized Cancer Therapy**

The MD Anderson Sheikh Khalifa Bin Zayed Al Nahyan Institute for Personalized Cancer Therapy was created to support preclinical research and clinical trials in which a patient's tumor biopsy is assayed for abnormal genes and gene products to select therapy with agents targeting the product of those particular abnormal genes. This integrated research and clinical trials program is aimed at implementing personalized cancer therapy and improving patient outcomes. A number of events have converged creating a "perfect storm" offering the opportunity to make a bold leap forward in personalizing cancer care. Personalized cancer therapy includes all aspects of individualized patient management driven by characterization of tumor, microenvironment and host characteristics including diagnosis, surgery, chemotherapy, targeted therapy, radiation therapy, and immunological manipulation either alone or in concert.

Website: <http://www.mdanderson.org/ipct>

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### **McCombs Institute**

Red and Charline McCombs and their daughters, Marsha, Connie, and Lynda, have given cancer researchers a tool for scientific discovery that has great promise to accelerate the rate at which new patient-focused advances are made. To thank them for their generosity, the institute was named in their honor.

#### **A New Approach**

The McCombs Center brings together thought leaders in seven key areas of biomedical research the center focuses on molecular-based approaches to cancer diagnosis and treatment.

- Metastasis Research Center
- Center for Cancer Immunology Research
- Robert J. Kleberg, Jr. and Helen C. Kleberg Center for Molecular Markers
- Proton Therapy Center
- Center for Advanced Biomedical Imaging Research
- Center for Targeted Therapy
- Center for RNA Interference and Non-Coding RNAs

(Each of the seven areas, listed above, have a separate listing in this section, which is organized alphabetically by the name of the institute or center.)

Website: <http://www.mdanderson.org/mccombs>

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### **Metastasis Research Center**

The Metastasis Research Program (MRP) is a component of the NIH Cancer Center Support Grant, designed to advance knowledge and research in the field of Metastasis Research. The Metastasis Research Center (MRC), supported by MD Anderson, is a multidisciplinary research center run in parallel to MRP. The co-directors of the Metastasis Program are Lee Ellis, MD, from the Departments of Surgical Oncology and Cancer Biology, Menashe Bar-Eli, PhD, from the Department of Cancer Biology, and Elsa Flores, PhD, from the Department of Molecular &

Cellular Oncology. These investigators also lead the MRC with the addition of Sendurai Mani, PhD, from the Department of Molecular Pathology. The MRP/MRC consists of 30+ members from diverse departments contributing their knowledge to the field of metastasis biology. All major tumor sites are included in the MRP/MRC and members of the MRP/MRC are also members of other centers and programs throughout the institute; this leads to cross-fertilization of ideas and resources.

The main objectives of the MRP/MRC are to: 1) provide educational opportunities in the biology of metastasis, and 2) to provide support for novel research ideas. The MRP/MRC sponsors an annual retreat that is held in early December of each year. The retreat includes presentations from members of the MRP/MRC as well as recipients of grant funding provided by the MRC. The day culminates with the annual Fidler Lectureship in Metastasis Biology that will be selected by members of the MRP/MRC.

In addition, the MRC supports two grant-funding opportunities per year (April and October). Each request for applications will be thematic, addressing a distinct area of metastasis research. These grants will be provided for 1-2 years of support with the provision that the recipients of the grant will use these funds to generate preliminary data to support the subsequent submission of an R01 (or equivalent) grant.

The MRP/MRC will consist of subthemes including: 1) the tumor microenvironment (led by Dr. Bar-Eli), 2) genomics and genetics of metastasis (led by Dr. Flores), and 3) cancer stem cells and EMT (led by Dr. Mani). Small working groups will meet to discuss strategies to advance the field in these particular areas. In addition, each section of the MRP/MRC will alternate in leading Institutional Grand Rounds every 6 months. Lastly, the MRP/MRC will sponsor a seminar series on the first Tuesday of each month. Designated speakers sponsored by the MRP/MRC will lecture on the topic of metastasis biology. The MRC seminar series will place a greater emphasis on metastasis research. Additionally, the remaining Tuesday seminars throughout the month will be sponsored by the Department of Cancer Biology.

Website: <http://www.mdanderson.org/metastasis>

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## Proton Therapy Center

### Center Details

- 200-ton gantries, rotating devices 35 feet in diameter, to direct proton beams with sub-millimeter precision
- Reinforced eight-foot-thick walls to shield patients and staff
- Four treatment rooms
- Reception area with a fully stocked patient library, meeting and lecture rooms, and treatment planning rooms
- Capacity to treat 3,500 patients a year

**Research and Treatment:** The Proton Therapy Center has more than doubled the nation's capacity to deliver proton beam radiation therapy, using state-of-the-art technology. It is only the third proton therapy center in the nation devoted to patient care. There are four centers involved in research.

Proton beams are more effective than traditional radiation therapy in destroying cancer cells in a precise manner while causing very little damage to healthy tissue. The earliest treatment protocols will be for prostate cancer patients. In addition, researchers anticipate that patients with head and neck cancers as well as pediatric cancers would benefit from the precision of this radiation treatment. The center works in close concert with the Center for Advanced Biomedical Imaging Research to locate and destroy cancer cells early in their development.

Partnerships: In a public/private partnership, Hitachi and other investors have constructed and equipped the \$127 million facility. Other partners include the Houston-based financial services firm Sanders Morris Harris, Inc.; The Styles Company, a healthcare management and development firm; the Houston Firefighters' Relief and Retirement Fund; the Houston Police Officers Pension System; General Electric; Varian Medical Systems; and IMPAC Medical Systems.

Website: <http://www.mdanderson.org/proton>

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### **Robert J. Kleberg, Jr. & Helen C. Kleberg Center for Molecular Markers**

Early diagnosis and personalized treatment: The overall research objective of the Robert J. Kleberg, Jr. & Helen C. Kleberg Center for Molecular Markers will be to identify the molecular markers that will allow a cancer specialist to diagnose cancer early and predict response to a particular treatment. The plan is to eventually be able to create a personalized treatment for each individual patient.

Analysis of the DNA, RNA, and proteins of tumors: A major focus of the research will be to characterize the molecular changes in cancer patients' tumors by analyzing DNA, RNA and proteins in the tumors and also in the blood. Molecular markers will help identify those at risk for cancer and provide information for screening and prevention measures. Doctors will also use the markers to select the best treatment with the fewest side effects for each patient.

Applications for all cancers: "What we learn about molecular markers in lung cancer may be translated to breast cancer. This program is not disease-site specific. In fact, we believe the research can impact a variety of cancers," says Gordon B. Mills, M.D., Ph.D., director of the program.

What's already happening? A research team led by Dr. Mills found a potential new protein marker of the prognosis of breast and ovarian cancers. Tumor cells with an abundance of the protein Rab25, the researchers found, are more aggressive and associated with poorer outcome. Thus, Rab25 could become a target for cancer treatment.

Website: <http://www.mdanderson.org/kleberg>

## MD Anderson Shared Resources

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### Cancer Center Support Grant Shared Resources

#### 9.1.01 Sequencing and Microarray Facility (SMF) consists of the DNA Analysis Facility and the Genomic Facility

**DNA Analysis Facility (DAF)** The goal of the DNA Analysis Core Facility is to provide M.D. Anderson investigators holding peer-reviewed grants, reliable nucleic acid analysis, using the latest technology to provide a high level of technical expertise in a centralized facility.

**Services Provided:**

- **DNA sequencing** - The DAF offers DNA sequencing from single or double stranded DNA templates. ABI Big Dye terminator cycle sequencing chemistry is used for the majority of our sequencing reactions. Sequence read-lengths are normally between 800 and 900 bases with a base-calling accuracy >98.5%. The sequence reliability can be increased to 99.99% by sequencing the same template in the opposite direction. The facility performs sequencing reactions, analyzes the data and provides sequence as text files and chromatograms.
- **Next Generation Sequencing: Illumina GAI** - The DAF provides high density short read massively parallel “next generation” sequencing using the Illumina GAI. The GAI, based on Illumina’s well-established reversible terminator-based sequencing by synthesis chemistry, is capable of generating 4-5 gigabases of sequence data per day with read lengths of 36, 75 and 100 bases.
- The GA II is a very flexible platform, enabling a wide variation in applications that differ only in sample preparation and downstream data analysis, including:
  - ChIP Sequencing
  - Methylation Sequencing
  - Transcriptome Analysis (single read or paired end)
  - Nucleosome Sequencing (single read or paired end)
  - Genomic DNA Sequencing
  - Targeted Resequencing
- **Automated Fluorescent Fragment Analysis** - Automated genetic fragment analysis is used to study genotypes, loss of heterozygosity and microsatellite instability. This technique involves using fluorescent primers during amplification to label PCR products. The products are then separated by capillary electrophoresis. Users are responsible for providing fluorescently labeled PCR products. These are run together with sizing standards on the 3730 DNA Sequencer. The data is then analyzed and processed using GeneMapper software.
- **Gene Resequencing** - Gene resequencing provides a fast, simple method of detecting variants in cancer related genes. It allows an entire gene to be evaluated in a single experiment. The DAF performs this assay using Applied Biosystems VariantSEQR® kits, along with our own custom designed primers. The DAF will custom design and optimize resequencing for any human gene requested by an investigator. Please contact the DAF for the most current list of genes available.
- **Quantitative Gene Expression Analysis** - This service includes RNA quantification, RNA QC, reverse transcription, DNase1 treatment and Taqman® PCR based quantitative gene expression assay setup and analysis. Assays are performed in 96

well, 384 well or low-density array format. The DAF provides commonly used endogenous control gene assays.

### **Genomics Facility**

#### **Services Provided:**

- **Sample Quality Assurance (QA)/Quality Check (QC)**
  - RNA sample QA/QC
  - DNA sample QA/QC
- **Target Preparations (TP) Services - provided for the following applications/platforms**
  - TP for gene expression profiling on Affymetrix platform – 3'IVT Express
  - TP for gene expression profiling on Affymetrix platform – Gene 1.0 ST
  - TP for gene expression profiling on Affymetrix platform – Exon 1.0 ST
  - TP for single nucleotide polymorphism (SNP) genotyping mapping arrays on Affymetrix platform
  - TP for Tiling arrays on Affymetrix platform
  - TP for microRNA profiling on standard glass slide arrays (commercially available)
  - TP for NimbleGen platform
  - TP for Illumina platform
- **Hybridization Services for all the TP services listed above**
- **Imaging (including signal quantification) Services**
  - Imaging (and signal quantification) of all hybridized microarrays listed above
  - Imaging (and signal quantification) of other/custom microarrays purchased by the user
- **Genomics Support Services**
  - Experimental design: The GF manager meets with new and potential GF users to discuss experimental design before projects are initiated. Wide flexibility in user support services is available to fit the needs and resources of the individual users.
  - Bioinformatics assistance: A statistical analyst from the Bioinformatics Shared Resource is available once a week at the department of Bioinformatics and Computational Biology to assist new users with experimental design.
  - LIMS: Users can track the entire workflow of samples and projects in the core on the MDACC intranet by accessing the LIMS implemented in the GF.
  - Access to data: All data generated at the GF are uploaded to the Research Data Management Tool (RDMT). Users can access their respective accounts on the RDMT to access their data. Faculty in the department of Bioinformatics and Computational Biology access the uploaded data for statistical analyses.
- **Training, Education and Communication Services**
  - Genomics workshops and presentations: The GF has organized several microarray workshops at MDACC to educate new and potential users on the latest microarray technologies.
  - Technology Seminars: The GF routinely organizes seminars on topics related to new technologies in the microarray field.
  - Training: Upon request, users are trained in target preparation for the applications on the Affymetrix, NimbleGen, Exiqon, and Illumina platforms.
  - Grant text support: The GF directors and manager provide letters of support and text information as needed for the preparation of grant applications by MDACC investigators who use the GF.

### 9.1.02 Biospecimen Extraction Resource (BER)

#### Services Provided:

- **DNA Extraction** - from whole blood, fresh or frozen tissue, saliva, mouth washes, cultured cells and formalin fixed tissue. Methodology depends on the source of the tissue.
- **PCR and Fragment Analysis** - DNA can be subjected to PCR and the PCR product is then analyzed by single strand conformational polymorphism or it can be separated by size using gel electrophoresis. This approach can be used for genotyping samples at polymorphic loci.
- **RNA Extraction from Fresh Frozen Tissue** - method used depends on tissue type. Currently done manually, but plans are to develop strategies with an Autogen Extraction Machine and an ABI PRISM 6100 Nucleic Acid PrepStation.
- **Simultaneous Isolation of RNA, DNA and Protein** - done using a Qiagen kit - most useful for non-laboratory based investigators.
- **cDNA Preparation and RT-PCR from RNA** - RNA that has been extracted by the facility can then be used as a template for cDNA preparation and RT-PCR of target sequence. The product is of sufficient quality to submit to the DNA Analysis Facility.
- **Pyrosequencing for SNP detection or CpG methylation assay using Pyrosequencer, PSQ HS96**
- **Sodium Bisulfite treatments** - DNAs are treated with sodium bisulfite before they could be PCR'd for CpG methylation assay.
- **Processing of whole blood** - Plasma, lymphocytes and red blood cells are stored for future studies.
- **Whole genome amplification** - As little as 10 ng of genomic DNA is amplified to about 5.0 ug.

### 9.1.03 Translational Chemistry Core Facility (TCCF)

#### Services Provided:

- **Custom Synthesis** - The Translational Chemistry Core Facility can synthesize specific compounds for use in research at M. D. Anderson. If the compound has been reported previously and the synthetic sequence is known, the TCCF can legally synthesize a compound for use in non-human applications. Examples of this type of service include the synthesis of SAHA, Gleevec and BMS-354285.
- **Development** - The TCCF can design and synthesize new compounds with the desired chemical properties and biological activity against molecular targets; the development of analogs to known classes of compounds; and the modification of existing drugs to enhance their therapeutic effects.
- **Modeling** - Computer-aided drug design – or molecular modeling – typically involves a structure-based or ligand-based approach and the TCCF can provide this design support and closely integrate it with its custom synthesis services for projects that require the design of novel, small-molecule inhibitors targeting new or established receptors. Virtual screening, homology model construction and other modern methods of computational chemistry/biology are used as part of the modeling efforts of the TCCF and, generally speaking, these efforts will be associated with key aspects of the well-known hits-to-leads philosophy. For example: modeling can employ virtual versus random screening to greatly increase the percentage of hits when selecting compounds from a library (i.e., hit identification); modeling can be utilized in the design of tailor-made libraries based on scaffolds of current hits or to identify new synthetic scaffolds with similar activity (i.e., lead identification); and generation of QSAR models for activity and receptor selectivity prediction and computational assessment of ADME/Tox issues (i.e., lead optimization).

### 9.1.04 Research Animal Support Facility (RASf) – Houston/Smithville consists of the Animal Resource Services, Mutant Mouse Pathology Service, and Genetic Services.

## **Animal Resource Services (ARS)**

### **Services Provided:**

- **Animal Health Quality Assurance Program** - operated as a modified barrier, with the aim of maintaining animal populations that are well defined and free of potentially confounding murine infectious and/or parasitic diseases. Disease diagnosis, prevention and control are addressed via the CCSG-supported Quality Assurance (QA) program, stringent facilities management, and the cooperative efforts of investigative and animal facility personnel.
- **Animal Orders** - purchase orders for animals must be submitted to the facility operations manager and must cite an approved ACUF (see IACUC in “Getting Started”). Orders to specify Adventitious Pathogen Free, Parvo Virus free, and Helicobacter negative health status.
- **Animal Import/Export** - import or export of animals, domestic or international.
- **Breeding Colony Management** - training and hands-on assistance in breeding colony management, including identification systems, collection of genotyping samples, strategies for cohort production, backcrossing, troubleshooting production problems, and now includes computerized record keeping, cage cards and labels, and custom report generation.
- **Custom Production** - fully managed to maintain/safeguard a strain, make crosses, generate congenic stains with or without speed congenic technique (see below), or produce specified sex/genotype cohorts for your research protocol.
- **Data Management** - wireless network available in most physical locations in the RASF-S. Each networked animal room is equipped with laptop computer on mobile stand - providing live access to web-based breeding colony and records management software program (Facility by Locus Technology).
- **General Husbandry** - consult with the RASF-S staff about animal housing needs and options before ordering animals. Ventilated, microisolation, suspended and disposable polystyrene cage systems are available.
- **General Technical Services** - blood collection, identification, drug administration by injection or gavage, diet administration, tissue collections.
- **Surgery and Anesthesia** - anesthesia and surgery services provided or laboratory staff can be trained to do so. Our facilities are setup to allow multiple surgeons to work simultaneously when large throughput is required to support experiments.
- **Science Park Transgenic Services** - provides rederivation, embryo & sperm freezing.
- **Veterinary Care and Consultation** - animal health is assessed daily and problems are brought to the attention of the clinical veterinarian for diagnostic procedures and/or treatment. Medications to treat numerous commonly encountered conditions are stocked in our clinic, as are anesthetics and analgesics. Veterinary pathology, serum biochemistry analysis and phenotyping services are also available to support research programs.
- **Veterinary Care** - includes preventive medicine; surveillance, diagnosis, treatment, and control of disease, including zoonosis control; management of protocol-associated disease, disability, or other sequelae; anesthesia and analgesia; surgery and postsurgical care; assessment of animal well-being; and euthanasia. The Quality Assurance program monitors colony health, including routine serology, clinical pathology, and anatomic pathology, and also includes microbiological monitoring to assure effective sanitation and sterilization of the facility and equipment.
- **Veterinary Facilities** - services include operating rooms, intensive care, radiography, radiotherapy, nuclear medicine, pathology laboratories, necropsy

rooms, facilities to sanitize and sterilize housing equipment, refrigerated storage for animal diets, specialized rodent and rabbit housing facilities (quarantine, specific pathogen free, hazard containment), and housing facilities for large animals.

- **Veterinary Services** – RASF-H veterinarians and staff are available to assist with animal husbandry, clinical procedures, surgical procedures, diagnostic and experimental imaging, clinical and anatomic pathology procedures, and sentinel monitoring procedures. Training is also provided for research staff to perform their own procedures.
- **Veterinary Consultation** - Veterinarians provide consultation services on all aspects of animal care and use, from animal model selection to specimen collection techniques. Services include clinical medicine, experimental surgery, anesthesiology, radiobiology, laboratory animal medicine, diagnostic/experimental imaging, animal models, animal colony quality assurance, euthanasia, and clinical and anatomic pathology.

#### **Mutant Mouse Pathology Service – Smithville (MMPS)**

##### **Services Provided:**

- **Ante mortem and post mortem imaging** performs high resolution ultrasound examination of mice in vivo to identify soft tissue abnormalities and high resolution radiography to investigate both soft tissue and skeletal anomalies
  - **Hematology and serum chemistry** if the lesion under investigation is primarily biochemical rather than anatomical in nature, ante or post mortem determination of hematologic and serum chemical abnormalities is required, particularly for models of diabetes and other metabolic diseases.
  - **Necropsy** tissues are examined, collected, fixed overnight in 10% neutral buffered formalin, then placed in 70% ethanol for long term storage. Digital images of gross lesions are archived.
  - **Histopathology**
    - accurate and thorough descriptions of histologic lesions present on submitted slides
    - semi-quantitative or quantitative data suitable for statistical analysis may be obtained
  - **Consultation**  
Provides:
    - valuable insights into the comparative pathology of human and mouse disease,
    - assistance in planning stages of a study to help optimize study results, and
    - assistance with interpreting immunohistochemical and quantitative histopathologic studies.
  - **Training** scientists and their laboratory personnel to perform ante mortem imaging, necropsy, and quantitative histopathologic studies as required for specific projects
- 
- **Genetic Services – Houston/ Smithville** - speed congenics, microsatellite analysis, strain authentication, background characterisation and genetic consultation - for genetic consultation in developing or maintaining rodent models, genotyping methodologies, including direct assistance with speed congenic technique.

#### **9.1.05 Genetically Engineered Mouse Facility (GEMF)**

##### **Services Provided:**



- **Pronuclear Injection** - A DNA construct, provided by the investigator and purified by the facility, will be injected into fertilized mouse eggs which are then transferred into the oviduct of foster females. Resulting pups are potentially transgenic and will be transferred to the investigator for analysis.
- **Gene-Targeting in Mouse ES Cells** - Genetic alterations introduced into ES cells can be transmitted to the mouse germline by injecting the gene-altered ES cells into mouse early embryos to form chimeras. A targeting vector, supplied by the investigator, will be introduced into ES cells via electroporation. DNA from surviving cell clones will be provided to the investigator for Southern or PCR analysis to identify positive homologous recombinant clones, and up to three targeted clones will be expanded for subsequent injection.
- **Blastocyst Injection** - Genetically modified ES cells can be injected into C57BL/6 blastocysts, C57BL/6 albino blastocysts, or aggregated with ICR embryos. Injected blasts will then be transferred back to the uteri of foster females. Approximately three weeks after pups are born, facility personnel will inform investigators of the number of chimeras produced and their percentage chimerism.
- **Rederivation of Mouse Lines** - Rederivation can restore optimal health conditions for valuable mouse lines. Fertilized eggs from the mouse line of interest will be obtained from oviducts of superovulated females mated to males of the line to be rederived. Embryos will be transferred into oviducts of foster females.
- **Cryopreservation** - Approximately 200 heterozygous embryos collected from the mouse line of interest will be frozen using a two-step method (Jackson Labs cryopreservation course). Frozen embryos are maintained in the GEMF facility.
- **Sperm Cryopreservation** - The researcher will need to supply 2-3 recently mated male mice for the procedure. Approximately 20 straws of sperm will be collected and frozen. Frozen sperm are maintained in the GEMF facility.
- **In Vitro Fertilization** - Embryos can be produced using in vitro fertilization techniques to recover embryos from frozen sperm samples, or to rederive a mouse line using fresh sperm samples.
- **Embryonic Stem Cell Generation** - Embryonic stem cells can be generated from a mouse line of interest for use for in vitro or in vivo experiments. The investigator will supply mice of proper breeding age, which will be superovulated and mated to obtain blastocysts. These embryos will then be cultured, the inner cell mass will be isolated, and then subsequently grown in culture to obtain embryonic stem cells.
- **Mouse Resource Facility** - The MRF can supply northern blots, genomic DNA, cDNA libraries, BAC filter sets, and vectors for the generation of targeting constructs. Additionally, the MRF maintains a small colony of Cre, FlpE, GFP, lacZ, and p53 mice essential for the generation and/or verification of conditional deletions in mice.

*The strength of the Genetically Engineered Mouse Facility lies in our commitment to obtain results for the investigator. We work closely with investigators to determine the level of service that would produce the appropriate animals or determine reagents that will allow their project to progress in a timely manner. Through our US and international online contacts, we have access to a wide variety of skills and knowledge in the field of GEM technology. As well, our own knowledge and experimentation in the field allows us to efficiently generate reagents for the PI.*

#### **9.1.06 Small Animal Imaging Facility (SAIF)**

##### **Services Provided:**

- **Project consultation** - SAIF staff and affiliated faculty are integrally involved in the design and implementation of animal imaging studies. Specialists from the appropriate imaging modalities are available to discuss any aspect of imaging experiments. SAIF personnel consult with investigators regarding animal support, instrumentation, experiment design, and Institutional Animal Care and Use Committee (IACUC) issues.

- **Instrumentation Support** – SAIF facilitates access for CCSG Members to powerful small animal imaging technologies, including 4.7T and 7T MRI, PET, gamma camera, CT, planar x-ray, and ultrasound, and to the expertise necessary to efficiently integrate imaging into biomedical research. While SAIF instrumentation has been configured to accommodate a wide range of routine measurements, SAIF personnel are available to develop or modify existing instrumentation in order to enable more specialized applications.
- **Image Acquisition and Communication** – Once projects are approved, SAIF staff and affiliated faculty coordinate with investigators to ensure that appropriate imaging protocols are in place to achieve the desired measurements. Staff are available to support all aspects of the experiment, including image acquisition, animal transport and handling, and data delivery. When appropriate, users or their designees can also be trained to conduct imaging experiments at their own convenience. Data are delivered to investigators in a variety of formats to support investigators with widely varying backgrounds.
- **Data Processing** – SAIF staff and affiliated faculty are available to assist investigators with advanced image or data processing as required. These arrangements are made prior to initiation of a study in which such service would be required. Alternatively, in many circumstances users or their designees can be trained to analyze data at their own convenience.

**9.1.07 Tissue Biospecimen & Pathology Resource (TBPR)** consists of the **Tissue Bank** and the **Research Histopathology Facility**

**Tissue Bank**

**Services Provided:**

- **Organization of tissue procurement and banking at MDACC** – Provides access by all basic science, translational, and clinical investigators to human tissue specimens that have been removed by therapeutic resection or biopsy and are suitable for research usage
- **Assurance of compliance with NCI Best Practices for Biospecimen Resources (issued June 2007)**
- **Initiation of chain of custody of research specimens through centralized locations for collection and initial processing**
- **Provision of centralized tissue database management (TissueStation)** – A comprehensive relational database with linkages to clinical, epidemiologic, and pathologic information
- **Assistance with obtaining pre-operative patient consent** – obtained via a Research Coordinator stationed in Department of Anesthesia Pre-operative Assessment Center
- **Verification of consent** - Verification of patient consent status for tissue collection and distribution
- **Prospective research tissue identification & collection**
  - Surgical Pathology suites in Alkek Hospital and Mays Clinic
  - Endoscopy unit in Clark Clinic
  - Procedure rooms in disease-site centers and Interventional Radiology suites on request
- **Prospective tissue processing**
  - Fresh, snap frozen, in media, frozen in OCT, cryogenically frozen according to protocol
  - Fixed in RNA-Later, 70% ethanol, neutral buffered formalin, or other fixatives as requested
  - Other processing as required by specific protocols, such as sterile disaggregation and preparation for cell line development

- Tracking and distribution of specimens and centralized database management (TissueStation)
- **Retrospective tissue distribution**
  - Via online or email request
  - Targeted searches and selection of previously frozen and stored tissue via database
  - Conversion of frozen specimens to other forms (block, slide, etc.) per request
- **Storage of processed specimens** - Secure, monitored facility in the Mitchell Basic Sciences Research Building (Tissue Banking Storage Facility, Second Phase)
- **Verification of IRB research protocol approval** - Verification of Surveillance Committee (Institutional Review Board) approval of investigator for tissue research before release of specimens
- **Specimen quality control** - Quality control/quality assurance of tissue specimens
- **Interface with subspecialty surgical pathologists, cytopathologists, and hematopathologists**

#### **Research Histopathology Facility**

##### **Services Provided:**

- Histologic processing and sectioning of fixed tissue specimens
- Frozen sections of fresh-frozen tissue specimens
- Hematoxylin and eosin staining
- Special staining
- Preparation of sections on positively charged or coated slides for immunohistochemistry or in situ hybridization
- Collection of sections in tubes, including buffer-containing microcentrifuge tubes, for research laboratory analysis
- Expert consultation on histopathologic and related technologies and methodologies
- Referral for histopathology consultation by organ-site subspecialty pathologists
- Online ordering, tracking, and accounting database
- Immuno staining
- RNase-free sectioning
- Laser capture sectioning

#### **9.1.08 Characterized Cell Line Core (CCLC)**

##### **Services Provided:**

- **Validate cell lines by verifying known mutations in candidate cancer genes**
- **Use STR DNA fingerprinting (Ref. 5)**
- **Provide validated cell lines tested for:**
  - Short tandem repeat DNA fingerprint (Ref. 5)
  - Mycoplasma contamination
  - Viral contamination
  - Known mutations and mutations in hot spots in candidate cancer genes
- **For some cells information will also be available on:**
  - DNA copy number
  - Transcriptional profile
  - Functional proteomics

#### **9.1.09 High Resolution Electron Microscopy Facility (HREMF)**

##### **Services Provided:**

- Consultation and assistance in the design of experiments to utilize TEM and SEM

- Conventional processing of samples for SEM and TEM
- Research and development of novel techniques to meet the demands of individual research projects
- Assistance in screening samples
- Assistance in interpretation of data and recommend subsequent and future experiments
- Foster collaborations

#### 9.1.10 Flow Cytometry and Cellular Imaging Facility (FCCIF)

##### Services Provided:

- **Flow Cytometry** - Indispensable tool for the study of all aspects of cell biology including protein expression, cell proliferation and differentiation, cell signaling pathways, enzyme activity, gene regulation, cell lineage, apoptosis, autophagy, and chemotherapeutic resistance. Fluorescent dyes, proteins and fluorophore-coupled antibodies are assayed at the individual cell level, facilitating high content analysis of mixed cell populations and rare cell types. Current instrumentation allows simultaneous quantitative analysis of up to 13 parameters. The Core facility provides researchers with technical expertise in instrument operation, assay development, data acquisition and various data analysis techniques.
- **Cell Sorting** - Multiparameter cytometric analysis is complemented by the ability to isolate desired cell populations based on up to 16 light scatter and fluorescence parameters with high speed cell sorting for culture and further characterization. Current instrumentation routinely sorts up to 4 cell populations from 10<sup>8</sup> cells/hour. Cells can be sorted into tubes, culture plates or onto slides.
- **Laser Scanning Cytometry\*** - A slide-based system with fluorescence detection and quantitation that can analyze up to three fluorochromes from cells deposited on slides. FACS sorted, adherent or rare tumor or stem cells can be analyzed using this technology. Protein expression data can be obtained from as few as several hundred cells. \*North Campus Location Only
- **Confocal Microscopy\*** - Laser Scanning and Spinning Disk systems allow the localization and co-localization of cellular and sub-cellular components and cellular interactions in both fixed and live specimens. The systems are particularly useful in observing multicellular structures from tissues or cultured specimens in their native 3D forms. The Core facility offers researchers tools and techniques for image acquisition, 3D-reconstruction and time-series observation as well as a variety of image processing and analysis functions. Both systems are configured to allow longitudinal analysis of live cells. \*North Campus Location Only

#### 9.1.11 Pharmacology & Analytical Facility (PAF) consists of High Performance Liquid Chromatography/Mass Spectrometry Facility (PAF-HPLC/Mass Spec) and the Nuclear Magnetic Resonance Facility (PAF-NMR)

##### High Performance Liquid Chromatography/Mass Spectrometry Facility (PAF-HPLC/Mass Spec)

##### Services Provided:

- **HPLC Facility** - consists of 15 high-throughput automated liquid chromatographic systems capable of detection of a variety of xenobiotics after extraction and chromatographic separation using visible light, UV, fluorescence, radiochemical, refractive index and electrochemical detection. Development of drug extraction and analytical assay procedures are routinely re-established from published methods or are established on site to serve the needs of the investigator.
- **Mass Spectrometry Facility** - consists of 9 mass spectrometers including 7 tandem (LC/MS/MS) instruments equipped with HPLC or UPLC chromatography systems and a micromass Q-TOF (tandem orthogonal time-of flight) mass spectrometer. The facility assists investigators with qualitative and quantitative measurement of small molecules, typically consisting of drugs and drug-derived compounds. Services provided include the following:

- Verification of drug product synthesis, purity and stability
- Quantitation of drugs and drug metabolites for pharmacokinetic analysis
- Determination of drug metabolism and metabolic pathways
- Identification of complex unknown compounds (i.e. impurities, metabolites, small proteins, drug-target interactions)
- Quantitation of volatile drugs and drug metabolites (GC/MS)
- Unequivocal confirmation of presence and identification of unknown compounds (Q-TOF MS)

### **Nuclear Magnetic Resonance Facility (PAF-NMR)**

#### **Services Provided:**

- Provide and maintain NMR spectrometers - Typically users operate the instruments. The NMR facility has 300-MHz, 500-MHz, and 600 MHz spectrometers equipped to conduct a wide variety of 1D and 2D programs. 3D experiments can be performed on the 500-MHz and 600 MHz instruments using triple resonance probes (TXI) tuned to <sup>15</sup>N, <sup>13</sup>C, and <sup>1</sup>H, or <sup>31</sup>P, <sup>13</sup>C and <sup>1</sup>H. NMR spectroscopy of cell cultures is available on the 500 and 600 MHz spectrometers and high resolution magic angle spinning probes are available on the 600 MHz instrument to study cells, synthesis resins and other semi-solids. 750 MHz and 800 MHz instruments are available through our participation in the Gulf Coast Consortia.
- User training is provided on the operation of the instruments as well as how to run advanced 2D and 3D experiments. Users must pass a proficiency test before they can operate the instruments on their own.
- Sample analysis is offered for those who do not wish to obtain their own spectra. This includes acquisition and interpretation of spectra. Structural biology, that is, the determination of the structure of a protein or a nucleic acid, is also available as a service.
- Molecular modeling capabilities also are available but are not currently offered as a service. Instead, researchers in each independent research group can use the software for their own specific needs.

#### 9.1.12 **Human Pedigree Analysis Resource (HPAR)**

##### **Services Provided:**

- **Database Development/Integration** – We provide custom database development for studies of individuals at increased risk for cancer from genetic factors. We design database systems to be user friendly and cost-effective. Our systems are designed with the highest level of security.
- **Web Development** – We have built and continue to maintain secure web applications that perform a variety of functions, including: content management systems and the collection of participant follow up information. We work on a variety of platforms, including Java/JSP, PHP, ASP, C#, Cold Fusion as well as application frameworks such as .NET, WebObjects. Web development projects require tight coordination with Information Services..
- **Data Management/Support** – Provide data management support for the collection and analysis of family history information, specimen tracking, clinical and laboratory tracking information and the development of clinical and risk assessment tools for the risk breast/ovarian and colorectal cancer clinics.
- **Data Analysis** - The Section of Computational Genetic Epidemiology in the Department of Epidemiology assists many investigators in the analysis of family data.
  - Assistance is provided for guidance in the development of data collection tools for family history information.

- Assistance is provided in the analyzing data and in developing novel methods of analysis.
- Extensive resources are available for consultative assistance for the analysis of pedigree data in the Section of Computational and Genetic Epidemiology.
- Specialized programs for analysis of familial data include LINKAGE, Pedigree Analysis Package, and Statistical Analysis for Genetic Epidemiology, Genetic Analysis Package, Helix Tree and PLINK.
- **Protocol Development** - assist with establishing plans for patient and information flow and developing institutional protocols using an online process for registering new participants to studies and capturing data from the patients through a web interface.

#### 9.1.13 **Monoclonal Antibody Facility (MAF)**

##### **Services Provided:**

- **mAb development**
  - Procurement of mice
  - Mouse and Rat immunization protocols for whole cells, purified proteins, peptides and other antigens
  - Testing mouse/rat sera for positive response
- **Fusion and Hybridoma Screening**
  - Cell Fusion of immunized mouse spleen or lymph node cells with drug-sensitive myeloma fusion partner for generation of hybridomas
  - Growing and isolation of primary fusants by tissue culture
  - Screening done by ELISA
  - Provide investigators with culture supernatants for antibody assays
  - Special screening by FACS
- **Cloning**
  - Single cell cloning of desired hybridomas to create stable cell line
  - Freezing representative hybridoma cell lines for long term viable storage in liquid nitrogen
- **Small-scale antibody production**
  - Production of large amounts of antibody-containing culture supernatants or mice ascites fluid
  - In vitro production for non-murine hybridomas
- **Antibody purification**
  - Small scale production of purified monoclonal antibodies from custom hybridomas or hybridomas stocked under MABF extensive library
  - Protein A/ Protein G affinity chromatography
  - Affinity Purification of monoclonal antibodies using FPLC (Fast Protein Liquid Chromatography)
- **Antibody characterization**
- **Murine Isotyping**
  - SDS PAGE gel electrophoresis
  - F(ab) and F(ab)<sub>2</sub> fragment production
- **Antibody conjugation**
  - Fluorochromes
  - Biotin
  - Consultation service – assay development, ELISA assay design, radio-immunoprecipitation, flow cytometric analysis, fluorochrome conjugation, fluorescent microscopy, parallel-plate flow assay

#### 9.1.14 **Patient-Reported Outcomes, Survey & Population Research (PROSPR)**

**Services Provided:** In order to support research that utilizes patient-reported outcomes and quality of life data, this shared resource provides services to assist investigators in identifying existing measures, developing new measures, designing data collection strategies, and using computers in assessment. A description of the type of services provided follows.

- **Established measures:**
  - maintains a library of established measures for assessing quality of life, psychological functioning, and health behavior in oncology settings
  - consults with investigators to identify the appropriate tool for assessment in their studies and conducts appropriate literature searches
  - researches copyrights, usage fees, and training requirements for administration of measures
- **Development of new measurement tools for specialized assessment needs:**
  - designs procedures to develop item pools, including appropriate procedures for translating questionnaires
  - conducts focus groups and codes the data
  - ensures content validity
  - conducts appropriate psychometric analyses including assessing the new measure's reliability and validity
- **Research support:**  
**provides assistance with grant proposal submissions**
  - develops data collection procedures individualized to study design
  - submission of protocols for patient-reported outcome and psychosocial studies
  - provides data collection services for patient-reported outcomes research (mail, telephone, in clinic)
  - conducts assessments for energy balance research, including cardiorespiratory and strength assessments, physical performance testing, body composition and dual-energy x-ray absorptiometry (DXA)
- **Data management:**
  - develops participant recruitment / tracking databases
  - develops databases for entering and managing questionnaire data
  - performs psychometric analyses
  - provides scored datasets for analysis
  - interprets data
  - develops randomization modules (simple or adaptive)
- **Computer-based assessment:** This resource, in collaboration with eHealth, will provide consultation and programming to develop assessment tools using innovative technologies such as web-based assessments, assessments using mobile device (cell phones, iPads) and electronic diaries. Such tools will increase efficiency of research by reducing the need for staff entry of data recorded on paper questionnaires and by allowing collection of data in real time.

#### **9.1.15 Molecular Cytogenetics Facility (MCF)**

**Services Provided:**

- **Conventional Cytogenetics:**
  - Giemsa stained analysis of mitotic chromosomal aberrations
  - G, C, Q, R band analyses of mitotic chromosomal aberrations
  - G, C and Ag-NOR analysis of meiotic chromosomal aberrations
  - Determination of inter or intra-species contamination of tissue culture cell lines
- **Fluorescence-in situ Hybridization (FISH) based molecular cytogenetics:**
  - Single FISH DNA probe on interphase cells or metaphase chromosomes
  - Multi-color FISH analyses on interphase cells or metaphase chromosomes
  - Telomere FISH analyses on interphase cells or metaphase chromosomes
  - Spectral Karyotyping (SKY) of human, mouse and rat metaphase chromosomes

- Single or multi-color probe-specific FISH analyses on paraffin-embedded tissue sections
- Gene-mapping studies using multi-color FISH probes on metaphase chromosomes

#### 9.1.16 Immune Monitoring Core Lab (IMCL)

##### Services Provided:

- Consultation on experimental and clinical trial design involving immune monitoring.
- ELISPOT assays for (e.g., IFN- $\gamma$ , IL-4, Granzyme B).
- Leukocyte/lymphocyte phenotype analysis with FACS (1-8 color).
- Intracellular cytokine staining (IFN- $\gamma$ , TNF $\alpha$ ).
- HLA tetramer/pentamer staining antigen-specific TCR.
- Cell proliferation assays (MTT, CFSE).
- ELISA for cytokines.
- Multiplex cytokine assays using Luminex-100 system and MSD biochip system.
- New sensitive flow cytometry-based CTL assay using caspase 3-cleavage in target cells as a readout.
- Processing and storage of PBMC samples from clinical trials (on a case-by-case basis).
- TCR V  $\beta$  clonotype analysis
- TCR gene excision circle (TREC) analysis for circulating naïve T-cell

#### 9.1.17 Biostatistics Resource Group (BRG)

##### Services Provided:

##### Biostatistical Consulting and Collaboration

- Novel study designs including Bayesian adaptive methods for clinical trials
- Design of experiments, clinical trials and other studies such as animal, translational and prevention studies
- Preparation for grant applications
- Design and review of protocols for submission to Office of Protocol Research
- Advice on data requirements for data analysis
- Standard and innovative analyses including Bayesian modeling and inference, hierarchical modeling, neural network modeling, pharmacodynamic modeling, analyses of population pharmacokinetics, nonlinear dynamics, and statistical analyses for cancer screening studies
- Statistical report writing and interpretation for manuscript preparation
- Long-term collaborative research efforts

#### 9.1.18 Bioinformatics Shared Resource (BISR)

**Summary** The mission of the BISR is to provide bioinformatic and biostatistical collaboration, consultation, and quantitative research resources to clinical, laboratory, and prevention scientists engaged in the planning, conduct, analysis, and interpretation of research studies that use modern high-throughput technologies from molecular biology. Additionally, members of the BISR collaborate with oncology research scientists to develop bioinformatic and biostatistical methods to improve the efficiency of current and future basic science, therapeutic, diagnostic, prevention, and intervention studies. This resource is located in the Department of Bioinformatics and Computational Biology (BCB). The BCB Department, along with the Department of Biostatistics, is part of the Division of Quantitative Sciences.

The BISR cooperates closely with the Genomics Core Laboratory and with the developing reverse phase protein lysate array (RPPA) Core Facility at the Kleberg Center. Data generated by these units is conveyed directly from the cores to the BISR along with requests for analysis.

##### • Services Provided:

The activities of the BISR are focused on the design and analysis of experiments that apply high-throughput molecular biology technologies to cancer research. Members of the BISR have experience working on data sets that use the following technologies: mRNA expression



microarrays from Affymetrix, Agilent, and Illumina, mass spectrometry, 2D-PAGE, SAGE, TMAs, array CGH, SNP chips, methylation arrays, microRNA microarrays, exon tiling arrays, real-time PCR, and RPPA.

- The BISR provides the following services:
- Advice on choosing appropriate technology platforms
- Assistance with experimental design
- Identification of relevant factors
- Sample size and power computations
- Choice of appropriate controls
- Development and maintenance of databases
- Pre-processing of high-throughput data sets
- Statistical analysis of high-throughput data sets
- Bioinformatic interpretation of high-throughput data sets

No fees are assessed for these services; they are provided as needed to all researchers at the institution to the maximum level of capacity of the resource. Salary support through the PI's funding mechanism is requested when faculty bioinformaticians and statistical analysts collaborate from the outset of a research project.

- **Expertise and Resources**

The BISR consists of seven faculty bioinformaticians and eight statistical analysts, all of whom are experienced in the design and analysis of experiments using high-throughput molecular biology technologies. Members of the BISR have worked on projects that involve mRNA expression microarrays from Affymetrix, Agilent, or Illumina; proteomics using mass spectrometry or two-dimensional polyacrylamide gel electrophoresis (2D-PAGE); serial analysis of gene expression (SAGE); tissue microarrays (TMA); array comparative genomic hybridization (CGH); single nucleotide polymorphism (SNP) chips; methylation arrays; microRNA arrays; exon tiling arrays; real-time polymerase chain reaction (PCR); and reverse-phase protein lysate arrays (RPPA).

- The BISR works consistently to assist M.D. Anderson researchers interpret the results of high-throughput experiments. The BISR web server hosts a mirror of GeneCards, providing local access through an integrated interface to many of the standard genomics databases. We also provide access to PDQ\_MED, which automates sophisticated PubMed searches linking large numbers of terms. In addition, in cooperation with the central IT department, we provide access to and instruction in using Ingenuity Pathways.

- **Education**

The BISR sponsors a weekly seminar series open to all researchers at M.D. Anderson. Seminar schedules are available online, as are tutorials and the full lecture notes from an annual class on Analysis of Microarray Data taught every fall through the University of Texas Graduate School of Biomedical Sciences.

### 9.1.19 Clinical Trials Support Resource (CTSR)

#### Services Provided:

- Administrative Support – CTSR staff, who are part of OPR, assist the clinical research faculty and staff by providing service and support that not only reduces cost and improves efficiency, but also provides a user-friendly environment for investigators to develop new research in the areas of diagnosis, treatment, and prevention of cancer. Administrative support within the CTSR supplies infrastructure for the day-to-day operational management for the clinical research program. This includes the central management and oversight functions for coordinating and reporting on clinical research protocols.

- **Regulatory Affairs Support** - CTSR is dedicated to servicing the needs of the clinical investigators and adhering to the highest standards of clinical research compliance with local, state, and federal regulations. CTSR provides centralized support for the submission, review, approval, activation, modification, continuing review, and termination of protocols involving human subjects research. This includes the staffing of the Institutional Review Boards (IRBs) and the Data Monitoring Committee (DMC). The staff coordinates and maintains regulatory data for tracking the life cycle of the research protocols. These data, contained within regulatory documents, are part of the master protocol file in CTSR and reside in both electronic and paper media.
- **Information Technology Support** - The Research Applications Information System (RAIS) staff supports the development and maintenance of centralized databases for research-related regulatory and clinical data. The Protocol Data Management System (PDMS) and the Clinical Oncology Research system (CORE), provide structure and tools to manage and share clinical research data. The Protocol Document On-Line (PDOL) database supports and facilitates protocol documents through their complete life cycle, including the submission, review, and approval processes performed by the Clinical Research Committee (CRC) and IRB.
- **Regulatory Education Initiatives** - CTSR personnel provide regulatory research education as a key resource for researchers. Educational activities include: offering of a Brown Bag Session each month focusing on current issues that have come to the attention of CTSR; publishing a monthly bulletin for all clinical and basic science faculty and staff; and providing in-services for small group meetings and are modified to focus on specific areas of interest when requested by a department or disease center work group.
- **Certification Program** - CTSR personnel have assisted in the development of a new certification program entitled "Design and Management of Clinical Trials" given at MDACC and the Graduate School of Biomedical Sciences. The fundamental purpose of this program is to provide an introduction into clinical research management for individuals with non-clinical research related background (i.e. Ph.D. in biomedical sciences).

#### 9.1.20 Clinical and Translational Research Center (CTRC)

##### Services Provided:

- In June 2009, the **Clinical and Translational Research Center (CTRC)** relocated from the 10th floor Clark Clinic, to a larger clinical unit on the first floor of the hospital. That unit has 18 treatment rooms, an increase in specimen processing laboratory space, and consolidated offices that were previously split between two floors into a single, contiguous space. The move allowed the Clinical Translational Research Center to move to 9,750 sq. ft of space on the first floor of the of the LeMaistre Clinic Building to expand its area by nearly 2,600 gross square feet. Key features of the space include:
  - Medicine preparation room
  - Vital signs alcove
  - Dedicated waiting area and reception desk
  - Staff lounge
  - Increased specimen processing lab space
  - Complex processing lab area
  - Shipping room
  - Freezer room
  - Consolidated general lab and nursing work areas
- **CTRC nursing** provides research support through the administration of investigational agents, biologics, and conventional chemotherapy. In addition to drug administration, the staff provide patient teaching, patient observation, and infusion device management. The nursing staff is essential to the management of emergent situations, and documentation of treatment as delineated by the protocol. To ensure protocol compliance, the nurses are

detail oriented, attend site initiation visits, and participate in the multidisciplinary in-services. Our goal is patient safety and protocol compliance.

- **CTRC Laboratory** - provides pharmacokinetic (PK) collection, processing and shipping, and is located within the CTRC. The laboratory processing area can accommodate up to nine phlebotomists at a given time for the handling and management of multiple PK samples with an adjacent area for complex processing performed by our Sr Laboratory Technologist. Another room with two phlebotomy recliners allows for fast-track PK collection of blood specimens. Two -20°C and six -80°C freezers are within the unit for storage of PK specimens. The laboratory staff processes, labels, documents, tracks, stores, ships and performs quality control measures of PK specimens for compliance with protocols, accuracy and specimen integrity.
- **Pharmacy Services** - Clinical and Investigational pharmacy staff participates in the maintenance of regulatory records and protocols, supervising technologist activities. The Investigational Pharmacy staff completes protocol reviews for the Clinical Review Committee (CRC) and the Institutional Review Board (IRB), development of protocol information and drug information for the pharmacy dispensing areas and nursing, protocol pharmacoeconomic analysis and reimbursement risk analysis, and coordination of protocol management between pharmacy, medical staff, data managers and study sponsors. Dispensing Pharmacy staff participates in site initiation meetings and performs precise preparation of the phase I agents for delivery in the CTRC.

#### **9.1.21 Functional Proteomics Reverse Phase Protein Array Core (FPRPPAC)**

##### **Services Provided:**

- Provide standard operating procedures needed for the extraction of proteins from cell lines and tumor tissue for use in the Reverse Phase Protein Array studies
- Provide an updated list of validated antibodies for customers to choose from for their Reverse Phase Protein Array studies
- Perform Reverse Phase Protein Arrays on the samples received from customers
- Perform primary data analysis using custom software to determine signal intensity, curve construction and relative protein concentration
- Perform custom antibody validation using a Reverse Phase Protein Array that contains lysates from 330 cell lines grown under multiple conditions

## TEXAS MEDICAL CENTER

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### Texas Medical Center

Texas Medical Center (TMC) is a comprehensive medical complex that was organized in the mid-1940s as a means for coordinating medical and health education, patient care, and related research in a not-for-profit setting. Today it stands as the leading health care destination for people all over the world. More than 160 permanent buildings, not including Rice University, occupy nearly 1,000 acres that include 15 patient care facilities and 21 academic and research institutions, housing 20,000 advanced-degreed professionals in the life sciences. There are approximately 12,000 volunteers who assist with a wide variety of tasks benefiting the TMC.

More than 93,000 full and part-time employees work in the Texas Medical Center in member institutions with a combined annual operating budget in excess of \$6 billion. TMC hospitals contain more than 6,800 licensed beds. More than 6 million patient visits were recorded in 2010, the most recent year of record, which included about 18,000 international patients.

With nearly 72,000 students, the Texas Medical Center includes three medical schools, six nursing schools, a dental school, two colleges of pharmacy, a school of public health, a high school for the health professions (with an annual rate of greater than 95 percent of its graduates going on to college), a community college specializing in health careers training, plus other graduate and post-graduate schools and programs to provide training in the allied health professions.

The Houston Academy of Medicine-Texas Medical Center (HAM-TMC) Library, which serves as the accredited library for most of the TMC institutions, is recognized as one of the largest academic health sciences libraries in the U.S. In addition, research expenditures of the Texas Medical Center member institutions total about \$1.8 billion annually.

One of the most distinctive and visited locations in the Texas Medical Center is The John P. McGovern Texas Medical Center Commons amenities building, which is the central meeting and gathering place for thousands of staff, patients and visitors who frequent the campus daily. It features an exterior 64-foot waterwall; Waterside Court, which provides eight diverse food concepts; Trevisio Restaurant for fine dining, meetings and special events; and a 500-space parking garage.

A major part of this "biomedical city" called the Texas Medical Center is UTHealth, the most diverse of the academic health institutions in the Texas Medical Center.



## **MEMORIAL HERMANN HOSPITAL-Texas Medical Center, CHILDREN'S MEMORIAL HERMANN HOSPITAL and TIRR MH**

The Memorial Hermann-Texas Medical Center Campus is home to three hospitals: Memorial Hermann-Texas Medical Center, Children's Memorial Hermann Hospital and TIRR Memorial Hermann.

Part of the 12-hospital Memorial Hermann System, these hospitals serve as primary teaching hospitals for The University of Texas Medical School at Houston, ensuring that patient care is based on new knowledge at the frontiers of medicine.

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### **Memorial Hermann-Texas Medical Center**

For generations, Houston and its surrounding communities have trusted Memorial Hermann-TMC for outstanding care. Memorial Hermann-TMC built a reputation for excellence in heart and vascular, cancer, neuroscience, sports medicine and orthopedics, specialty surgery and organ transplantation.

As the first hospital to open its doors in the renowned Texas Medical Center, Memorial Hermann-TMC has a long history of innovation. These are just a few of the firsts: In 1946, Memorial Hermann-TMC was the first in Texas to perform a cardiac catheterization. In 1976, the hospital was the first in Texas and the second in the nation to launch an air ambulance program, Memorial Hermann Life Flight®, which remains Houston's only hospital-based air ambulance service. In 1985, Memorial Hermann-TMC broke new ground in the treatment of end-stage liver disease as the site of Houston's first liver transplant. In 1988, the hospital opened the first stroke center in Houston and one of the first dedicated stroke programs in the world. In 2005, Memorial Hermann-TMC was the first in the world to perform robotic reconstructive aortic surgery. In 2006, Memorial Hermann-TMC performed the first four-organ transplant in Houston and only the fourth in the nation. In 2011, Memorial Hermann-TMC gained world wide recognition for the treatment of Congresswoman Gabrielle Giffords wheree UTHealth faculty led the treatment team.

Through revolutionary advances in medicine and surgery, Memorial Hermann-TMC set new standards of care for the nation and has been recognized as an industry leader by prestigious national organizations, including Thomson Healthcare, VHA, *U.S. News & World Report*, University Health System Consortium and the American Heart Association.

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### **Children's Memorial Hermann Hospital**

When families come to Children's Memorial Hermann Hospital, they expect to find the technological advances and healing expertise of a university-affiliated academic hospital. What continues to surprise them is the special compassion and focus on families that distinguishes Children's Memorial Hermann Hospital as one of the finest in the nation.

Founded in 1986, Children's Memorial Hermann Hospital is the primary teaching institution for the pediatrics and obstetrics/gynecology programs at The University of Texas Medical School at Houston. Our healthcare professionals are focused on the specialized needs of women and children, with an emphasis on quality, customer service and leading-edge research.

The hospital offers the latest advances in maternal-fetal medicine and neonatal critical care services, as well as renowned programs in pediatric trauma, neuroscience, pulmonology and cardiac services. Interdisciplinary teams include experienced nurses, child life specialists, pediatric respiratory therapists, pediatric clinical pharmacists, social workers and more. In 2012, Children's Memorial Hermann Hospital became the first in Texas to perform in-utero surgery in the treatment of Spina Bifida.

As part of Memorial Hermann's network of hospitals, patients can now access children's healthcare or high-risk pregnancy services at our affiliated hospitals in the community or, for more acute healthcare needs, at Children's Memorial Hermann's main facility in the Texas Medical Center.

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### **TIRR Memorial Hermann**

TIRR Memorial Hermann changes lives by improving outcomes, offering hope and maximizing independence for people affected by disabling injury or illness. Recognized among the leading rehabilitation hospitals in the country, TIRR serves as a model for interdisciplinary rehabilitation services, patient care, education and research.

TIRR is one of only six rehabilitation hospitals in the nation designated as model systems by the National Institute on Disability and Rehabilitation Research (NIDRR) for both our spinal cord injury and traumatic brain injury programs. For 21 consecutive years, *U.S. News & World Report* has named TIRR to the list of "America's Best Hospitals."

TIRR's reputation is based on more than 50 years of experience in rehabilitation and research, the high caliber of physician partners and clinical staff and comprehensive programs and services. TIRR is also recognized for its long-standing commitment to educating patients, families, healthcare professionals, caregivers and the general public about rehabilitation. Extending TIRR knowledge and resources into the community remains a top priority and part of its pledge to make a difference in the lives of those recovering from disabling injury and illness. Website of Memorial Hermann locations:

<http://www.memorialhermann.org/locations/default.html>

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### **The University of Texas MD Anderson Cancer Center**

Celebrating seven decades of Making Cancer History®, The University of Texas MD Anderson Cancer Center ranks as one of the world's most respected and productive centers devoted exclusively to cancer patient care, research, education and prevention. It is one of the nation's original three comprehensive cancer centers designated by the National Cancer Act of 1971.

Since 1944, patients have turned to MD Anderson for cancer care in the form of surgery, chemotherapy, radiation therapy, immunotherapy, or combinations of these and other treatments. This multidisciplinary approach to treating cancer was pioneered at MD Anderson. Because they focus only on cancer, the center's experts are renowned for their ability to treat all types of cancer, including rare or uncommon diseases.

In 2011, more than 108,000 patients, about one-third of them new patients, sought care at MD Anderson. About one-third of these patients come to Houston from outside Texas seeking the research-based care that has made MD Anderson so widely respected. MD Anderson's clinical trials exploring novel therapies and diagnostic tests continues to be one of the largest such programs in the nation.

At MD Anderson, important scientific knowledge gained in the laboratory is rapidly translated into clinical care. In FY11, the institution spent more than \$623 million in research. MD Anderson ranks first in the number of research grants awarded and total amount of grants given by the National Cancer Institute. The institution holds 11 NCI Specialized Programs of Research Excellence grants.

In FY11, almost 7,000 students, including physicians, scientists, nurses and allied health professionals, took part in MD Anderson educational programs. The School of Health Professions offers bachelor's degrees in eight allied health disciplines.

More than 1,000 clinical residents and fellows come to MD Anderson each year to receive specialized training in the investigation and treatment of cancer. More than 500 graduate students are working on advanced degrees at the Graduate School of Biomedical Sciences in which MD Anderson cooperates with UTHealth, and more than 1,500 research fellows are being trained in MD Anderson laboratories.

MD Anderson employs more than 18,000 people, including more than 1,500 faculty members. A volunteer corps of about 1,100 people supplements its workforce; these volunteers provide more than 200,000 hours of service each year, the equivalent of 96 full-time employees. Faculty, staff and volunteers are dedicated to MD Anderson's mission of eliminating cancer as a major health threat.

Support activities, such as UT Police, are joint activities of MD Anderson and UTHealth.

Website: <http://www.mdanderson.org/>

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### Houston Academy of Medicine-Texas Medical Center Library



The Houston Academy of Medicine-Texas Medical Center (HAM-TMC) Library serves as the accredited library for most Texas Medical Center institutions and is the primary library for The University of Texas Medical School at Houston. The Library is also home to the [John P. McGovern Historical Research Collection](#), as well as the Menninger Collection on Psychiatry and Psychoanalysis, one of the world's most comprehensive collections of books, journals and archival materials in psychiatry, psychoanalysis and psychology.

Currently, the HAM-TMC Library contains 76,500 square feet of space and holds over 357,023 volumes, including books and journal volumes. Additionally, the Library has subscriptions to over 200 electronic databases and over 8,000 electronic journals. Over 50 public access computers are available to library users for Internet access and research, as well as word processing, database development and preparation of spreadsheets and public presentations through Microsoft® software applications. WiFi is available throughout the Library. The Library also offers such classes as Navigating, in addition to instruction in RefWorks, Tracking Your Publications and Creating Your Own eBooks.

Since 1991, the Library has served as the Regional Medical Library for the National Network of Libraries of Medicine, South Central Region, with responsibility for the library needs of health professionals in the five-state region of Arkansas, Louisiana, New Mexico, Oklahoma and Texas. Chosen by the National Library of Medicine, there are only eight Regional Medical Libraries in the nation.

Website: <http://www.library.tmc.edu/>

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### Research Medical Library of MD Anderson



The Research Medical Library provides information resources and specialized services to MD Anderson faculty, staff, and all GSBS students to further the institution's programs in patient care, research, education, and prevention. The main Library is located on the 21st floor of the



Pickens Academic Tower with satellite locations on South Campus (SCRB4) and in Smithville and Bastrop.

The Library is also home to the Historical Resources Center (HRC), which was established in 2000 as the official archival repository for institutional records, personal papers, photographs, videos, oral history interviews, and other materials that document MD Anderson's role in advancing cancer medicine, science, and public policy. It also encompasses the History of Cancer Collection of rare books, journals, monographs, and other published material.

The Library offers more than 100,000 print and electronic books; 5,500 electronic journals; 150 online databases; free interlibrary loans and expert searching; classes on PubMed, Scopus, and EndNote; and an embedded librarian in the School of Health Professions.

#### Facilities – Pickens Academic Tower

- ◆ Occupies entire 21st floor of the T. Boone Pickens Academic Tower: 18,173 square feet
- ◆ Collaborative classroom with 18 laptops
- ◆ Videoconference/seminar room with capacity for 24 conference/42 theater style
- ◆ Three group study rooms with computer and whiteboard
- ◆ 46 public computers
- ◆ 166 total seating capacity

#### Facilities – SCR4

- ◆ Located on the 1st floor of the South Campus Research Building 4: 5,170 square feet
- ◆ Two meeting rooms equipped with collaborative MediaScape Table technology
- ◆ One “demo room” for small group hands-on instruction
- ◆ Six public computers
- ◆ Six laptops available for in-building checkout
- ◆ Book pick-up and drop-off services

#### Smithville

- ◆ Located on the campus of Science Park in Smithville, the Library has four networked study carrels including three Macs and one PC
- ◆ Two reading areas with journal and textbook collections
- ◆ A meeting/reading room with white board and seating for six
- ◆ Library liaison service provided by the Outreach Coordinator based in Houston

#### Bastrop

- ◆ Located on the campus of the Michale E. Keeling Center for Comparative Medicine and Research in Bastrop, the Library has seating for 8 including video and teleconferencing capabilities
- ◆ Journal and textbook collections
- ◆ Library liaison service provided by the Outreach Coordinator based in Houston

<http://www3.mdanderson.org/library/>

## ACADEMIC GENERAL INFORMATION

### Degrees Offered at The University of Texas Health Science Center at Houston

School/Program	Degree	Cert.	Bach.	Mast.	Doc.
School of Dentistry	D.D.S.				X
	Oral and Maxillofacial Surgery Certificate (4 years post-DDS)	X			
	Oral and Maxillofacial Surgery Certificate/MD * (6 years post-D.D.S.) *MD degree conveyed by UT Medical School	X			X
	<b>Advanced Education Programs</b> General Practice Residency (GPR), Advanced Education in General Dentistry (AEGD) (certificate only),	X			
	<b>M.S.D.*</b> Endodontics, Periodontics, Prosthodontics (*M.S.D. is required in these programs in addition to the certificate); Orthodontics, Pediatric Dentistry (certificate program, M.S.D. is optional)	X		X	
	<b>B.S. in Dental Hygiene</b>		X		
	<b>Dental Hygiene Certificate Program</b>	X			
Graduate School of Biomedical Sciences	<b>M.S. in Biomedical Sciences</b> (with concentrations in Biochemistry and Molecular Biology, Biomathematics and Biostatistics, Biomedical Sciences, Cancer Biology, Cell and Regulatory Biology, Experimental Therapeutics, Genes and Development, Genetic Counseling, Human and Molecular Genetics, Immunology, Medical Physics, Microbiology and Molecular Genetics, Molecular Carcinogenesis, Molecular Pathology, Neuroscience, Virology and Gene Therapy).			X	
	<b>Ph.D. in Biomedical Sciences</b> (with concentration in Biochemistry and Molecular Biology, Biomathematics and Biostatistics, Cancer Biology, Cell and Regulatory Biology, Experimental Therapeutics, Genes and Development, Human and Molecular Genetics, Immunology, Medical Physics, Microbiology and Molecular Genetics, Molecular Carcinogenesis, Molecular Pathology, Neuroscience, Virology and Gene Therapy).				X
School of Biomedical Informatics	<b>Certificate (in Health Informatics)</b>	X			
	<b>M.S. (in Health Informatics)</b> (Focus areas in Applied Health Informatics, Biomedical Engineering, Clinical Informatics, Computational Biomedicine, Learning and Technology and Public Health Informatics)			X	
	<b>Ph.D. (in Health Informatics)</b> (Focus areas in Biomedical Engineering, Clinical Informatics, Computational Biomedicine, Learning and Technology and Public Health Informatics)				X
Medical School	<b>M.D.</b>				X
	<b>M.S. in Clinical Research</b>			X	
School of Nursing	<b>B.S.N.</b>		X		
	<b>M.S.N.</b>			X	
	<b>Ph.D. (in Nursing)</b>				X
	<b>D.N.P.</b>				X
School of Public Health	<b>M.P.H. (in Public Health)</b>			X	
	<b>M.S. (in Public Health)</b>			X	
	<b>Dr.P.H. (in Public Health)</b>				X
	<b>Ph.D. (in Public Health)</b>				X
	<b>Certificate in Public Health</b>	X			
	<b>Certificate in Public Health Informatics</b>	X			

## Accreditation at UTHealth

The University of Texas Health Science Center at Houston is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award certificate, baccalaureate, masters, doctorate and professional degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of The University of Texas Health Science Center at Houston.

While SACS accredits the total institution, many of the academic degree programs offered at UTHealth also undergo accreditation by specialized accrediting bodies\*. They are as follows:

School	Degree or Certificate	Accrediting agency
<b>School of Dentistry</b>	D.D.S.	American Dental Association Commission on Dental Accreditation
	M.S.	American Dental Association Commission on Dental Accreditation
	Advanced Education Certificate Program	American Dental Association Commission on Dental Accreditation
	B.S. (Dental Hygiene)	American Dental Association Commission on Dental Accreditation
	Dental Hygiene Certificate Program	American Dental Association Commission on Dental Accreditation
	Oral and Maxillofacial Surgery Certificate Program	American Dental Association Commission on Dental Accreditation
<b>Graduate School of Biomedical Sciences</b>	M.S. with specialization in Genetic Counseling	American Board of Genetic Counseling
	M.S. with specialization in Medical Physics	Commission on Accreditation of Medical Physics Education Programs
	M.S.	
	Ph.D.	
<b>Medical School</b>	M.D.	American Medical Association/ Association of American Medical Colleges Liaison Committee on Medical Education (LCME)
		Accreditation Council for Graduate Medical Education (ACGME)
		Accreditation Council for Continuing Medical Education (ACCME)
	M.S. in Clinical Research	
<b>School of Biomedical Informatics</b>	M.S.	
	Ph.D.	
<b>School of Nursing</b>	B.S.N.	Commission on Collegiate Nursing Education
	M.S.N.	Commission on Collegiate Nursing Education
	Nurse Anesthesia	Council on Accreditation of Nurse Anesthesia Educational Programs

School	Degree or Certificate	Accrediting agency
	D.N.P.	Commission on Collegiate Nursing Education
	Ph.D. (Nursing)	
<b>School of Public Health</b>	M.P.H.†	Council on Education for Public Health
	M.S.†	Council on Education for Public Health
	Dr.P.H.	Council on Education for Public Health
	Ph.D.	Council on Education for Public Health
	M.P.H. (Industrial Hygiene)	The Applied Science Accreditation Commission of the Accreditation Board for Engineering and Technology

\* The University of Texas Health Science Center at Houston is also accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians.

† The Industrial Hygiene curriculum in the MPH and MS degree programs is accredited by the Applied Science Accreditation Commission (ASAC) of Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

**Degrees Offered at The University of Texas MD Anderson Cancer Center**

<b>School/Program</b>	<b>Degree</b>	<b>Cert.</b>	<b>Bach.</b>	<b>Mast.</b>	<b>Doc.</b>
<b>Graduate School of Biomedical Sciences</b>	<b>M.S. in Biomedical Sciences</b> (with concentration in Biochemistry and Molecular Biology, Biomathematics and Biostatistics, Biomedical Sciences, Cancer Biology, Cell and Regulatory Biology, Experimental Therapeutics, Genes and Development, Genetic Counseling, Human and Molecular Genetics, Immunology, Medical Physics, Microbiology and Molecular Genetics, Molecular Carcinogenesis, Molecular Pathology, Neuroscience, Virology and Gene Therapy).			X	
	<b>Ph.D. in Biomedical Sciences</b> (with concentration in Biochemistry and Molecular Biology, Biomathematics and Biostatistics, Cancer Biology, Cell and Regulatory Biology, Experimental Therapeutics, Genes and Development, Human and Molecular Genetics, Immunology, Medical Physics, Microbiology and Molecular Genetics, Molecular Carcinogenesis, Molecular Pathology, Neuroscience, Virology and Gene Therapy).				X
<b>School of Health Professions</b>	<b>Clinical Laboratory Science</b>	X	X		
	<b>Cytogenetic Technology</b>	X	X		
	<b>Cytotechnology</b>	X	X		
	<b>Diagnostic Imaging</b>		X		
	<b>Histotechnology</b>	X			
	<b>Medical Dosimetry</b>	X	X		
	<b>Molecular Genetic Technology</b>		X		
	<b>Radiation Therapy</b>	X	X		

## Accreditation at MD Anderson

The University of Texas MD Anderson Cancer Center is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate, masters, and doctoral levels. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4501 for questions about the accreditation of The University of Texas MD Anderson Cancer Center.

Many of the academic degree programs offered at MDACC undergo accreditation by specialized accrediting bodies.\* They are as follows:

<b>School/Program</b>	<b>Degree</b>	<b>Accrediting Agency</b>
<b>The University of Texas MD Anderson Cancer Center School of Health Professions</b>		
Cytogenetic Technology	B.S.	National Accrediting Agency for Clinical Laboratory Sciences
Clinical Laboratory Science	B.S.	National Accrediting Agency for Clinical Laboratory Sciences
Diagnostic Imaging	B.S.	Joint Review Committee on Education In Radiologic Technology
Histotechnology	B.S.	National Accrediting Agency for Clinical Laboratory Sciences
Cytotechnology	B.S.	Commission on Accreditation of Allied Health Education Programs
Medical Dosimetry	B.S.	Joint Review Committee on education in Radiologic technology
Molecular Genetic Technology	B.S.	National Accrediting Agency for Clinical Laboratory Sciences
Radiation Therapy	B.S.	Joint Review Committee on Education in Radiologic Technology

### **The University of Texas Graduate School of Biomedical Sciences at Houston**

M.S. with specialization in Genetic Counseling	American Board of Medical Genetics
M.S. and Ph.D. with specialization in Medical Physics	American Association of Physicists in Medicine

\*The University of Texas MD Anderson Cancer Center is also accredited by the Accreditation Council for Continuing Medical Education (ACCME) and the Accreditation Council for Graduate Medical Education (ACGME).

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## UTHealth Academic Qualifications

In accordance with Department of Education guidelines, in order to receive Title IV financial aid funds, a student must be qualified to study at the postsecondary level. A student qualifies if he/she:

- Has a high school diploma;
- Has the recognized equivalent of a high school diploma, typically a general education development (GED) certificate;
- Has completed home schooling at the secondary level; or
- Has an academic transcript of a student who has successfully completed at least a two-year program that is acceptable for full credit toward a bachelor's degree.

In addition to these qualifications, please refer to the school catalog section for specific admissions criteria for academic degree program in each of the UTHealth schools.

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## Academic Fresh Start

If a student who enrolls under the Texas Fresh Start program, completes a prescribed course of study, earns a baccalaureate degree, and applies for admission to a postgraduate or professional program, the institution, in considering the applicant for admission into the postgraduate or professional program, shall consider only the grade point average of the applicant established by the course work completed after enrollment under the Texas Fresh Start program, along with any other criteria the institution uses in evaluation applications for admission.

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## Tuition and Fees

Tuition and fees are subject to change by legislative or Regental action and become effective on the date enacted. The Texas Legislature does not set the specific amount for any particular student fee. The student fees assessed are authorized by state statute; however, the specific fee amounts and the determination to increase fees are made by the university administration and The University of Texas System Board of Regents.

Please refer to the Office of Registrar website for current Tuition and Fee Schedules.

Registrar website: [http://registrar.uth.tmc.edu/SOC/tuition\\_index.html](http://registrar.uth.tmc.edu/SOC/tuition_index.html)

For additional tuition and fee information go to the Office of the Registrar's website under Current Students/Student Information for a list of general information helpful to all students. The website discloses current information regarding tuition and fee exceptions and/or waivers. Veterans education benefits, and the Policy for Texas Resident Tuition. Please refer to the Office of the Registrar website at [http://registrar.uth.tmc.edu/Registration/gen\\_reb\\_info.html](http://registrar.uth.tmc.edu/Registration/gen_reb_info.html) to view this information.

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## Tuition and Fees Payment Policy

Payment of tuition and fees are due no later than the last day of regular registration for the term.

Students whose registration is cancelled because of non-payment of issuing an insufficient funds check will not be reinstated for the term.

An insufficient check fee of \$25.00 will be assessed for each returned check.

Students who have fees billed to a sponsor are financially responsible for any charges determined to be uncollectible by the Accounting Office. Furthermore, extended delays in collection of receivables from sponsors will require the student to make the uncollected payment. Student payments will be refunded upon receipt of payment from the sponsor.

Payment of tuition and fees may be paid in full or in installments for the fall, spring and summer 12 week semester. An Installment Use Fee of \$20 will be assessed for the use of the installment plan. A \$20 Late Installment Use Fee will be assessed if the initial payment is late; a \$15 charge will be assessed for each subsequent delinquent installment payment. Certain fees, such as health insurance, liability insurance and the installment use fee are not installable and must be paid in full at the initial payment. Check with the Bursar's Office for a complete list of non-installable fees.

A student who fails to provide full payment of tuition and fees, including late fees assessed by the university, when the payments are due, is subject to one or more of the following actions:

- Prohibited from registration in future terms until full payment is made,
- Withholding of degree and/or official transcript,
- May be denied credit for the work done during the academic year, and
- Subject to all penalties and action authorized by law.

For more information regarding tuition and fee payment, installment plans and payment methods please contact:

Bursar's Office  
The University of Texas Health Science Center at Houston  
University Center Tower  
7000 Fannin, Suite 2240  
713-500-3380

Bursar Website: <https://inside.uthouston.edu/finance/bursars/tuition-payment.htm>

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### **Adding, Dropping and Withdrawing Courses**

For all programs other than Medical School (MD) and Dentistry (DDS) students may add and drop classes after initial enrollment period during the first twelve days of the fall and spring semesters and during the first four days of the summer term. Students withdrawing from classes after the initial drop/add period must process a drop form that may be obtained from the Student Affairs Office in each school or from the Office of the Registrar.

Classes dropped on or before the 12<sup>th</sup> class day of a semester or 4<sup>th</sup> class day of a summer term will not appear on a student's transcript. Classes dropped after the 12<sup>th</sup> class day of a semester or the 4<sup>th</sup> class day of a summer term will appear on the student's permanent record with a "W", "WP" or "WF" grade, depending upon the school's grading policy.

Refunds for classes dropped will be credited in strict accordance to the schedule specified by state law and will depend on the number of days that have elapsed since the beginning of the semester or term.

Students should check with their school advisor or instructor to make sure the appropriate approvals, guidelines and deadlines for add, drop or withdrawals from courses are followed for their specific program.

Class Schedule Contents with add/drop and information can be found on the Registrar's website at <http://registrar.uth.tmc.edu/>on, TX 77030-3900



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## Refund Policy

All programs at UTHealth follow a standard Refund Policy based on the first day of the semester term and not on the first day class convenes. Refunds shall be made of applicable tuition and fees collected for courses from which a student drops within the first twelve days of the fall and spring semesters, provided the student remains enrolled at the institution. Refunds made of applicable tuition and fees collected for courses which a student drops, shall be made as soon as practicable during the two summer semesters, provided the student remains enrolled at the institution, will be as follows: 1) within the first four days of the 6 week summer session; and 2) within the first 12 days of the 12 week summer session.

All refunds will be based on the day the student drops the course(s) electronically through MyUTH ([https://my.uth.tmc.edu/psp/myuth/MYUTH/ENTP/h/?tab=UT\\_EP\\_NVT\\_SIGNON](https://my.uth.tmc.edu/psp/myuth/MYUTH/ENTP/h/?tab=UT_EP_NVT_SIGNON)) or the date the official withdrawal form is received in the Registrar's Office.

Refunds of tuition and mandatory fees shall be made to the students withdrawing completely from UTHealth during a semester according to the following schedules. The percent refunded is based upon the full payment of all tuition and fees. If full payment has not been made, it is possible that a balance may be due. Not all fees are refundable beyond the first day of the term. Tuition reassessment refunds will be made after the 20<sup>th</sup> class day.

(fall, spring, 12 week summer semesters)

Prior to the first day of the session (a \$15 matriculation fee shall be assessed)	100%
During the first 5 class days of the term	80%
During the second 5 class days of the term	70%
During the third 5 class days of the term	50%
During the fourth 5 class days of the term	25%
After the fourth 5 class days of the term	None

(6 week summer semester)

Prior to the first day of the session (a \$15 matriculation fee shall be assessed)	100%
During the first, second, or third class days of the session	80%
During the fourth, fifth, or sixth class days of the session	50%
After the seventh day of class and thereafter	None

All policies regarding the payment or refund of tuition, fees and charges are approved by The University of Texas System Board of Regents and comply with all applicable state statutes. Students should contact the Bursar's Office on any clarification of matters relating to payment or refunds of all tuition, fees and other charges associated with their enrollment at UTHealth.

Bursar Office

The University of Texas Health Science Center at Houston

University Center Tower

7000 Fannin, Suite 2240

Houston, Texas 77030

713-500-3380

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## UTHealth Teaching Affiliations

UTHealth continually strives to increase the number of formal educational affiliation agreements with other institutions and agencies in the greater Houston area and the state, including a dozen major hospitals, city and neighborhood clinics, public schools, and other sites that provide settings for clinical services. These agreements allow students a multiple array of opportunities for educational growth in health-related fields.

**Memorial Hermann Hospital** is the primary teaching affiliate of the Medical School and the School of Dentistry. Memorial Hermann Hospital and the UTHealth work toward the goals of

exemplary patient care, innovative teaching, community service, and productive research. The School of Dentistry operates general practice, pediatric dentistry, and oral and maxillofacial surgery clinics in conjunction with Memorial Hermann Hospital as part of the advanced dental education programs.

**Lyndon B. Johnson General Hospital** is a 332-bed full service general hospital staffed by faculty and residents of the UTHealth Medical School and School of Dentistry (oral surgery only). The hospital, owned and operated by the Harris County Hospital District, is medically staffed by Affiliated Medical Services, an organization formed through an agreement between the Medical School and Baylor College of Medicine.

**The University of Texas MD Anderson Cancer Center** and UTHealth, together with the Texas A&M Institute of Biosciences and Technology, collaborate extensively in research and education. Many of the MD Anderson Cancer Center faculty have joint appointments in most UTHealth units, and UTHealth students and residents gain clinical experience at MD Anderson Cancer Center in a variety of medical, dental and nursing specialties.

**The UT Medical School** has affiliations with institutions where residents are assigned, including St. Joseph Medical Center, for orthopedic surgery, psychiatry, radiology and urology; Harris County Psychiatric Center; St. Luke's Episcopal Hospital for anesthesiology, internal medicine, pathology, renal transplant and surgery; The Methodist Hospital for anesthesiology, colon and rectal surgery; Shriners Hospitals for Children–Houston for orthopedics; and Texas Children's Hospital for radiology, anesthesiology, physical medicine and rehabilitation; and Woman's Hospital for Texas for obstetrics.

**The UT School of Dentistry** has affiliations with institutions for dental student, dental hygiene student, and resident rotations, and training. Hospital affiliations include Ben Taub General, LBJ General, Memorial Hermann, The Methodist Hospital, Shriners Hospital, St. Luke's Hospital, Texas Children's Hospital, The Institute for Rehabilitation and Research, U.T. M.D. Anderson Cancer Center, and the Veterans Affairs Medical Center. Community clinics and organizations include: Bering-Omega Clinic, City of Houston, Communities in Schools Houston, Denver Harbor Dental Clinic, East Texas Health Area Network (ETHAN), Fort Bend Family Health Center, Harris County, Harris County Hospital District, Houston ISD, San Jose Clinic, and St. Luke's Episcopal Health Charities.

**The University of Texas Harris County Psychiatric Center** has affiliations or program agreements with the UT School of Nursing; College of the Mainland (nursing); DeBakey High School for Health Professions (preceptorship program); Houston Baptist University (psychology and nursing); Houston Community College (Emergency Medical Technician (EMT) and nursing); Lee College (EMT and nursing); Prairie View A&M (nursing); San Jacinto College South (nursing); Stephen F. Austin State University (nursing and psychology); Texas Southern University (psychology, social work, and health information management); Texas Woman's University (nursing), Galveston College (Nursing); Alvin Community College (nursing); San Jacinto College (nursing); University of Houston (nursing, psychology, and social work); University of Houston-Clear Lake (psychology and counseling/educational psychology); UT Austin (social work); UT-El Paso (occupational therapy); and UT Medical Branch (nursing). Psychology residents from a variety of institutions are also trained.

UTHealth has academic affiliations with numerous universities in Latin America, Europe, and Asia that permit interested students to arrange, on an individual basis, periods of study or research abroad. We recognize that health and biomedical sciences are global in scope and encourage academic exchange with other countries and cultures.

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## Concurrent/Inter-Institutional Enrollment

**The University of Houston, Texas Woman's University, UT Brownsville, UT at El Paso, UTMB in Galveston, UTHSC at San Antonio, UT Austin, and UTHealth** have concurrent enrollment agreements that allow students enrolled in one institution to enroll for support courses in another institution. Additionally, UTHealth has inter-institutional agreements with **Rice University, Baylor College of Medicine, Texas A&M HSC-IBT and the Gulf Coast Consortia.**

The mechanism for payment of tuition and fees vary according to the individual institution. Consult with the Registrar's Office for specific details at the following website:

<http://registrar.uth.tmc.edu/Registration/ConcurEnrollment.html> or call 713-500-3361.

## Student Government

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### Student Government

UTHealth authorizes the existence of a student government body that has the jurisdictions and powers delegated by the Board of Regents of The University of Texas System. The student association is the Student InterCouncil (SIC), which is recognized as a forum of student opinion and is comprised of representatives from each of the six schools and includes representatives from traditionally underrepresented minority and international student constituencies.

The SIC contributes to the quality of student life at the university by participating in the development and implementation of policies and procedures affecting students, providing funds to support special projects of other student groups, representing student interests on external and internal committees, providing feedback to university administration on tuition and fee proposals, improving communication among the schools through the publication of an on-line student newsletter, *Student Pulse*, and planning and implementing activities that address the special needs of students.

Learn more about the Student InterCouncil at their website.

Website: <http://www.uthouston.edu/sic/>

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### Student Organizations

UTHealth encourages its students, faculty, and staff to develop collegial relationships, and has established specific policies, based on UT System Board of Regents *Rules and Regulations*, that govern any organizations formed by those affiliated with the university.

A student organization that is registered with the UTHealth may have a membership composed of students, faculty, and staff of all or particular schools or operating units, but the organization may not suggest or imply that it is acting with the authority or as an agency of the institution.

Accordingly, a registered organization will not use the name of the UTHealth or the name of The University of Texas System as part of the name of the organization. An organization cannot display the UTHealth logo or the seal of either the UTHealth or The University of Texas System in connection with any activity of the organization or use such marks as part of any letterhead, sign, banner, pamphlet, or other printed material that bears the name of the organization. A registered organization may not have any person as a member who is not either a registered student or a member of the faculty or staff of UTHealth. The full UTHealth Organizations policy can be found

online in the Handbook or Operating Procedures (HOOP) Policy Number 110, Employee and Student Organizations ( <http://www.uthouston.edu/hoop/policy.htm?id=1448068>)

Students should contact their Student Affairs Office for application instructions for school-based student organizations.

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### Student Fee Advisory Committee

The Student Fee Advisory Committee established under Texas Education Code Sec. 54.5031 is charged with the responsibility of reviewing proposed tuition, student services, incidental, laboratory and other fee changes, and making recommendations to the university President before submission of new fee proposals to UT System for approval by the Board of Regents.

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### Student Guide

The Office of Academic And Research Affairs provides an informational resource website for students and prospective students that describes UTHHealth and community services, provides an overview of student policies and accompanying procedures, and information about the Texas Medical Center area.

The Student Educational and Program Services website is located online at <http://www.uthouston.edu/academics/applicants/index.htm>

For more information, contact the Office of the Executive Vice President for Academic and Research Affairs at (713) 500-3082.

## UTHealth Student Services

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### Registrar

The UTHHealth Registrar's Office provides a central computer-based student record system and web registration activities and other services for schools on this campus. The goals of the office are to provide an effective and efficient application process; to direct an accurate, facile registration process; and to maintain a computerized applicant, student, and alumni record system.

The Registrar's Office provides additional services which include the issuance of transcripts, certification of student status, Veteran's Administration counseling and verification, residence determination, and enrollment verification. The office, in conjunction with the Office of International Affairs, assists foreign students in maintaining their student status.

For further information, contact:  
Office of the Registrar  
The University of Texas Health Science Center  
at Houston  
P.O. Box 20036  
7000 Fannin, Suite 2250  
Houston, Texas 77225  
(713) 500-3388  
email: [registrar@uth.tmc.edu](mailto:registrar@uth.tmc.edu)  
Website: <http://registrar.uth.tmc.edu/>

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## Student Financial Services

UTHealth has available grants, scholarships and loans based on the most current regulations or guidelines in effect at the time of award. Financial aid counselors are available Monday- Friday from 8:00 a.m. to 5:00 p.m. to provide counseling on the financial assistance programs available to students. The Office of Student Financial Services is located on the 22nd floor of the University Center Tower, 7000 Fannin, Houston, Texas 77030.

A student subject to selective service registration will be required to file a statement that the student has registered or is exempt from selective service registration in order to be eligible to receive financial assistance funded by State revenue.

Students can visit the Student Financial Services website at <http://www.uthouston.edu/SFS/financial-aid/attendance.htm> to find the latest information regarding Costs of Attendance and an example of Student Living Expense Budgets for current aid years.

The Texas Education Coordinating Board administers various tuition assistance programs including programs for teachers and vocational nursing students. Further information about these programs may be obtained by contacting the Office of Student Financial Services.

Please visit the financial services website for instructions on how to apply for financial aid or contact:

Office of Student Financial Services  
The University of Texas Health Science Center  
at Houston  
P.O. Box 20036  
7000 Fannin, Suite 2220  
Houston, Texas 77225  
(713) 500-3860  
Website: <http://www.uthouston.edu/sfs/>

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## Bursar Office

The Bursar's Office (also known as the Cashier's Office) has the responsibility for the assessment and collection of tuition and fees, processing institutional deposits, remission of tuition, fees and sales tax to the State, financial reporting, reconciliation of various revenue accounts and providing quality customer service to students, faculty and staff. The primary purpose of this office is to assess and collect tuition and fees from students and third party sponsors, including providing and maintaining multiple installment payment plans, issuing student identification badges, distributing financial aid, emergency loans and refunds. This office works closely with the Registrar and Student Financial Service offices to support the needs of the students.

The Bursar Office is also responsible for distributing special compliance notifications to students, such as set aside funds from designated tuition to be used for local institutional aid assistance programs and how the student can apply for those funds.

The office is located in the UTHealth University Center Tower (UCT) room 2240 at 7000 Fannin, Houston, Texas 77030. Office hours are Monday-Friday, 8:00am-5:00pm. For questions regarding student accounts, tuition and fee payments, refunds, or installment plans students may call 713-500-3088.

Bursar Website: <https://inside.uthouston.edu/finance/bursars/>

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## Office of International Affairs

The Mission of the Office of International Affairs (OIA) is to serve as the internal institutional resource that facilitates and oversees institutional compliance with state, local and federal laws and regulations regarding the immigration status of non- U.S. citizens permanent residents and international visitors who join the academic, research, and clinical endeavors of The University of Texas Health Science Center at Houston.

Services and programs offered include:

- Advise on immigration issues to university units wishing to host or employ international visitors;
- Institutional compliance with immigration regulations assessment and training
- Processing of immigrant and non-immigrant visa applications sponsored by the institution;
- Acting as a liaison among institutional departments, government agencies, and private organizations; and
- Coordinating educational and cultural programs and activities that promote the well-being of international visitors, students, trainees, faculty, and staff.

To ensure compliance with federal, state, and local regulations as well as institutional policies, all foreign nationals who are not U.S. citizens or U.S. Permanent Residents must check-in with the Office of International Affairs prior to beginning their appointment and/or registering for classes in order to obtain the appropriate clearance to begin appointment and/or studies.

The Office of International Affairs is located in the University Center Tower, Suite 130. Office hours are Monday - Friday, 8:00 a.m. - 5:00 p.m., with the exception of Thursdays, when the office is closed from 8:00 a.m. - 11:00 a.m.

For further information, contact:

Office of International Affairs

The University of Texas Health Science Center at Houston

P.O. Box 20036

Houston, Texas 77225

7000 Fannin St., Suite 130

Houston, Texas 77030

(713) 500-3176 FAX (713) 500-3189

email: [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)

Website: <http://www.uthouston.edu/international-affairs/>

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## Office of Equal Opportunity

The Equal Opportunity Office within Human Resources provides leadership, resources, and advice to the university community by:

- Assisting the schools' 504 Coordinators (Section 504 of the Rehabilitation Act of 1973) with the evaluation of requests for disability accommodations, including the need for academic accommodations within the classroom, special adaptive computer equipment, and interpretation services;
- Educating hiring managers on best practices for attracting, hiring, and retaining a culturally diverse workforce;

- Ensuring that the proper demographic data is collected during the recruitment process;
- Preparing the university's affirmative action plans and benchmarking the university's diversity against other higher education institutions;
- Promoting an inclusive environment by delivering training on equal opportunity, harassment, affirmative action and diversity topics for students, supervisors and employees;
- Investigating claims of unlawful discrimination and harassment, including sexual harassment; and
- Updating the university's policies and ensuring compliance with federal and state laws, regulations, and orders.

For additional information, contact:  
 The University of Texas Health Science Center at Houston  
 Human Resources  
 7000 Fannin, Suite 150  
 Houston, Texas 77030  
 (713) 500-3079  
 Website: <http://hr.uth.tmc.edu/EEOnew/eo.html>

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### **Student Health Services (SHS)**

Student Health Services (SHS) provides health services to all UTHealth students. The mission of SHS is to offer quality healthcare for students and their families. A portion of the student services fee funds the programs. The health services are available for UTHealth students and their dependents. Services available include immunizations required for matriculation into and through UTHealth, tuberculosis screening, physical examinations, well woman examinations, flu shots, travel medicine, treatment of acute and chronic medical problems, and referrals to specialists as necessary. The clinic manages a 24-hour a day hotline for needlesticks and other exposures to hazardous body fluids. An on-site Class D pharmacy offers many prescription medications for common illnesses and oral contraceptives. The clinic is staffed by physicians who are board certified in both Internal Medicine and Pediatrics.

Low complexity office visits are covered by the student fees. Higher complexity visits can be charged to the student's insurance carrier. Immunizations may be covered by the student's insurance and if not, are offered at near cost. Testing following blood or body fluid exposure while performing educational assignments is covered by the Needlestick Program as long as student reports incident to our Occupational Exposure Hotline at (713) 500-OUCH. Any charges not covered by the student's insurance carrier are the responsibility of the student. These may include laboratory tests, radiological services, hospitalization and referred consultation, and pharmaceuticals.

Student Health Services is located in the UT Professional Building, Suite 1010. Office hours are 8:30 a.m. to 5:00 p.m. Appointments are preferred but not required for acute illness and emergencies.

For more information, contact:  
 UT Student Health Services  
 The University of Texas Professional Building  
 6410 Fannin, Suite 1010  
 Houston, Texas 77030  
 (713) 500-5171 FAX (713) 500-0605

Website: <http://www.uthouston.edu/studenthealth>

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### Student Health Insurance

The University of Texas System Board of Regents approved mandating health insurance for students enrolled in the UT System health components, including students previously enrolled. The Board of Regents has authorized the assessment of a health insurance fee for each semester to each student who cannot provide evidence of continuing coverage under another approved plan

In addition, the Board of Regents requires all international students holding non-immigrant visas and living in the United States to have coverage for repatriation and medical evacuation while enrolled at The University of Texas System component institutions. The required health insurance fee assessed by the university includes coverage for repatriation and medical evacuation. International students with coverage outside of the plan can contact UHealth Auxiliary Enterprises at 713/500-8400, or email: [student-insurance@uth.tmc.edu](mailto:student-insurance@uth.tmc.edu) to provide the information needed to waive the insurance fee and, if needed, purchase coverage for repatriation and medical evacuation.

A student health insurance program is offered to registered students through a private company selected by The University of Texas System. This plan is designed to supplement student health services. In addition, it also assists with expenses not covered by the student services fee such as prescriptions, hospitalization, etc. Students have the option of enrolling their families in this plan at an additional cost.

For further information, contact: Auxiliary Enterprises  
The University of Texas Health Science Center at Houston  
7779 Knight Road  
Houston, Texas 77054  
(713) 500-8400 FAX (713) 500-8409  
email: [student-insurance@uth.tmc.edu](mailto:student-insurance@uth.tmc.edu)  
Website: <http://www.uthouston.edu/auxiliary-enterprises/insurance>

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### UT Counseling & WorkLife Services

The university understands that balancing personal life with the demands of academia can be difficult. Therefore any concern that troubles a student or reduces his or her ability to concentrate can be brought to UT Counseling & WorkLife Services at no cost. Available services include individual or couples therapy sessions for a wide variety of concerns: depression, anxiety, loneliness, concerns about academic performance, alcohol or drug problems, eating disorders, relationship concerns, suicidal feelings, psychotic behavior, etc. In addition, to help students balance the competing demands of school and personal life, UT Counseling & WorkLife Services also offers resources and referrals for such legal issues as a simple will, financial concerns, child/elder care, adoption, and daily living.

Records are kept strictly confidential to the extent allowed by law, and there is no fee for service. Students who desire or who are in need of long-term therapy or of complicated medication management will be assisted with referrals. UT Counseling & Worklife Services also sponsors outreach and prevention programs, such as for managing stress or coping with test anxiety.

Referrals are not necessary and students are encouraged to call to make their own appointments.



For further information or to make an appointment, contact:  
UT Counseling & WorkLife Services  
The University of Texas Health Science Center at Houston  
University Center Tower, Suite 1670  
7000 Fannin  
Houston, Texas 77030  
(713) 500-3327  
email: [uteapmgt@uth.tmc.edu](mailto:uteapmgt@uth.tmc.edu)  
Website: <http://www.uthouston.edu/utcounseling>

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### Child Development Center

UTHealth operates a Child Development Center (UTCDC) for children ages six weeks through kindergarten, located within the University Housing complex at 7900 Cambridge. The Center is designed to create a safe, wholesome environment where children enjoy living and learning. The educational environment for infants is designed to provide visual and auditory stimulation in an atmosphere of warmth and nurturance. The program for toddlers and older children features open learning centers that provide for individual instructional activities with large and small group interaction. All children are encouraged to develop according to their own unique abilities, interests and growth rates.

In addition to being licensed by the State of Texas, the UTCDC is nationally accredited by the National Academy of Early Childhood Programs, a division of the National Association for the Education of Young Children. The UTCDC program was the first nationally accredited center in the Texas Medical Center. Each classroom has its own four-year degreed teacher and follows a developmentally appropriate curriculum. The UTCDC is open from 6:00 a.m. to 6:00 p.m., Monday through Friday, and is closed on all UTHealth holidays.

Parents are encouraged to participate in various projects involving their children and to serve as liaisons between their home and the UTCDC. Regularly scheduled parent/teacher conferences apprise parents of their child's growth and development. All parents are invited to participate in the activities of the Building Blocks Committee, which acts as a support group for the UTCDC.

For a tour or further information, contact:  
Child Development Center  
The University of Texas Health Science Center  
at Houston  
7900 Cambridge  
Houston, Texas 77054  
(713) 500-8454  
Website: <http://www.uthouston.edu/child-development-center>

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### University Housing

University Housing consists of two unique apartment communities. The 7900 Cambridge complex, built in 1982, offers first and second floor units in one, two, and three bedroom floor plans. The 1885 El Paseo property, built in 2005, is a contemporary style living environment with four floors of one and two bedroom apartments, with a four-story parking garage located in the middle of the complex. Each apartment is carpeted and comes equipped with an all-electric kitchen. The 1885 El Paseo property offers washers and dryers in each apartment. The 7900 Cambridge property offers coin-operated washers and dryers housed in three laundry rooms.

The entrances to both properties is controlled by a 24-hour guard. A shuttle to the Texas Medical Center is available to eligible residents.

Leasing office hours are from 8:00 a.m. to 6:00 p.m. Monday through Friday.

Affiliated students, faculty, and staff are encouraged to apply for a place on the waiting list for available vacancies.

Send inquiries to:  
University Housing  
The Leasing Office  
1885 El Paseo  
Houston, Texas 77054  
(713) 500-8444 FAX (713) 500-8448  
Website: <http://www.uthouston.edu/housing>

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## Transportation

UTHealth provides a commuter/circulator shuttle operation for all UTHealth students, faculty and staff. UTHealth identification badges are required for access onto the shuttle. The shuttle service is contracted through Groome Transportation and operates from 6:00 a.m. to 8:30 p.m. Monday through Friday, excluding official university holidays. During peak operating hours (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m.), the shuttle runs every 10-15 minutes from University Housing. Key shuttle stop locations are: University Housing, Recreation Center, University Center Tower, School of Nursing, Graduate School of Biomedical Sciences, Medical School Building, School of Public Health, and the Research Park Complex.

For information regarding shuttle services or route information, please contact the Auxiliary Enterprises Parking/Shuttle at [shuttle@uth.tmc.edu](mailto:shuttle@uth.tmc.edu) or visit their website at <http://www.uthouston.edu/shuttle>

In addition to the UTHealth Shuttle, the Texas Medical Center (TMC) operates a free METRO shuttle from its various locations. For more information about MC shuttle service, call the TMC Parking Office at (713) 791-6161.

Vehicles parking or driving on UTHealth property controlled by UTHealth are subject to enforcement of state vehicle inspection laws.

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## General Parking Information for UTHealth Students

Due to traffic congestion and on-going construction in the Texas Medical Center (TMC), much of contract parking is limited to remote parking locations. A shuttle bus or van from remote locations makes frequent stops at key locations throughout TMC. Free parking areas for bicycles are located throughout the TMC. Motorcycles park at a reduced rate.

Student contract parking is available from Texas Medical Center. Visit [www.tmc.edu](http://www.tmc.edu) and click on "Parking Information" then click Contract Parking to download instructions and a contract form. Reduced rate parking is available remotely in South Extension Lot, Smith Lands and South Main Lot. Some remote parking lots offer free shuttle service to the main campus and "after hours" privileges to park in the main campus garages after 6:00 p.m.; weekdays, although you must exit by 8:00 a.m.. After hours privileges are also extended 24/7 on Saturday and Sunday. For further information, please call TMC's Customer Service Helpline at 713-791-6161.

**University Center Tower (UCT) Garage:** Parking at the UCT garage located at 7000 Fannin (corner of Fannin & Pressler) is restricted to employees and students occupying the building. However, students are granted complimentary parking for one and a half hours with the student I.D. badge. The complimentary parking is for student-related business only (i.e., registrar, financial aid, bursar's office, and counseling). Before exiting the parking facility, a valid student

ID badge must be shown with the parking ticket to the attendant in the Parking Office on the first floor of the UCT building for validation. Parking in excess of the 1-1/2 hour complimentary parking is at the student's expense. This privilege is extended to enrolled/current students only. The UCT garage is open Monday through Saturday but collection of parking fees is Monday-Friday only. The garage security gates are usually open for parking access Monday through Friday 6:00 a.m. to 7:00 p.m. Monthly 24/7 contract parking is available for School of Biomedical Informatics (SBMI) students.

After hours (5pm – 8am) and weekend parking is available for students at a rate of \$30 for the six-month period (Jan. – June and July – Dec.). UCT garage and SON/SPH lot for SON and SPH students only.

Contract parking is available for ALL students at the South Campus lot across from the UTHealth Recreation Center. Students can catch the UTHealth shuttle in front of the Recreation Center.

**University Professional Building (UPB) Garage:** Monthly 24/7 contract parking is available. After hours (5:00 p.m. to 8:00 a.m.) and weekend parking is available at the University Professional Building Garage, 6414 Fannin, for students at a rate \$30 for the six-month period (Jan. – June and July – Dec.). Parking contracts can be attained by visiting the UTPB Parking Office (G.25) and presenting a student ID. There is a one-time non-refundable parking card activation fee of ten dollars (\$10) upon contract completion. The UTPB Parking Office is open from 7:00 a.m. to 6:00 p.m. Monday through Thursday and 7:00 a.m. to 5:00 p.m. on Friday.

For further information contact: Parking Services

The University of Texas Health Science Center at Houston  
7000 Fannin (UCT) or 6414 Fannin (UPB)  
Houston, Texas 77030  
(713) 500-3405 (UCT) or (832) 325-7655 (UPB)  
email: [Parking@uth.tmc.edu](mailto:Parking@uth.tmc.edu)  
Website: [www.uthouston.edu/parking](http://www.uthouston.edu/parking)

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### Alternative Transportation Options

**Van Pool Info:** METRO Star offers a monthly subsidy per van pool riders who ride at least twelve times per month round trip. The subsidy is provided direct to the van pool driver's account and the savings passed on to the rider. To form or join a van pool, register on METRO's online website at [www.ridemetro.org](http://www.ridemetro.org) or call METRO at (713) 224-RIDE.

**METRO:** METRO offers a 50% discount off the full fare for all local Park and Ride or METRO Rail rides. Student must obtain a letter showing you are a registered student of the university. The letter can be obtained by presenting a current UTHealth ID Badge at one of the UTHealth Parking Offices: UCT-7000 Fannin or UPB-6414 Fannin. The letter and student ID must then be taken to the METRO Ridestore, 1900 Main Street, 1<sup>st</sup> floor, to obtain a pictured METRO QCard. METRO is open Monday – Friday, 8am – 5pm, and can be reached by riding the METRO Rail Line to Downtown Transit Center stop. Contact METRO at (713) 739-6968 for more information.

For additional information, please contact UTHealth Parking/Shuttle Services at

Email: [Parking@uth.tmc.edu](mailto:Parking@uth.tmc.edu)  
Website: <http://www.uthouston.edu/parking>

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### Bookstores

Matthews Medical Book Company operates three locations at UTHealth – Medical School, School of Dentistry and School of Nursing.

A student at this university is not under any obligation to purchase a textbook from a university-affiliated bookstore. The same textbook may also be available from an independent retailer, including an online retailer.

### **Medical School Bookstore**

The Medical School Bookstore carries required and recommended textbooks for the Medical School as well as an extensive reference and review section. Medical equipment is discounted in varying amounts. In addition to textbooks and medical equipment, the bookstore stocks UTHHealth gift and clothing items. Books that are not in stock may be special ordered at the service desk or online. The hours of operation are 8:30 a.m. to 5:00 p.m., Monday through Friday.

Included among its services, the bookstore offers daily book buybacks, monogramming services, and discounted software. In addition, the bookstore orders graduation invitations and diploma frames.

For further information, contact:

Matthews UTHHealth Medical School Bookstore  
The University of Texas Health Science Center at Houston  
6431 Fannin, Suite B600  
Houston, TX 77030  
(713) 500-5860 FAX (713) 500-0540  
Website: <http://www.uthoustonbooks.com>

### **School of Dentistry Bookstore**

The School of Dentistry Bookstore carries required and recommended textbooks for the Dental School, reference and review books, 1<sup>st</sup> and 2<sup>nd</sup> year Dental Equipment Kits, Dental Hygienist Kits, as well as kits and equipment for the WREB. The bookstore also carries a variety of products for patients of the student clinic. Books and equipment that are not in stock may be special ordered at the service counter or online. The hours of operation are 8:00 a.m. to 4:00 p.m., Monday through Friday.

For further information, contact

Matthews UTHHealth School of Dentistry Bookstore  
The University of Texas Health Science Center at Houston  
7500 Cambridge  
Houston, Texas 77054  
(713)846-4450  
Website: <http://www.uthoustondental.com>

### **School of Nursing Bookstore**

The School of Nursing Bookstore carries required and recommended textbooks for the School of Nursing and the School of Public Health. In addition to textbooks, the bookstore stocks a large number of reference and review books, medical equipment, software, and School of Nursing gift and clothing items. Books that are not in stock may be special ordered at the service counter or online. The hours of operation are 8:30 a.m. to 5:00 p.m., Monday through Friday.

Included among its services, the bookstore also orders graduation invitations and academic regalia as well as buys used books from 9:00 a.m. to 4:00 p.m. daily.

For further information, contact:

Matthews UTHHealth School of Nursing Bookstore  
The University of Texas Health Science Center at Houston  
6901 Bertner, Room 280

Houston, Texas 77030  
(713)500-9561 FAX (713)500-0982  
Website: <http://www.uthoustonnursing.com>

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### University Dining and Catering Services

Food Service is provided at the School of Nursing, School of Dentistry and Medical School buildings through a contracted provider. Catering is available through the School of Nursing location. Vending is also contracted with machines located throughout the UTHealth campus.

Phone: 713-500-8405  
Catering: 713-500-9103

Website: [www.uthouston.edu/dining-catering](http://www.uthouston.edu/dining-catering)

**School of Nursing** The cafeteria is located on the first floor of the School of Nursing Building at 6901 Bertner Avenue. A variety of dining choices are available for your convenience. Call for catering needs throughout the university. Phone: 713-500-9103

**School of Dentistry** The grab-n-go is located on the ground floor of the School of Dentistry at 7500 Cambridge. A limited variety of dining choices are available along with a selection of specialty coffee drinks.

**Medical School** The grab-n-go is located on the ground floor of the Medical School Building at 6431 Fannin. A limited variety of dining choices are available along with a selection of specialty coffee drinks.

Hours of Operation (excluding university holidays): Monday - Friday 7:00 a.m. - 3:00 p.m.

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### Recreation Center Facilities and Programs

The Recreation Center is located at 7779 Knight Road, adjacent to the University Housing Complex. Operating hours of the facility are 5:30 a.m. to 10:00 p.m., Monday through Friday, 8:00 a.m. to 8:00 p.m. Saturday, and 10:00 a.m. to 8:00 p.m. Sunday. The facility will close on major university holidays; however, it will usually operate on holiday hours for some of the one-day holidays. These days and hours of operation are posted in advance.

The Recreation Center offers a variety of quality facilities, programs and equipment designed for health and fitness as well as fun and relaxation. Features include: a heated outdoor olympic-size pool, strength training equipment, cardiovascular equipment, and outdoor basketball and tennis courts. The Rec Center also offers outdoor sand volleyball courts, athletic fields and jogging trail. In addition to the amenities, programs consist of group fitness, personal/group training, recreational sports and more.

Recreation Center membership is open to all UTHealth faculty, staff, students, families and affiliates, including Texas Medical Center employees and UT System Alumni. The recreation student service fee entitles a current UTHealth student to use the Center. A valid UT ID is required for admittance and at time of purchase of any services offered. UTHealth employees and students have the option of having their spouse and or child(ren) join the facility and registration and payment for this is handled directly at the front desk of the facility. At that time Rec Center ID cards will be made for spouse or children who join.

There is no charge for children under 6 years of age, and the "Family" fee covers spouse and unlimited children between ages 6-20. UTHealth students do have the privilege of having "extended family" members (brother, sister, mother, father) join at the UT Affiliate rate and this must be handled directly at the facility. To get the best value, the Center encourages students

with children under the age of 16 to handle their family membership fees directly at the facility. Children under the age of 16 must be accompanied and supervised by a parent or guardian at all time while in the facility. No one under the age of 16 is allowed in the swimming pool or pool deck during the winter months, or at any time when the pool blankets are on the pool.

For further information, please contact:  
UTHealth Recreation Center  
The University of Texas Health Science Center at Houston  
7779 Knight Road  
Houston, Texas 77054  
(713) 500-8420  
Website: <http://www.uthouston.edu/recreation-center>

## **MD Anderson Student Services**

Students in the UT Graduate School of Biomedical Sciences have access to student services at both UTHealth and MD Anderson. The office of the Vice President for Academic Affairs at MD Anderson provides oversight, coordination and management for student services at MD Anderson.

For more information contact:  
Office of Academic Affairs  
The University of Texas MD Anderson Cancer Center  
1515 Holcombe Blvd., Unit 147  
Houston, TX 77030-4009  
(713) 792-0873 FAX (713) 792-2169

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### **Registrar**

All graduate students in The University of Texas Graduate School of Biomedical Sciences at Houston are provided student record system and registration activities and other services by the Health Science Center Registrar's Office.

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### **Student Financial Services**

All graduate students in The University of Texas Graduate School of Biomedical Sciences at Houston are provided financial aid specialists and counseling on financial assistance programs by the Health Science Center Office of Financial Services.

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### **Office of International Affairs**

The UTHealth Office of International Affairs serves the needs of non-U.S. citizens, faculty, students, fellows and staff at the UTHealth. Students with visas who rotate to MD Anderson must check-in at the MD Anderson Visa Office.

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### **Office of the Chief Diversity Officer**

Both UTHealth and MD Anderson are committed to enhancing diversity. At MD Anderson, the Chief Diversity Officer reports to the Vice President for Human Resources and has the responsibility for ensuring that MD Anderson promotes diversity as a way of life and meets its obligations as an Affirmative Action and Equal Employment Opportunity employer and educational institution.

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### **Emergency Health Services**

MD Anderson provides emergency health services for on-site student injuries.

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### **Employee Assistance Program**

The Employee Assistance Program (EAP) managed by MD Anderson Human Resources provides confidential assistance to educational appointees and immediate family members to resolve problems that affect their personal lives and performance and for personal legal matters. EAP offers professional assessment, guidance and referral services.

Website: <http://www.mdanderson.org/eap>

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### **Employee Wellness and Programs Departments**

These departments, managed by Human Resources, provide fitness programs, weight and wellness programs, individual coaching/counseling, and seasonal social events and sports programming for all employees including educational appointees.

Website: <http://www.mdanderson.org/ewpd>

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### **Scientific Publications**

The MD Anderson Office of Scientific Publications serves as a resource for all MD Anderson-based students and provides assistance to students in writing and editing scientific articles and grants with a faculty author at MD Anderson.

Website: <http://www.mdanderson.org/scipub>

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### **Faculty Development**

Dedicated to enhancing the professional development and career satisfaction of faculty and trainees, Faculty Development offers a variety of programming, online learning resources and personal assistance tailored to their unique needs. Students' career development needs are considered in the design of many of these programs and resources, and all students are encouraged to attend the open events advertised.

Website: <http://www.mdanderson.org/departments/facultydev/>

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### **Trainee and Alumni Affairs**

Trainee and Alumni Affairs provides leadership, guidance and support to MD Anderson departments, programs, trainees, students, alumni and external regulatory agencies, thereby promoting positive educational experiences throughout the institution.

Website: <http://www.mdanderson.org/Prof Education/TSS/>

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### **Job Search Assistance**

Job posting databases on the graduate school and MD Anderson websites and institutional subscriptions to Science Netwave and other cancer sites are available to all students.

Websites:

<http://www.uthouston.edu/gsbs/current-students/career/employment/>

<http://www.mdanderson.org/library>

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## Other UTHealth Provided Student Services

Student Health Services, Student Health Insurance, UT Counseling and Worklife Services, Child Development Center, University Housing, Transportation and Parking, Bookstore, Dining and Catering Services, Recreation Center Facilities and Programs, and the Houston Academy of Medicine-Texas Medical Center Library are also available to all students in the Graduate School of Biomedical Sciences regardless of whether their supervisory professor has a shared faculty appointment at UTHealth or MD Anderson. Refer to [page 68 thru 79](#) for more details.

## UTHealth and MD Anderson Policy Information for GSBS Students

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### Policy Information for Students

All students are admitted into The University of Texas Graduate School of Biomedical Sciences at Houston (GSBS), rather than into departments at UTHealth or MD Anderson. During their first and subsequent years of study, students take classes in the GSBS taught by faculty who hold both an appointment in the GSBS and also hold a faculty appointment in either UTHealth or MD Anderson, or Texas A & M University's Institute of Biotechnology. Also in their first year, students take three or more tutorial rotations selected from among all GSBS faculty.

As both MD Anderson and UTHealth are State of Texas agencies and sister academic institutions in The University of Texas System, the academic policies governing students and faculty are fundamentally similar. GSBS faculty and both institutions' administrations have agreed that students in the GSBS will be governed in academic matters by the policies in the UTHealth *Handbook of Operating Procedures* and The University of Texas Board of Regents' *Rules and Regulations*. When students rotate to MD Anderson or select a faculty supervisor who holds an appointment at MD Anderson, there are some all-employee policies at MD Anderson, for example the immunization policy, that may differ from those of UTHealth and then do apply to GSBS students at MD Anderson. These students are informed about these policies during orientation.

The following excerpts and policy descriptions from the UTHealth *Handbook of Operating Procedures* (HOOP) are from selected policies that relate to student life. Additional student policies can be found in the HOOP located at <http://www.uthouston.edu/hoop/disposition-table.htm>

In an educational community as large as The University of Texas System, formal policies and procedures must exist to facilitate the orderly conduct of affairs. The University of Texas System Board of Regents' *Rules and Regulations* (<http://www.utsystem.edu/board-of-regents/rules.htm>) reflect the general policies and rules set forth by The University of Texas System Board of Regents and apply to all institutions within the UT System. All UTHealth policies must reflect the policies outlined in the Regents' *Rules and Regulations*. The HOOP implements the rules of governance and administrative procedures for UTHealth within the guidelines of the policies set forth by The University of Texas Board of Regents' *Rules and Regulations*.

**STUDENTS ARE CHARGED WITH THE RESPONSIBILITY FOR KNOWLEDGE OF AND COMPLIANCE WITH ALL UTHEALTH POLICIES, REGULATIONS AND PROCEDURES UNIQUE TO THE INDIVIDUAL SCHOOL IN WHICH THE STUDENT IS ENROLLED.**

For additional information on policies specific to individual schools, contact the Student Affairs Office in your school or access the individual school's website from links provided on the UTHealth home page at <http://www.uthouston.edu/>.



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### **Educational Records and Family Educational Rights and Privacy Act (FERPA)**

The University of Texas Health Science Center at Houston complies with the Family Educational Rights and Privacy Act of 1974 (FERPA), which protects the privacy of educational records and establishes the rights of students to access of their educational records. The Registrar will annually notify students of their rights and the procedures for exercising these rights.

The full policy can be found in HOOP Policy Number 129, Educational Records. <http://www.uthouston.edu/hoop/policy.htm?id=1448106>

All research papers, theses, and dissertations authored by degree candidates are available to interested members of the general public upon request.

The link to the full text of FERPA can be found on the on the Registrar's website at <http://registrar.uth.tmc.edu/Registration/FERPA.html>.

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### **AIDS, HIV, HBV, and HCV Infection**

UTHealth works to help safeguard the health and safety of students, employees, patients, and the general public against the contact and spread of infectious diseases. The UTHealth is also sensitive to the needs and rights of any of its employees or students who have contracted diseases that might be infectious. In recognition of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) as serious public health threats, the UTHSC-H has adopted policy and procedural steps to both prevent the spread of HIV, HBV, and HCV infections and to protect the rights and well-being of those employees or students who may be infected with HIV and HBV. The full HOOP policy, which defines terms and addresses general principles, voluntary counseling and testing, work-related exposure, and educational efforts, can be found in HOOP Policy Number 158, Bloodborne Pathogen Infection Control. <http://www.uthouston.edu/hoop/policy.htm?id=1448164>

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### **Campus Security**

UTHealth is committed to a safe and secure learning and working environment. To that end, the university strives to assure that its buildings and contents are secure and that members of the university community are properly identified and are given appropriate access to university facilities and amenities. Campus security policies can be found online in HOOP Policy Number 2, Campus Security (<http://www.uthouston.edu/hoop/disposition-table.htm>)

In compliance with the Student Right-to-Know and Crime Awareness and Campus Security Act, UTHealth collects specified information on campus crime statistics and makes timely reports to the campus community on crimes considered to be a threat to students and employees. The University of Texas at Houston Police Department provides a link to crime statistics on its website at <http://www.mdanderson.org/utpd/>.

Guidance on reporting criminal activity on campus can be found online in HOOP Policy Number 87, Reporting Criminal Activity on Campus <http://www.uthouston.edu/hoop/policy.htm?id=1448022>

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### **Conduct and Discipline**

All UTHealth students are expected and required to obey federal, state, and local laws; to comply with the Regents' *Rules and Regulations*, the rules and regulations of UTHealth, and The University of Texas System, and directives issued by administrative officials of the university or

UT System in the course of their authorized duties, and to obey standards of conduct appropriate for an academic institution. Any student who engages in conduct that violates the Regents' *Rules and Regulations*, UTHealth or UT System rules, or federal, state, or local laws is subject to discipline whether the conduct takes place on or off campus and whether or not civil or criminal penalties are imposed for such conduct.

The full student conduct and discipline policy can be found online in HOOP Policy Number 186, Student Conduct and Discipline <http://www.uthouston.edu/hoop/policy.htm?id=1448220>

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### Copyrighted Material and Software

All employees and students of The University of Texas Health Science Center at Houston must comply with United States Copyright Law of 1976, as amended, (Title 17, United States Code) ("Copyright Act") including UTHealth policies and guidelines governing the use of copyrighted materials. All students are responsible for knowing the laws that govern copyrighted materials which are outlined in HOOP Policy Number 47, Classroom and Research Use of Copyrighted Material at <http://www.uthouston.edu/hoop/policy.htm?id=1447942>.

Both uploading and downloading of files can pose a violation of copyright laws. Students should be cautious and research whether the source provides material licensed by the copyright owner.

Links regarding Peer-to-Peer file sharing and potential copyright infringement can be found on the UTHealth Information Technology website at <http://it.uth.tmc.edu/cio/index.htm>, under the heading of Cyber-Security Tips (US-CERT).

UTHealth must also comply with current copyright laws pertaining to computer software stated in Title 17 of the United States Code and with software license agreements. Any use of university computers and/or computer peripherals by students or employees for unauthorized duplication of copyrighted or licensed works is subject to appropriate disciplinary action as well as those civil remedies and criminal penalties provided by federal and state laws. Detailed information on Software Copyright Compliance can be found in HOOP Policy 198 at <http://www.uthouston.edu/hoop/policy.htm?id=1699026>

In addition to potential civil and criminal penalties established by federal law, each UTHealth school may impose student disciplinary actions where appropriate in accordance with university policies governing student conduct and discipline.

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### Criminal Background Checks - Students

UTHealth is committed to providing a safe environment for its students and employees. The university obtains criminal background information regarding applicants for security sensitive positions. The university has determined that all positions (whether employee or student) within the university are security sensitive. Increasingly, a criminal background check is being required by clinical facilities at which students enrolled in clinical programs receive education and training. Furthermore, some licensing boards in Texas require criminal background checks before issuing a license to practice. Individuals who are unable to meet the university's criminal history standards may be denied admission or continued enrollment in the program.

Enrolled students may be required to consent to additional criminal background checks for clinical placement or other purposes at the discretion of the Dean of each school.

The full policy can be found online in HOOP Policy Number 160, Criminal Background Checks <http://www.uthouston.edu/hoop/policy.htm?id=1448168>

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## Disability Accommodation

UTHealth is committed to providing equal opportunities for qualified employees, job applicants, and students with disabilities in accordance with state and federal laws and regulations.

Student applicants and enrolled students can obtain information concerning program-related accommodations in each school from the school's Section 504 Coordinator (usually found in the Student Affairs office of each school). The Disability Coordinator (in Human Resources) and the Section 504 Coordinators can provide information and referrals regarding campus accessibility, disabled parking permits, transportation services, and other resources.

The full policy can be found online in HOOP Policy Number 101, Disability Accommodation <http://www.uthouston.edu/hoop/policy.htm?id=1448050>

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## Equal Educational Opportunity

UTHealth endeavors to foster an educational environment and working environment that provides equal opportunity to all members of the university community. To the extent provided by applicable law, no person shall be excluded from participation in, denied the benefits of, or be subject to discrimination under, any program, or activity sponsored or conducted by The University of Texas System or any of its institutions on the basis of race, color, national origin, religion, sex, age, veteran status, or disability.

Any student or potential student who has a complaint under this policy should contact the associate dean for student affairs in his or her school, the executive vice president for academic and research affairs, or the Office of Human Resources.

The full policy can be found online in HOOP Policy Number 183, Equal Opportunity, Discrimination and Harassment <http://www.uthouston.edu/hoop/policy.htm?id=1448214>

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## Hazing

Hazing is prohibited by both state law and by the Regents' *Rules and Regulations* (Rule 50101). Individuals or organizations engaging in hazing could be subject to fines and charged with criminal offenses. Additionally, the law does not affect or in any way restrict the right of the University to enforce its own rules against hazing.

The term "hazing" is broadly defined by statute to mean any intentional, knowing, or reckless act, occurring on or off UTHealth property, by one person alone or acting with others, which endangers the mental or physical health or safety of a student for the purpose of pledging, being initiated into, affiliating with, holding office in, or maintaining membership in any organization whose members are or include students at the university. Hazing with or without the consent of the student is prohibited and violations may render both the person inflicting the hazing and the person submitting to the hazing subject to criminal prosecution and student disciplinary action by UTHealth.

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## Student Immunizations and Health Records

All students registering at The University of Texas Health Science Center at Houston (UTHealth) are required to furnish an immunization record signed by a health care provider. Certain exemptions are allowed from all immunization requirements. A hold is automatically placed on an applicant's record at the time an application for admission is submitted. If admitted to the University, this hold will block registration. The UT Student Health Clinic will release all immunization holds after proof of immunizations is satisfied. The UT Student Health Clinic may place a hold on a student's record at any time if a student fails to comply with the requirements of this policy.

The following immunizations and screening tests are required for all students at The University of Texas Health Science Center at Houston:

- Tuberculin Skin Test must be done within the past 12 months, even for those who have received BCG vaccine as a child. If current or former PPD skin test is positive a chest x-ray, taken within the past 12 months, documenting no active tuberculosis must be submitted with immunization form;
- Measles – proof of two doses of measles vaccine administered on or after the first birthday and at least 30 days apart or proof of immunity;
- Mumps – proof of one dose of mumps vaccine administered on or after the first birthday or proof of immunity;
- Rubella – proof of one dose administered on or after the first birthday or proof of immunity;
- Tetanus/Diphtheria or Tetanus/Diphtheria and Pertussis – proof of one “booster” dose of either within the past 10 years;
- Hepatitis B virus (HBV) – proof of serologic immunity to HBV or certification of immunization with a complete series of hepatitis B vaccine. Student must be vaccinated to most current status possible prior to registering for classes;
- Varicella (chickenpox) – Physician validated history of the disease or proof of two dose vaccine series or lab report of positive varicella titer. If varicella titer is negative, varicella vaccine series is required; and,
- Meningococcal (Meningitis) – Required of all incoming and transfer students 30 years old and younger. Students must have been immunized within the past five years **and** submit proof of immunization at least ten days prior to the first day of class.

**\*\*Important information regarding the Meningococcal Vaccine\*\***

Beginning with the Spring 2012 semester, Texas law (Texas Education Code 51.9192) mandates that Texas universities and health science centers require all new and transfer students show proof of vaccination against bacterial meningitis. The law does not apply to new and transfer students who are over the age of 30 at the time of enrollment or who are enrolled only in distance learning classes.

The only exceptions permitted by law are for:

1. Students who can provide proof that a health care provider has determined that it would be a health risk for the student to have the vaccine; or,
2. Students who use the *Exemption Form* issued by the Texas Department of State Health.

Obtaining the required form from the Texas Department of Health Services to establish an exemption for reasons of conscience is a time-intensive process that takes approximately a month. If you are anticipating using this exemption then you will need to start this process early. An online exemption request form can be found on the Texas Department of State Health Services website at <http://www.vaccineinfo.net/exemptions/index.shtml>

***Please note if you are a student who previously attended a UTHealth school or another institution of higher education before January 1, 2012 and are re-enrolling following a break in enrollment of at least one fall or spring semester you must fulfill the meningitis vaccine requirement.***

For more information on immunizations or how to obtain certain required immunization exemptions students are requested to contact the UT Student Health Clinic at (713) 500-5171 or by visiting their website at <http://www.uthouston.edu/studenthealth>.

The full policy, which lists required immunizations and procedures for requesting exemptions from required immunizations, can be found in HOOP Policy Number 55, Student Immunizations and Health Records <http://www.uthouston.edu/hoop/policy.htm?id=1447958>

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### **Determination of Resident Status**

Before an individual may register at UTHealth and pay tuition at the rate provided for residents of the State of Texas, the individual must provide required information regarding their residency status. The Registrar is the Residency Determination Official for the university. The full policy can be found online in HOOP Policy Number 58, Determination of Resident and Non-Resident Tuition Status <http://www.uthouston.edu/hoop/policy.htm?id=1447964>.

Information about the Petition for Resident Tuition and a link to the Core Residency Questionnaire can be found on the Registrar's Website at: <http://registrar.uth.tmc.edu/Services/Student Forms.html>. (Scroll down and click on "Residency Policy and Form.")

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### **Absences**

**Observance of a Religious Holy Day:** Students who wish to observe a religious holy day that interferes with classes, examinations or completion of assignments, must inform the instructor of each class to be missed and/or of the planned absence(s) not later than the fifteenth day of the semester. The notification must be in writing and may either be delivered by the student personally to each instructor, with receipt of the notification acknowledged and dated by each instructor, or mailed by certified mail, return receipt requested, to each instructor. Pursuant to Texas law, a request to observe a religious holy day may be denied if the student's absence will interfere with clinical care.

As noted, a student who follows these procedures and is excused from class for a religious holy day may not be penalized, but the instructor may respond appropriately if the student fails to satisfactorily complete a missed assignment or examination within a reasonable time after the absence. The full policy can be found in HOOP Policy Number 112, Observing Religious Holy Days <http://www.uthouston.edu/hoop/policy.htm?id=1448072>

**Military Obligations:** For any academic term that begins after the date a student is released from active military service but not later than the first anniversary of that date, a school shall readmit the student, without requiring reapplication or charging a fee for readmission, if the student is otherwise eligible to register for classes. On readmission of the student under these circumstances, the School shall provide to the student any financial assistance previously provided by the institution to the student before the student's withdrawal if the student meets current eligibility requirements for the assistance, other than any requirement directly affected by the student's service, such as continuous enrollment or another similar timing requirement; and allow the student the same academic status that the student had before the student's withdrawal, including any course credit awarded to the student by the institution. The university may require reasonable proof from a student of the fact and duration of the student's active military service.

Similarly, if a student enrolled in a school fails to attend classes or engage in other required activities because the student is called to active military service that is of a reasonably brief duration and the student chooses not to withdraw from school, the school shall excuse a student from attending classes or engaging in other required activities, including examinations, in order for the student to participate in active military service to which the student is called, including travel associated with the service. A student whose absence is excused under this provision may not be penalized for that absence and shall be allowed to complete an assignment or take an examination from which the student is excused within a reasonable time after the absence. An instructor may appropriately respond if the student fails to satisfactorily complete the assignment or examination with a reasonable time after the absence.

**Military Service Withdrawal:** A student who withdraws as a result of being called to active military service may choose: (1) to receive a refund of tuition and fees for the semester; (2) if eligible, to be assigned an incomplete "I" in each course; or (3) at the instructor's discretion, to receive a final grade in the courses where the student has completed a substantial amount of course work and has demonstrated sufficient mastery of the course material.

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### Sexual Assault

UTHealth seeks to provide a campus environment free from inappropriate conduct of a sexual nature including sexual assault. Sexual assault is defined according to the definition stated in Section 22.011 of the Texas Penal Code.

In accordance with this commitment, and in accordance with the requirements of the Higher Education Reauthorization Act of 1992, UTHealth has created a policy specifically to address this important issue. The full policy on student sexual assault and how to proceed if you are a victim of sexual assault can be found online in HOOP Policy Number 59, Sexual Assault-Students <http://www.uthouston.edu/hoop/policy.htm?id=1447966>.

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### Sexual Harassment

UTHealth has different procedures for dealing with allegations of sex discrimination and sexual harassment. Any student who feels that he or she has been discriminated against on the basis of his or her sex should use the appropriate grievance process outlined in Hoop Policy Number 183. This policy applies to the conduct of all members of the UTHealth community, including, but not limited to administrators, faculty, staff, students, residents, fellows and other trainees, volunteers, vendors, consultants, observers and visitors. The full policy, can be found online in HOOP Policy Number 183, Equal Opportunity, Discrimination and Harassment <http://www.uthouston.edu/hoop/policy.htm?id=1448214>

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### Substance Abuse – Students

UTHealth is committed to maintaining an environment that is free from substance abuse. The university expects impaired students to seek help voluntarily and to assume responsibility for their professional and personal conduct. UTHealth recognizes that substance abuse is a treatable condition and, as an institution dedicated to health, facilitates the treatment and rehabilitation of this condition. Such assistance may be provided through UT Counseling and Worklife Services, the Medical School Department of Psychiatry and Behavioral Sciences, private physicians or community agencies with expertise in treating chemical dependence.

Any employee, fellow or student who causes harm to or appears to endanger the safety of himself or herself or others, will be subject to disciplinary action in accordance with university policy.

The full policy on Substance Abuse can be found online in HOOP Policy 173 at <http://www.uthouston.edu/hoop/policy.htm?id=1448194>

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### Student Travel

UTHealth supports the educational, research, and service activities of its students by sponsoring and reimbursing certain approved travel activities and expenditures. The university, however, has special concerns as to how students are asked or permitted to travel on official university business. The Student Travel policy includes special rules outlined by The University of Texas System Board of Regents to ensure that students who are asked or authorized to travel are aware of university rules on travel, how to seek and obtain approval for travel, how to be reimbursed for travel expenditures, and safety rules that apply to student travel.

The full policy on Student Travel can be found online in HOOP Policy 61 at <http://www.uthouston.edu/hoop/policy.htm?id=1447970>

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## Solicitation on Campus

No solicitation shall be conducted on the campus of UTHealth unless permitted under HOOP Policy 165. Auxiliary Enterprises is the responsible office at UTHealth for coordinating the review and approval for solicitation on campus. All other inquiries or questions regarding the definitions outlined in the university policy should be directed to the Office of Legal Affairs.

The full policy on Solicitation on Campus can be found online at <http://www.uthouston.edu/hoop/policy.htm?id=1448178>

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## Other Important Policies Affecting Students

The Handbook of Operating Procedures (HOOP) lists other important policies affecting students and is divided into a Table of Contents found in the HOOP Disposition Table. Policies may fall under several different chapters including, but not limited to Chapter 2 University Citizenship, Chapter 6 Students, Chapter 17 Information Technology, or Chapter 18 Safety and Health and Chapter 23 Research. **Students are expected to read and familiarize themselves with university policies and procedures.**

Some additional HOOP Policies not outlined in detail above that students should familiarize themselves with are:

109 General Standards of Conduct, Chapter 2 University Citizenship  
<http://www.uthouston.edu/hoop/policy.htm?id=1448066>

9 Alcoholic Beverages, Chapter 2 University Citizenship  
<http://www.uthouston.edu/hoop/policy.htm?id=1447866>

8 Use of University Name or Logo On Merchandise, Chapter 1 University Administration  
<http://www.uthouston.edu/hoop/policy.htm?id=1447864>

11 Use of University Facilities, Chapter 2 University Citizenship  
<http://www.uthouston.edu/hoop/policy.htm?id=1447870>

174 Speech and Assembly, Chapter 2 University Citizenship  
<http://www.uthouston.edu/hoop/policy.htm?id=1448196>

167 Student Employment Appointments, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1448182>

56 Student Financial Aid, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1447960>

121 Student Loan Collections, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1448090>

57 Tuition, and Fees Payment, Refunds and Student Debt, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1447962>

58 Determination of Resident and Non-Resident Tuition Status, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1447964>

- 60 Student Services, Chapter 6 Students  
<http://www.uthouston.edu/hoop/policy.htm?id=1447968>
- 85 University Closure for Emergency, Disaster or Severe Weather, Chapter 18 Safety & Health  
<http://www.uthouston.edu/hoop/policy.htm?id=1448018>
- 86 Medical Emergencies, Minor Injuries/Illnesses, Chapter 18 Safety & Health  
<http://www.uthouston.edu/hoop/policy.htm?id=1448020>
- 87 Reporting Criminal Activity on Campus, Chapter 18 Safety & Health  
<http://www.uthouston.edu/hoop/policy.htm?id=1448022>
- 168 Conduct of Research, Chapter 23 Research  
<http://www.uthouston.edu/hoop/policy.htm?id=1448184>
- 202 Honesty in Research, Chapter 23 Research  
<http://www.uthouston.edu/hoop/policy.htm?id=1702018>



**THE UNIVERSITY OF TEXAS  
HEALTH SCIENCE CENTER AT HOUSTON**

**AND**

**THE UNIVERSITY OF TEXAS  
M. D. ANDERSON CANCER CENTER**

**THE UNIVERSITY OF TEXAS  
GRADUATE SCHOOL OF BIOMEDICAL  
SCIENCES AT HOUSTON**

**2012 – 2014 CATALOG**

The University of Texas Health Science Center at Houston (UTHealth) is accredited by the Southern Association of Colleges and Schools (SACS) Commission on Colleges to award certificate, baccalaureate, masters, doctoral, and professional degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of The University of Texas Health Science Center at Houston.

The University of Texas MD Anderson Cancer Center is accredited by the Southern Association of Colleges and Schools (SACSD) Commission on Colleges to award baccalaureate, masters, and doctoral levels. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4501 for questions about the accreditation of The University of Texas MD Anderson Cancer Center.

This catalog is a general information publication only. It is not intended to nor does it contain all regulations that relate to students. Applicants, students, and faculty are referred to the GSBS General Catalog. The provisions of this catalog and/or the GSBS General Catalog do not constitute a contract, expressed or implied, between any applicant, student or faculty member and UTHealth or The University of Texas MD Anderson Cancer Center (MD Anderson) or The University of Texas System. UTHealth and MD Anderson reserve the right to withdraw courses at any time, to change fees or tuition, calendar, curriculum, degree requirements, graduation procedures, and any other requirement affecting students. Changes will become effective whenever the proper authorities so determine and will apply to both prospective students and those students already enrolled. To the extent provided by applicable law, no person shall be excluded from participation in, denied the benefits of, or be subject to discrimination under any program or activity sponsored or conducted by The University of Texas Graduate School of Biomedical Sciences at Houston on the basis of race, color, national origin, religion, sex, sexual orientation, age, veteran status, or disability.

## Message from the University of Texas Graduate School of Biomedical Sciences Deans



Welcome to the **University of Texas Graduate School of Biomedical Sciences (GSBS) at Houston**. Our school is built around the scientific expertise of two major institutions in the Texas Medical Center, **MD Anderson Cancer Center** and **UT Health**, which are both members of the University of Texas statewide system. In addition, we have faculty participation from Texas A&M Health Science Center Institute for Biosciences and Technology, and our students have access to graduate courses offered at nearby Rice University and Baylor College of Medicine. This breadth offers amazing opportunities in basic and translational scientific programs, leading the way in research and discoveries.



Our vision for the graduate school is to create a collaborative and innovative academic environment that inspires and lays the foundation for new generations of biomedical scientists to realize their potential, commit to success and have major impact on treatment of diseases worldwide.

Within this catalog you will find valuable information concerning our curriculum, research programs, academic activities and key policies and procedures for our graduate school. In addition, we encourage you to make full use of our web site (<http://www.uthouston.edu/gsbs/index.htm>) where you may access additional information to help you develop your strategy for completing your MS or PhD degrees at our institution.

Now is an incredible time to be training in the biomedical sciences. The technologies and information available today are unprecedented and provide opportunities for outstanding training and the ability to make discoveries that impact humanity. We look forward to partnering with you on your journey to achieve your goals in science and beyond.

Michael R. Blackburn, PhD  
Dean

Michelle C. Barton, PhD  
Dean

**ACADEMIC CALENDAR  
2012 - 2013**

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<b>Fall Term 2012</b>	<b>August 20</b>	<b>Orientation Begins</b>
	<b>August 27</b>	<b>Fall Semester Begins</b>
	<b>September 3</b>	<b>Labor Day Holiday – no classes</b>
	<b>September 10</b>	<b>First Tutorial Begins</b>
	<b>November 16</b>	<b>First Tutorial Ends</b>
	<b>November 22 - 23</b>	<b>Thanksgiving Holiday – no classes</b>
	<b>December 7</b>	<b>Last Day of Classes</b>
	<b>December 10 - 14</b>	<b>Final Examinations</b>
	<b>December 14</b>	<b>End of Fall Semester</b>

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<b>Spring Term 2013</b>	<b>January 7</b>	<b>Second Tutorial Begins</b>
	<b>January 14</b>	<b>Spring Semester Begins</b>
	<b>January 21</b>	<b>MLK Holiday – no classes</b>
	<b>March 11 - 15</b>	<b>Spring Break – no classes</b>
	<b>March 15</b>	<b>Second Tutorial Ends</b>
	<b>March 18</b>	<b>Third Tutorial Begins</b>
	<b>May 3</b>	<b>Last Day of Classes</b>
	<b>May 6 - 10</b>	<b>Final Examinations</b>
	<b>May 10</b>	<b>End of Spring Semester</b>
<b>May 11</b>	<b>Formal Commencement</b>	
<b>May 17</b>	<b>Third Tutorial Ends</b>	

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<b>Summer Term 2013</b>	<b>May 20</b>	<b>Summer Term Begins</b>
	<b>May 27</b>	<b>Holiday – no classes</b>
	<b>July 4</b>	<b>Holiday – no classes</b>
	<b>August 9</b>	<b>Last Day of Classes</b>
	<b>August 12-13</b>	<b>Final Examinations</b>
	<b>August 13</b>	<b>End of Summer Semester</b>

**ACADEMIC CALENDAR  
2013 – 2014**

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<b>Fall Term 2013</b>	<b>August 19</b>	<b>Orientation Begins</b>
	<b>August 26</b>	<b>Fall Semester Begins</b>
	<b>September 2</b>	<b>Labor Day Holiday – no classes</b>
	<b>September 9</b>	<b>First Tutorial Begins</b>
	<b>November 15</b>	<b>First Tutorial Ends</b>
	<b>November 28 - 29</b>	<b>Thanksgiving Holiday – no classes</b>
	<b>December 6</b>	<b>Last Day of Classes</b>
	<b>December 8-13</b>	<b>Final Examinations</b>
	<b>December 13</b>	<b>End of Fall Semester</b>

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<b>Spring Term 2014</b>	<b>January 6</b>	<b>Second Tutorial Begins</b>
	<b>January 13</b>	<b>Spring Semester Begins</b>
	<b>January 20</b>	<b>MLK Holiday – no classes</b>
	<b>February 17</b>	<b>Presidents' Day Holiday – no classes</b>
	<b>March 10-14</b>	<b>Spring Break – no classes</b>
	<b>March 14</b>	<b>Second Tutorial Ends</b>
	<b>March 17</b>	<b>Third Tutorial Begins</b>
	<b>May 2</b>	<b>Last Day of Classes</b>
	<b>May 5 - 9</b>	<b>Final Examinations</b>
	<b>May 9</b>	<b>End of Spring Semester</b>
	<b>May 10</b>	<b>Formal Commencement</b>
<b>May 16</b>	<b>Third Tutorial Ends</b>	

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<b>Summer Term 2014</b>	<b>May 19</b>	<b>Summer Term Begins</b>
	<b>May 26</b>	<b>Holiday – no classes</b>
	<b>July 4</b>	<b>Holiday – no classes</b>
	<b>August 12</b>	<b>Last Day of Classes</b>
	<b>August 13 - 14</b>	<b>Final Examinations</b>
	<b>August 14</b>	<b>End of Summer Semester</b>

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## **MISSION STATEMENT**

The mission of The University of Texas Graduate School of Biomedical Sciences at Houston (GSBS) is to train and educate research scientists and scientist-educators, to generate new knowledge in the biomedical sciences, and to increase public understanding of science.

Our goal is to maintain an innovative and diverse environment that provides an unprecedented breadth of opportunities for outstanding graduate students to train with leading biomedical scientists at The University of Texas MD Anderson Cancer Center, UT Health and other institutions across the Texas Medical Center. The combined strengths of these institutions provide students with access to basic and translational scientific programs that are at the cutting edge of the fight to treat all major diseases. The curriculum is designed to provide students with a rigorous exposure to critical thinking strategies, area-specific scientific skills, and career development initiatives. This curriculum, together with an emphasis on research training and scientific productivity, is designed to position our students for an outstanding and successful career in the biomedical sciences.

The educational objectives are achieved through programs leading to the Doctor of Philosophy (PhD) and Master of Science (MS) degrees. These academic activities are carried out in research laboratories and classrooms under the guidance of GSBS faculty members from the schools of UTHealth, UTMDACC, and the Texas A&M Health Science Center Institute of Biosciences and Technology (IBT). As a comprehensive health science university, UTHealth's mission is to educate health science professionals, discover and translate advances in the biomedical and social sciences, and model the best practices in clinical care and public health. UTHealth pursues this mission in order to advance the quality of human life by enhancing the diagnosis, treatment, and prevention of disease and injury, as well as promoting individual health and community well-being. UTMDACC's mission is to eliminate cancer in Texas, the nation, and the world through outstanding programs that integrate patient care, research and prevention, and through education for our undergraduate and graduate students, trainees, professionals, employees, and the public. IBT's mission is to perform advanced and innovative molecular research in bioscience and medicine and to encourage transfer of new discoveries from the laboratory to the marketplace. The Outreach Program and other GSBS faculty and student public service activities are aimed at educating the public about the biomedical sciences, as well as promoting an interest in careers in science, particularly among elementary and secondary school students.

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## **History and Purpose**

In 1963, the 58th Session of the Texas Legislature authorized the Board of Regents of The University of Texas System to establish a Graduate School of Biomedical Sciences (GSBS) at UTHealth. The creation of the GSBS, with the approval of the Texas Commission on Higher Education, included the following general charge:

“The GSBS will conduct graduate programs at the masters and doctoral levels and postdoctoral programs in the sciences and related academic areas pertinent to medical education and research.”

The School is an important academic bridge between UTHealth components and the UT MD Anderson Cancer Center. The School is linked to the intellectual resources of the thousands of faculty associated with UTMDACC and the UTHealth Schools of Medicine, Dentistry, Public Health, Nursing, and Biomedical Informatics.

From its beginnings the School adopted an interdisciplinary approach to biomedical sciences education in contrast to more traditional departmentalized models focused on particular disciplines.

The graduate programs of the School offer areas of concentration at the leading edge of education in the biomedical sciences. As a result, the School has attracted large numbers of outstanding faculty and students. School faculty has grown to over 580 members, and currently there are about 555 degree-seeking students. Students frequently conduct their research in newly developing interdisciplinary or multidisciplinary areas in basic and translational research.

The challenge to health sciences universities in the 21st century is to integrate the academic and clinical aspects of biomedical research in order to understand and prevent illness, promote health, and restore normal function. The GSBS is in a unique position to meet that challenge by capitalizing on its distinguished faculty and its contemporary approach to graduate biomedical education.

The School is an integral and essential part of the academic activities not only of UTHealth but also of the UTMDACC. Together, UTMDACC and UTHealth provide the supporting academic framework for the GSBS. The Texas Education Code stipulates that UTMDACC and UTHealth “...jointly prescribe courses and jointly conduct graduate programs at the masters and doctoral levels.” It is self-evident that graduate education in biomedical research is a key ingredient in the development of increased institutional excellence and is essential to the maintenance of national research excellence. Similarly, the School is absolutely dependent upon UTHealth and UTMDACC because School courses are taught by faculty members drawn from the two parent institutions, and because of the need for financial and administrative support. Thus, the relationship between UTHealth and UTMDACC is fundamental and symbiotic.

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## **THE FACULTY**

Faculty at the School is drawn from several UTHealth academic units (Medical, Dental, Biomedical Informatics, Public Health, and Nursing), from UTMDACC including the Science Park-Research Division at Smithville and Science Park-Veterinary Division in Bastrop, and from IBT.

The research interests of the faculty span the entire range of the biomedical sciences. These areas of interest currently include biochemistry, biostatistics, biophysics, cancer biology, cell biology, molecular carcinogenesis, genes and development, genetic counseling, human and molecular

genetics, immunology, integrative biology, medical physics, microbiology and molecular genetics, molecular biology, molecular pathology, neuroscience, pharmacology, physiology, radiation biology, regulatory biology, reproductive biology, toxicology, and virology and gene therapy. Detailed faculty profiles are included at the end of this catalog.

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## **GSBS STRUCTURE AND DEGREE PROGRAMS**

Recognizing that contemporary biomedical research often involves interdisciplinary approaches, the faculty has developed its educational programs to make its vast resources available to students with minimal constraints. Major emphasis is placed on studies leading to the PhD degree. However, students with specific interests in acquiring technical and specific professional skills may be admitted to courses of study for the MS degree. In addition, persons who wish to take courses and/or conduct research, but not as part of a formal degree program, may be admitted as non-degree students. Degree and non-degree programs offered at the School are described in the following sections.

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### **DOCTOR OF PHILOSOPHY DEGREE IN BIOMEDICAL SCIENCES**

The PhD degree program is designed to offer students the opportunity to complete didactic and laboratory studies through which they may gain the expertise to conduct independent and creative research that contributes new knowledge in an area of the biomedical sciences.

#### **Curriculum**

Successful students in this degree program will develop the necessary skills to conduct novel research at a professional level, learn the theoretical background for their particular area of study, and become familiar with the issues of biomedical ethics that interface with their chosen fields of study. To this end, the faculty has developed a challenging five-step curriculum that gives the student the opportunity to attain the skills necessary to pursue a career in biomedical research. The five steps of the curriculum include:

1. *Tutorial laboratory experiences:* This experience is primarily designed to offer a student the opportunity to select an area of research for their research dissertation and a mentor to guide this research. This phase of the curriculum occupies approximately one-half of the student's day for the first 30 weeks of study. During this time, the student must develop competence in research in three different tutorial laboratories.
2. *Breadth in the biomedical sciences:* Each student is required to develop a broad awareness of several different areas in the biomedical sciences. This requirement is met by students demonstrating the acquisition of theoretical knowledge in Quantitative, Molecular, Cellular, and System concepts as used in the biomedical sciences, by completion of a minimum of four introductory courses in the Quantitative, Molecular, Cellular, and Systems areas of the biomedical sciences, and by passing a candidacy exam. However, with faculty approval, a specific Program of study may require a different set of courses to meet the breadth requirement. Under this arrangement, students affiliated with that Program must meet the specific course requirements of the Program rather than



area requirements. A list of the current requirements for each Program may be obtained from the School's web site (<http://www.uthouston.edu/gsbs/>) or the GSBS Office of Academic Affairs.

3. *Appreciation of the ethical issues in biomedical research:* Each student is required to demonstrate knowledge in biomedical ethics by passing a one-credit-hour course entitled *The Ethical Dimensions of the Biomedical Sciences* (GS211051). The course, taught by School faculty, will provide students with a framework to recognize, examine, and resolve ethical conflicts in their professional lives. The course explores such issues as the commitment to truth and its breakdown; the ethics of authorship; experimentation with human and animal subjects; and the relationships of scientists to industry, society at large, and future generations. In addition, two on-line modules, “Data Acquisition and Management” and “Responsible Authorship and Publication” must also be successfully completed by all students.
4. *Capability to formulate a significant research problem:* Each student is given the opportunity to develop the skills needed to formulate a significant research problem in one of the Areas of Research Concentration approved by the Texas Higher Education Coordinating Board. The attainment of this skill is demonstrated by the student’s passing an oral candidacy examination, which tests the student’s depth of preparedness for undertaking a research problem and knowledge of the pertinent scientific background.
5. *Ability to perform research that significantly contributes to the scientific body of knowledge:* The student performs research and writes a dissertation under the guidance of a supervisory committee. Students must demonstrate competence in the formulation and performance of original research. After completing the research and writing the dissertation, the student must present a public seminar of the research findings and successfully defend the dissertation. All completed dissertations are available to the public.

The five steps in the curriculum of the PhD program described above represent the general GSBS academic requirements. Additional course work included in a student’s program of study is selected by the student and a faculty advisory committee. The program of study should be selected to provide the student with educational experiences appropriate to the scientific disciplines with which the dissertation research is concerned.

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## **General Requirements**

The University of Texas Graduate School of Biomedical Sciences at Houston requires a minimum of 54 credit hours to obtain the degree of Doctor of Philosophy (PhD). Students are required to register as full-time students each term, for a total of 24 credit hours earned each year. The average time to completion of the PhD degree is 5.5 years. Thus, PhD students, on average, complete 135 credit hours by the completion of the degree requirements. The 54 credit-hour minimum includes one credit hour of the *Ethical Dimensions of the Biomedical Sciences* (GS211051), 12 credit hours of *Tutorial Research Experience* (GS001514), four required School area requirement courses, and a minimum of one year of registration for research, which includes

*Research in Biomedical Sciences* (GS001520) and *Dissertation for Doctor of Philosophy* (GS001920). Any exceptions to this minimum credit-hour requirement must be approved by the Dean upon recommendation by the Academic Standards Committee. The majority of these 54 credit hours (i.e. over 50%), plus the majority of any additional coursework required by the Academic Standards Committee or the student's advisory or supervisory committees, must be taken in residence at the School, at other UTHealth schools, or at an institution with which a consortium arrangement exists (i.e., Rice University, the University of Houston, or Baylor College of Medicine).

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## **Tutorial Laboratory Requirements**

PhD students must complete, with a grade of “Pass”, three different tutorial laboratory rotations under the supervision of three different GSBS faculty members.

The tutorials are each worth four credit hours (10 weeks per tutorial, 20 hours per week, or other arrangements resulting in a total of 200 hours in the laboratory) and are normally taken during the first two semesters. The tutorial laboratory experience serves the dual role of introducing the incoming student to a variety of research environments and allowing the student the opportunity to select an advisor to supervise future dissertation research.

One tutorial requirement may be waived at the discretion of the Academic Standards Committee if:

1. The student has a Masters degree from another institution, provided the MS degree involved laboratory research and the preparation of a thesis; or
2. The student has had post-baccalaureate laboratory research experience judged by the Academic Standards Committee to be equivalent to a tutorial rotation; or
3. The student has authored peer-reviewed publications in the biomedical sciences.

Waiver of more than one tutorial requirement will not be permitted except in extraordinary circumstances. Students wishing a tutorial waiver must first obtain approval of their Dean's Office Advisor, and then must submit a written request for waiver to the Academic Standards Committee. Tutorial waivers will be considered only for students who have identified the laboratory in which they will remain for their dissertation research. Therefore, the request must also be accompanied by a letter from the student's proposed advisor supporting the waiver.

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## **Advisory Committee**

Upon the completion of the tutorial rotations, the student identifies a research Advisor. The student, with the assistance of the Advisor, proposes an Advisory Committee and submits the proposal to the Academic Standards Committee for its approval. Upon approval by the Academic Standards Committee and the Dean, the Advisory Committee members are notified of their appointment. The student must meet with the Advisory Committee at least every 6 months to keep them apprised of progress toward the degree. As the student's research progresses, a change

in focus may necessitate a change in committee membership. This change must be approved by the Academic Standards Committee.

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### **Area Course Requirements**

All students pursuing the PhD degree must complete with a grade of at least *C* (or demonstrate equivalent proficiency as determined by the Academic Standards Committee) one course from each of the following four Areas: Quantitative, Molecular, Cellular, and Systems. The only exception is made for students who are affiliated formally with a Program that has been approved by School Faculty to have modified area requirements. Currently, five Programs have modified area requirements: Biochemistry and Molecular Biology, Genes and Development, Medical Physics, Biomathematics and Biostatistics, and Microbiology and Molecular Genetics. Students affiliated with one of these Programs are required to meet the specific course requirements of that Program.

Area courses must be completed before the student petitions to take the PhD candidacy examination. Area courses are intended to provide students with breadth of knowledge in relevant areas of biomedical sciences, provide basic communication skills, and should be taught at least once a year. The objective of the requirement for breadth in education is to facilitate creative collaboration between biomedical scientists trained in depth in different disciplines.

Primary Area courses have been approved by the Academic Standards Committee as satisfying the above criteria. Students who can demonstrate extensive undergraduate academic experience in one or more of the areas may take an approved alternative course to satisfy an Area requirement. The use of an alternative course for Area credit requires prior approval of the course directors of the primary Area course and the alternative Area course, and of the student's Faculty Advisor and Dean's Office Advisor. Listings of the approved primary and alternative courses that satisfy Area course requirements are updated annually by the Academic Standards Committee and are available in the Office of Academic Affairs.

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### **Recognition of Previous Graduate Course Work**

Students may petition for approval of a graduate-level course taken at another institution to satisfy an Area requirement by providing documentation that the course is equivalent to a School course that satisfies the requirement. The request to substitute a course should be submitted to the Office of Academic Affairs for approval by the Academic Standards Committee in the first semester after matriculation. Students should discuss the substitution of previous course work with their Advisor or Dean's Office Advisor prior to submitting the form to the Office of Academic Affairs. Undergraduate courses are unacceptable as substitutes for GSBS Area courses.

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### **Ethics Course Requirement**

All students are required to pass a one-credit-hour course entitled *The Ethical Dimensions of the Biomedical Sciences* prior to petitioning for candidacy. The aim of the course, taught by School faculty, is to provide students with a framework to recognize, examine, and resolve ethical

conflicts in their professional lives. The course explores such issues as the commitment to truth and its breakdown; the ethics of authorship; experimentation with human and animal subjects; and the relationships of scientists to industry, society at large, and future generations.

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## **MS Degree Bypass**

Students will be considered for a bypass of the MS degree only after satisfactory completion of the PhD candidacy examination. A recommendation from the Examination Committee that the student should be permitted to bypass the MS degree will be reviewed by the Academic Standards Committee.

Completion of the Master of Science degree is recommended for students:

1. With little experience in laboratory research; or
2. Who have not written research papers or literature reviews; or
3. Who would benefit from the opportunity to pursue a research project under close supervision; or
4. Who need significant improvement in written and oral communication; or
5. Who have not determined which biomedical problem(s) they intend to pursue independently.

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## **Programs**

Faculty members have established formal programs of study to provide students with a structured curriculum within an area of research or a department. The Programs, approved by the Texas Higher Education Coordinating Board, provide students with a recommended series of courses appropriate for the area, collective advice on research training from the faculty members of the program, and provide an opportunity for interaction between students and faculty who have similar research interests.

PhD students matriculating in Fall 2012 and thereafter are required to affiliate with a Program by the end of their first year of study.

The curricular recommendations developed by the Programs provide sufficient flexibility to permit students to develop an individualized program of study within the Program's framework. At the PhD level, current organized Programs of study include:

Biochemistry and Molecular Biology  
Biomathematics and Biostatistics  
Cancer Biology  
Cell and Regulatory Biology  
Experimental Therapeutics  
Genes and Development  
Human and Molecular Genetics

Immunology  
Medical Physics  
Microbiology and Molecular Genetics  
Molecular Carcinogenesis  
Neuroscience  
Virology and Gene Therapy

Further information about the PhD Programs and the faculty affiliated with them may be obtained from the School web site (<http://www.uthouston.edu/gsbs/>) or the Office of Academic Affairs.

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### **The PhD Candidacy Examination: Its Purpose**

The purpose of the candidacy examination is to test the breadth and depth of knowledge in the biomedical sciences. The examination is meant to be an evaluation of the student's ability to construct an hypothesis, to design the means by which to test it, and to critically analyze obtained results. The purpose of the oral candidacy examination is to give the student the opportunity to demonstrate:

- An understanding of the research area in which he or she is being tested;
- The ability to formulate a research problem and to comprehend its significance; and
- The ability to design appropriate experimental approaches to solve the problem.

A student's performance will be regarded as satisfactory only if the student:

- Demonstrates an adequate knowledge of the field and the research specialty in which he or she is being tested;
- Formulates a research problem, the solution of which will make a substantial contribution to our existing knowledge;
- Makes sound judgments about the proposed experimental design and can interpret critically the results anticipated; and
- Demonstrates that the experimental design and methods proposed are appropriate to solving the problem.

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### **Petition for the PhD Candidacy Examination**

Students who matriculated in the Fall 2008 term or thereafter must petition for PhD candidacy by the end of the second year following matriculation.

Before submitting the petition for the candidacy exam, the student must have eliminated all deficiencies identified by the student's Advisory Committee and completed the tutorials, ethics requirements and Area course requirements. If a student has formally affiliated with a Program, the Program guidelines for the candidacy exam process should be followed. Students not affiliated with a Program should follow general School guidelines.

PhD students who matriculated on or after the Fall 2008 term must take a candidacy exam in the “off-topic” format. "Off-topic" means that the written proposal must be on a topic different from the student’s proposed dissertation project, different from any project pursued by the student in a tutorial rotation, different from the student’s MS thesis (if applicable), different from any on-going project in the laboratory of the student’s advisor, and not a project that differs in a trivial manner from any of the above (that is, different animal model, different gene, etc.). Individual Programs have further defined off-topic and the Program Directors and Program guidelines should be consulted before a student prepares these abstracts.

Prior to the Advisory Committee meeting, where permission to take the candidacy exam will be requested, the student shall forward to the Advisory Committee members an abstract of the student’s proposed dissertation project. This abstract should be no more than one page in length, and must contain the background, hypothesis and specific aims of the project. The student shall also forward to the Advisory Committee three off-topic abstracts. Each off-topic abstract should be no more than one page in length and must provide the background and hypothesis of the proposal. At the Advisory Committee meeting just prior to the taking of the candidacy exam, the Committee is responsible for approving the petition for candidacy, including the approval of the three off-topic abstracts.

Working with the Advisor, the student identifies the membership of the Examining Committee. The student then meets individually with the proposed members of the Examining Committee, and provides them with the off-topic abstracts. The members' initials on the Examining Committee form indicate the Committee's approval of the student’s off-topic abstracts and the member's willingness to serve on the Examining Committee. The student then submits the completed petition forms, plus the dissertation abstract plus the three off-topic abstracts to the Office of Academic Affairs for approval by the Academic Standards Committee.

When the Office of Academic Affairs notifies the student of the approval of the Candidacy Exam petition, the student contacts the Examining Committee to schedule the exam (no sooner than six weeks from the approval). Once the exam is scheduled, the Examining Committee decides which of the three off-topic abstracts will form the basis for the candidacy exam proposal, and provides this information to the student. The student has four weeks to complete the proposal and forward it to the Examining Committee. The Examining Committee then has two weeks to review the proposal prior to the examination. The candidacy examination should take place as soon as possible after the petition is approved by the Academic Standards Committee but no later than the end of the next term following approval of the petition for candidacy.

Students taking the on-topic candidacy examination, due to Program-specific requirements, must also petition for candidacy, and should consult with their Program Director for the guidelines.

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## **PhD Candidacy Examination**

All PhD students must prepare and defend a research proposal as part of their candidacy examination. The candidacy examination should take place as soon as possible after the petition is approved by the Academic Standards Committee but no later than the end of the next term

following approval of the petition for candidacy. The candidacy examination tests both breadth and depth of the student's understanding of a defined research area. The examination may include both a written component, designed primarily to establish the student's breadth of knowledge, and an oral component in which depth of understanding will be evaluated. If provided, the written examination will be prepared by members of the Program with which the student is affiliated.

Students not affiliated with a Program may:

- Take the written candidacy examination administered by a particular Program or by faculty within a particular area of research concentration that matches the student's interests; or
- Form an ad hoc Examination Committee (approved by the Academic Standards Committee) to administer the written breadth examination.

It is the student's responsibility to select the date, time, and place of the examination. If a member of the Examining Committee is unable to attend the examination, a substitute who meets the same criteria (e.g., outside the student's major interest or from another department/Program) should be added. The new member must be approved by the Office of Academic Affairs and the Academic Standards Committee Chair.

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### **Results of the PhD Candidacy Examination**

The Chair of the Examining Committee is responsible for submitting the results of the examination to the Office of Academic Affairs for review by the Academic Standards Committee. The results of the examination will be one of the following (students are recommended to candidacy by the Academic Standards Committee and admitted to candidacy by the Dean only after review and approval of the examination results):

- **Student passes unconditionally.** The Examination Committee, where appropriate, also may recommend that a student who receives an unconditional pass may bypass the MS degree.
- **Student passes conditionally, with the conditions clearly stated, i.e., the exact nature of the deficiency(ies) along with a suggested mechanism to repair the deficiency(ies).** The examining committee may choose to formulate the final mechanism for removing the deficiency(ies), or the examining committee may at their discretion assign this responsibility to the student's Supervisory Committee. Conditions must be fulfilled within one year of the exam date. The Chair of the Examining Committee must write a letter of certification to the Office of Academic Affairs when the student has resolved the conditional pass. The Chair of the Examining Committee must serve as a member of the Supervisory Committee, at least until the conditional pass has been resolved. Requests for an extension of the one-year deadline, with justification by the Supervisory Committee, must be submitted to the Academic Standards Committee for its approval. In all cases, conditions must be fulfilled before the student requests the defense of the PhD dissertation.

- **Student is to be re-examined at some future date before the Examining Committee will render a decision.** Results of the first exam (where it was determined that the student would be re-examined) should be submitted to the Office of Academic Affairs immediately following the exam. The exam committee for the re-evaluation must be composed of the same faculty members that conducted the first exam. Upon re-examination, the Committee may only elect to Pass or Fail the student. If the student fails to successfully complete the re-examination prior to the deadline determined by the Examining Committee (not to exceed one year from the first examination), the Academic Standards Committee will dismiss the student from the PhD program.
- **Student fails.** Failure of the examination means the Examining Committee has determined the student has not demonstrated the requisite potential to complete the PhD program, and the Academic Standards Committee will dismiss the student from the PhD program. The Committee may, at its discretion, determine that the student will be permitted to continue towards a terminal MS degree. Subsequent to dismissal, the student may re-apply to the School; the application will be considered in competition with other applications pending at the time.

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### **Registration for PhD Dissertation**

After being admitted to candidacy for the PhD degree, the student is permitted to register for *Dissertation for Doctor of Philosophy (GS001920)*. The student must register for at least one semester of *Dissertation* before becoming eligible for the PhD dissertation defense. The student must be registered for *Dissertation* in the final semester in which requirements are completed.

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### **Expectations for the PhD Dissertation**

The following are expectations for the PhD dissertation, established by the GSBS Faculty. They are based on the Council of Graduate Schools publication, “Requirements for the PhD”

#### **Nature and Purpose**

The doctoral dissertation is the final and most important component of the series of academic experiences, which culminate in the awarding of the PhD degree. Four major functions are fulfilled by the dissertation experience:

- It is a work of original research or scholarship which makes a contribution to existing knowledge;
- It is an educational experience which demonstrates the candidate's mastery of research methods and tools of the specialized field;
- It demonstrates the student's ability to address a major intellectual problem and arrive at a successful conclusion; and
- It demonstrates that the student possesses the potential to function as an independent researcher.



In view of the wide range of fields of knowledge in which the PhD degree is awarded, it is not feasible to set specific requirements and standards for this degree. Nevertheless, there is a general -- and usually explicitly stated -- agreement among American universities that the doctoral dissertation should be a distinct contribution to knowledge, and of sufficient value to warrant its publication in a reputable journal, or as a book or monograph. At the present time, School rules prohibit a student from preparing a dissertation by assembling published papers verbatim. Instead, the dissertation should be an original document written by the student. In years past, some universities required that the dissertation (or a substantial part) be published before the degree was officially awarded. Today that requirement has virtually disappeared; instead the common criterion has become "worthy of publication."

Although the role of the dissertation as an educational experience is usually not as clearly set forth as its role in developing new knowledge, it may be equally as important. A successful dissertation is a demonstration of the candidate's ability to use the tools and methods of research in the field, to organize the findings, and to report them in a mature, literate, and lucid fashion.

### **Scope of the Project**

The allowable scope of the dissertation project is also difficult to state precisely. The dissertation should clearly be a substantial and significant undertaking, yet not so extensive or open-ended that it cannot be successfully concluded in a reasonable period of time. The trend in recent years has been away from the long and comprehensive dissertation project, and in the direction of a more sharply delineated task. The dissertation should be the introduction to a career of research and scholarship, not its apex.

### **Relationship with MS Thesis**

GSBS students may utilize a Masters degree project as the basis of the hypotheses to be tested by the doctoral research. The PhD dissertation must not include data that are part of the MS thesis. Data from the MS thesis may be included in the dissertation as part of the Introduction or as an appendix. In all cases, data from the MS thesis must be identified clearly as originating from the previous work. Furthermore, the PhD dissertation must have a title that is distinct from the MS thesis.

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### **Defense of the PhD Dissertation**

Within three years after advancement to candidacy, and at a time deemed appropriate by the Supervisory Committee, the student will submit a complete draft of the dissertation to each member of the Supervisory Committee, together with the form requesting to defend the PhD dissertation. The completed defense form and a one-page summary of the research should be submitted to the Office of Academic Affairs at least 14 days before the scheduled defense. For students who matriculate in the Fall 2008 term or thereafter, students must submit a first-author paper for publication in a peer-reviewed journal prior to the PhD defense. The Supervisory Committee must approve the journal to which the paper is submitted. A request for exception to

this policy must be endorsed by the Supervisory Committee and approved by the Academic Standards Committee.

The dissertation defense will be held no sooner than two weeks or later than three months after the request form is received by the Office of Academic Affairs and approved by the Dean.

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### **Guidelines for the PhD Dissertation Defense**

The purpose of the dissertation defense is to provide a consistent and complete evaluation of the dissertation and the student's understanding of the research, as well as the student's ability to report information to the scientific community in a well-organized and interesting form.

An announcement of the defense will be distributed by electronic mail to GSBS students and faculty and posted on various bulletin boards throughout the Texas Medical Center.

Guidelines for the defense are:

- The student will deliver a 45- to 60-minute public presentation, including a detailed description of the background, rationale, materials and methods, results, and conclusions appropriate to the research. Following the presentation, the student will respond to questions from the audience.
- Immediately thereafter, and at a location announced at the end of the seminar, the Supervisory Committee will examine the student on the dissertation. Any member of the GSBS Faculty who attends the public presentation may participate in the examination to the extent described below. Others wishing to attend must be approved by the Supervisory Committee.
- The student's Advisor will serve as moderator of the examination. The student will be expected to respond to questions from those attending on any aspect of the written dissertation or the material presented at the public presentation.

After the defense, the student will meet privately with the Supervisory Committee to discuss the results. Finally, the Supervisory Committee will determine what recommendation to make to the Dean and the Academic Standards Committee. The Committee may conclude that the student has passed, or it may require additional research, modifications to the dissertation, and/or another defense. Within one week after the dissertation defense, the results of this meeting will be communicated through the Office of Academic Affairs to the Dean and the Academic Standards Committee for their information and approval.

Within one week of the dissertation defense, any School Faculty member who has read the student's dissertation and has attended the defense may write directly to the Dean to provide an evaluation of the student's performance. In reaching a final decision on whether to award the PhD or require further work and/or another defense, the Dean will take into consideration the recommendation of the Supervisory Committee and other comments received from School Faculty. In particular cases, the Dean may solicit additional evaluations of the dissertation from experts in the field either within or outside the School Faculty.

The decision of the Dean will be communicated to the student and the Supervisory Committee within one month of the dissertation defense.

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### **Completion of the PhD Requirements**

The PhD degree is not awarded until: the student has successfully completed the dissertation defense, the unbound dissertation, approved by the Supervisory Committee, is submitted to the Office of Academic Affairs for the Dean's signature, and all exit forms are completed and submitted to the Office of Academic Affairs. Students who entered the PhD program in Fall term of 2008 or later must also have submitted a first-author publication prior to graduation. The student must be registered for *Dissertation* in the final semester in which requirements are met.

Students must also complete a form indicating the dissertation-related research areas to be listed on the diploma. Students may request to list none, one or two areas on the diploma. If areas are listed, the first must be the Program with which the student is affiliated. The second area can correspond to one of the areas of research concentration listed below:

Biochemistry  
Biomathematics and Biostatistics  
Biophysics  
Cancer Biology  
Cell Biology  
Experimental Therapeutics  
Genes and Development  
Human and Molecular Genetics  
Immunology  
Integrative Biology  
Medical Physics  
Microbiology  
Molecular Biology  
Molecular Carcinogenesis  
Molecular Pathology  
Neuroscience  
Pharmacology  
Physiology  
Virology and Gene Therapy

The degree will be issued as of the final day of the semester in which all degree requirements have been met. The PhD degree must be completed within seven years of first registration in GSBS. Students may continue registration in GSBS after the seven-year limit only with the express written permission of the Dean.

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## **DOCTOR OF MEDICINE/DOCTOR OF PHILOSOPHY DUAL DEGREE PROGRAM**

A joint MD/PhD program is offered by the combined GSBS and Medical School faculties. The formal program integrates the requirements of both degree programs and makes available particular activities for candidates interested in pursuing careers as physician scientists. In general terms, the first two years of the program involve primarily the pre-clinical course work of the Medical School curriculum. In the third, fourth, and fifth years, students are engaged in a combination of clinical clerkships, PhD course work, and dissertation research. The final year is spent in required and elective clinical rotations. Students in the MD/PhD program who enter their PhD training in the Fall term of 2012 or later must join one of the GSBS Programs of study.

Students admitted to the program receive financial assistance that meets the cost of tuition and provides a stipend for the duration of the program. Admission to and continuing matriculation in both GSBS and the Medical School is required for participation in the program. Further information about the program is located at this Joint Program's website (<http://mdphd.uth.tmc.edu/>).

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## **MASTER OF SCIENCE DEGREE IN BIOMEDICAL SCIENCES**

Students enrolled in MS degree programs are provided the opportunity to gain mastery of the scientific background of their discipline and their specific research problem. Such mastery is acquired from didactic instruction and individual study of the scientific literature. Laboratory studies provide opportunities to gain technical facility with the methods required for investigation. The preparation of the MS thesis provides experience in stating a research problem within the framework of contemporary knowledge, presenting the rationale for the technical approach to be taken in solving the problem, presenting valid and reproducible results obtained by the application of methodology appropriate to the problem, and providing a coherent analysis of the results and the conclusions drawn from this analysis.

The acquisition of technical expertise should be the major objective of students at the MS degree level, and the MS thesis should evidence the student's mastery of the knowledge and technology required for the solution of the research problem. While studies at the MS level may place less emphasis than those at the PhD level on the scope and magnitude of the intellectual contribution, the MS thesis should demonstrate the student's creativity in the solution of a scientific problem. The thesis should be an original document written by the student.

The MS degree remains an important component of the School's educational program. Although many students currently bypass the MS portion of the PhD program, the Faculty continues to recognize the value of studies for the MS degree for some PhD students, as well as for students seeking graduate training available through individualized or specialized MS programs.

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## General Course Requirements

The MS program of work must consist of a minimum of 30 credit hours of coursework, which must include one credit hour of *The Ethical Dimensions of the Biomedical Sciences* plus the two online Ethics modules, at least six credit hours of *Thesis for Master of Science* and a minimum of six credit hours of *Research in Biomedical Sciences*. For students entering in the Fall of 2010, a minimum of 12 credit hours of didactic courses, graded A/F, must be taken. Other didactic courses, *Literature Survey*, *Special Project: Course*, and *Special Project: Research* may be used toward the remaining required credit hours. The majority ( i.e., over 50%) of these 30 credit hours, plus the majority of any additional coursework required by the Academic Standards Committee or the student's Advisory or Supervisory Committees, must be taken in residence at GSBS, at other UTHSC schools, or at an institution with which UTHealth has consortium arrangements (i.e., Rice University, the University of Houston, or Baylor College of Medicine).

Students in an MS degree program who have completed graduate courses in the general area of biomedical sciences at another institution may request that credit hours earned elsewhere be used toward the 30-credit hour GSBS requirement. While there is no limit to the number of hours for which a student may be credited, no more than two courses may be used toward the GSBS minimum requirement of 30 credit hours. The student must have received at least a C (if the course awards letter grades of A, B, C or F) or P (if the course was graded pass/fail) in the course to be awarded GSBS credit hours. The grades from such courses taken at other institutions will not be used in the calculation of the cumulative grade point average.

The following rules apply to registration for *Special Project: Course*, *Special Project: Research*, and *Literature Survey*:

- *Special Projects* should not exceed four hours per semester and *Literature Surveys* should not exceed two hours per semester.
- No more than 12 credit hours of *Special Project* (or *Tutorial Research Experience*) plus *Literature Survey* may be accepted toward meeting the 24 credit hours required for completion of the MS degree.
- If more than one *Special Project: Research* is included in the MS program of work, the projects must be supervised by different instructors.
- Degree students will not be permitted to use credit hours in *Special Project: Research* taken while they were non-degree students toward meeting the 24 credit hours required for completion of the MS degree.

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## Ethics Requirements

All students are required to pass a one credit hour course entitled *The Ethical Dimensions of the Biomedical Sciences*. The aim of the course, taught by School Faculty, is to provide students with a framework to recognize, examine, and resolve ethical conflicts in their professional lives. The course explores such issues as the commitment to truth and its breakdown, the ethics of authorship, experimentation with human and animal subjects, and the relationships of scientists

to industry, society at large, and future generations. This course, and two online ethics modules, “Data Acquisition and Management” and “Responsible Authorship and Publication,” must be completed before the student petitions for candidacy.

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### **Petition to Candidacy for the MS Degree**

A petition to candidacy for the Master of Science degree must be submitted to the Academic Standards Committee for approval. The petition consists of the program of work, an abstract of the proposed research, and the proposed members of the Supervisory Committee. The program of work should indicate the courses that will be used to fulfill the minimum 30 semester credits for the MS; for purposes of the petition to candidacy this may include courses taken, in progress, and/or planned. The petition must be approved by the Academic Standards Committee and the student admitted to candidacy before the student can receive credit for the first semester of *Thesis*. The petition should be submitted within two years of admission to the MS program or within two years of admission to the PhD program, or for M.D./PhD students, after the first full year of enrollment in the School. If an extension is requested, written justification must be provided to the Academic Standards Committee for its approval.

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### **Defense of the MS Thesis**

During the final semester of *Thesis* the student must submit for approval by the Dean a form to request the defense of the MS thesis. The form, with a one-page summary of the research, should be submitted to the Office of Academic Affairs at least 14 days before the scheduled thesis defense. The Office of Academic Affairs checks to be certain that all courses included in the program of work have been completed. If all is in order, an announcement of the thesis defense will be distributed by electronic mail to GSBS students and faculty and is posted on appropriate bulletin boards throughout the Texas Medical Center. If the program has not been completed, the student and the Committee are notified and the thesis defense will not be permitted until the required courses have been completed.

Application for the MS defense must be made within one year after advancement to candidacy. Requests and justification for extensions must be submitted to and approved by the Academic Standards Committee.

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### **Completion of the MS Requirements**

The MS degree is not issued until the student has successfully completed the defense, the unbound dissertation, approved by the Supervisory Committee, is submitted to the Office of Academic Affairs for the Dean's signature, and all exit forms are completed and submitted to the Office of Academic Affairs. The MS degree is awarded on the last day of the semester in which all requirements are completed. The student must be registered for *Thesis* in the final semester in which requirements are met.

All requirements for the MS degree must be completed within three years of first registration in GSBS. Students may continue registration in GSBS after the three-year limit only with the express written permission of the Dean. Students admitted to the School for the express purpose of obtaining only an MS degree and who wish to work for a PhD must reapply for admission to a PhD program.

Operating within this general framework for the MS degree in Biomedical Sciences are the individualized MS degree option and two specialized programs, Genetic Counseling and Medical Physics. All degrees awarded will be termed Masters of Science in Biomedical Sciences.

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## **INDIVIDUALIZED MS DEGREE**

Qualified students may be admitted to the School to pursue an MS degree with a concentration in Biomedical Sciences, or in a Program, upon approval by the Program Director. With the advice and consent of an advisory committee, the student will construct a plan of study, including didactic course work and a thesis topic appropriate to his or her particular interests. The degree can usually be completed in two years of full-time study, although the School permits students three years for completion of degree requirements.

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## **SPECIALIZED MS DEGREE PROGRAMS: GENETIC COUNSELING**

The specialized MS degree in Genetic Counseling is designed for individuals who seek a terminal MS degree with requisite education in human genetics and genetic counseling skills. The program's objective is to provide clinical and research training in genetic counseling, with graduating students demonstrating proficiency in genetic counseling competencies and having accrued a substantial and diverse clinical case experience in order to sit for the American Board of Genetic Counseling credentialing exam. The program's challenging curriculum provides comprehensive training in classical and molecular genetics and genomics, medical genetics, cancer genetics, prenatal genetics, psychosocial counseling, and approaches to research. Students receive an in-depth exposure to a variety of genetics clinics. In addition to the general MS requirements, the Genetic Counseling Program requirements include the successful completion of specialized courses, clinical rotations and a masters of science thesis.

### **Curriculum**

Genetic Counseling students take classes in the areas of molecular and human genetics, statistics and epidemiology, developmental biology, and ethics, as well as counseling issues. The majority of course work is completed by the end of the first year. Clinical rotations and the completion of a masters research thesis project dominate the second year. Required course work includes (credit hours in parentheses):

Introduction to Genetic Counseling (2)

Developmental Anatomy (2)

Topics in Medical Genetics I (2)

Topics in Medical Genetics II (2)  
Approaches to Research in Genetic Counseling I (2)  
Approaches to Research in Genetic Counseling II (2)  
Psychosocial Issues in Genetics (2)  
Psychosocial Genetics Practicum (1) x4  
The Ethical Dimensions of the Biomedical Sciences (1)  
Cancer Genetic Counseling (2)  
Contemporary Issues in Genetic Counseling (1) x2  
Introductory Clinical Rotations (3)  
Advanced Clinical Rotations (4) x3  
Masters Thesis Research (4)

## **MS Thesis**

Students are expected to propose and complete a laboratory or clinically-oriented research question that will include study design, collection of data (where applicable), data analysis, and a written thesis. A written thesis and oral defense of the thesis is required for graduation.

## **Clinical Rotations**

Clinical experience is an essential aspect of genetic counseling training. Students at UTHealth receive cases of significant depth and breadth in the genetic counseling arena. After completing their clinical training, students should be well-prepared, flexible genetic counselors, familiar with the needs of an increasing diverse clientele.

## **Prerequisites**

Admissions requirements are those established by GSBS for the MS program. A Subject Test of the GRE is recommended, but not required. A cumulative undergraduate GPA of 3.0 or greater is required. Successful applicants generally have a GPA of 3.5 or better, and GRE scores in the 75% range. However, the Genetic Counseling Program considers the entire application when selecting applicants to interview.

The following background is strongly recommended:

- Client advocacy experience (crisis counseling/Planned Parenthood)
- Volunteer experience
- Genetic counseling internship/shadowing/exposure
- Undergraduate or graduate coursework in
  - Biology
  - Psychology
  - Genetics
  - Chemistry
  - Biochemistry
  - Calculus
  - Statistics



An interview at the School is required for admission to the Program and will be arranged after the application is reviewed.

Further information concerning the prerequisites or academic requirements for this program may be obtained by writing to:

Claire N. Singletary, MS, CGC  
Department of Pediatrics  
The University of Texas Medical School at Houston  
P.O. Box 20708  
Houston, Texas 77225  
[Claire.N.Singletary@uth.tmc.edu](mailto:Claire.N.Singletary@uth.tmc.edu)

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### **SPECIALIZED MS DEGREE PROGRAMS: MEDICAL PHYSICS**

The Specialized MS in Medical Physics Program is designed for individuals who seek a program that will prepare them primarily for a clinically-oriented career in medical physics. The Program objective is to provide clinical and research training in medical physics that will prepare the graduate for a professional career in a clinical environment, a clinical support research laboratory, or a clinical support industry. The Program also prepares the graduate for entry into a PhD program in medical physics or into a clinical medical physics residency program. The Program curriculum is designed to educate the student in the areas of radiation oncology physics, diagnostic imaging physics, and medical health physics related to both ionizing and non-ionizing radiation. The area of radiation oncology physics emphasizes radiotherapy; the area of diagnostic imaging physics includes both diagnostic radiology and nuclear medicine; the area of medical health physics includes protection from ionizing and non-ionizing radiation. Program requirements include:

#### Coursework

1. The student must complete a minimum of 32 hours of required courses.

#### Required Courses (semester hours in parentheses)

Mathematics for Medical Physics (3)  
Introduction to Medical Physics I: Basic Interactions (3)  
Introduction to Medical Physics II: Medical Imaging (3)  
Introduction to Medical Physics III: Therapy (3)  
Introduction to Medical Physics IV: Nuclear Medicine (3)  
Electronics for Medical Physicists (3)  
Radiation Detection, Instrumentation, and Data Analysis (3)  
Radiation Biology (2)  
Introduction to Radiation Protection (3)  
Anatomy and Oncology for Medical Physicists (2)  
Medical Physics Seminar (3 semesters x 1 hour / semester; 3)  
The Ethical Dimensions of the Biomedical Sciences (1)

2. The student must complete a minimum of two hours of electives.

#### Available Electives (semester hours in parenthesis)

Biomedical Statistics (4)  
Principles of Magnetic Resonance Imaging (2)  
Physics of Position Emission Tomography (2)  
Special Radiation Treatment Procedures (2)  
Fundamental Biological Principles of Molecular Imaging & Therapeutics (4)  
Various Medical Physics Special Project Courses (2 each)  
Other electives from GSBS, Rice University, or University of Houston

## **MS Thesis**

A thesis of quality sufficient for publication in a refereed journal is required. The student must register for *Thesis* credit for at least one semester. The student is admitted to candidacy upon submission to and approval of, the planned program of coursework, the abstract of the proposed research, and a list of proposed members of the Supervisory Committee, by the Program and the GSBS Academic Standards Committee. The student must be admitted to candidacy before receiving credit for the first semester of *Thesis*. The MS Thesis is considered complete when the final written version is signed by all members of the student's Supervisory Committee and after the student's delivery of a public seminar and successfully passing an oral examination on the Thesis by members of the Supervisory Committee and other interested faculty. The student is expected to prepare a first draft of at least one paper based on the thesis work for submission for publication in an appropriate peer-reviewed scientific journal.

## **Clinical Rotations**

The student must complete two clinical rotations of 200-300 contact hours duration each:

Radiation Therapy Physics Rotation (4)  
Diagnostic Imaging Physics Rotation (4)

## **Supplementary Training** (not mandatory)

Students may receive supplementary training by taking short courses in Therapeutic Radiological Physics offered by the MDACC Department of Radiation Physics, or Imaging Physics offered by the MDACC Department of Imaging Physics. Formal credit is not awarded for these courses.

Students should arrange for enrollment in consultation with the Executive Director for Educational Programs, MDACC Department of Imaging Physics.

## **Prerequisites**

A bachelor's degree in physics or in basic science or engineering with an established physics background is required. The physics background may be demonstrated by completion of upper level courses in atomic and nuclear physics, electromagnetism, quantum mechanics, classical mechanics, and thermodynamics. Additional requirements are calculus, differential equations, and one year of chemistry. One semester of biology is highly beneficial. Applicants are expected to have a grade point average of at least 3.0 on a scale of 4.0 for all upper division junior, senior, and graduate level work (if any) (particularly in the prerequisite areas).

Completion of the General Test of the Graduate Record Examinations is required; completion of

the specialty test in physics is optional, but could be of benefit to the applicant. Foreign nationals whose native language is not English must present evidence of proficiency in English by satisfactorily completing the Test of English as a Foreign Language (TOEFL) and the Test of Written English (TWE).

Further information may be obtained by writing to:  
Edward F. Jackson, PhD  
Director, Medical Physics Graduate Education Program  
The University of Texas MD Anderson Cancer Center  
Department of Imaging Physics, Unit 1472  
1515 Holcombe Boulevard  
Houston, Texas 77030-4009  
[ejackson@mdanderson.org](mailto:ejackson@mdanderson.org)

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## **NON-DEGREE STUDY**

Qualified individuals who hold a bachelor's degree in science, have a demonstrated interest in a career in research, and wish to take courses at the graduate level without enrolling in an MS or PhD degree program may be admitted to the School as non-degree students. Such students will pay regular (per credit) tuition and will receive transcripts indicating the appropriate grades and credit for work completed. Non-degree students will not be eligible for School-based or sponsored financial aid, but may be eligible for other types of financial aid from UTHealth. Further information about non-degree study is included in the section on admission.

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## **RESOURCES FOR GRADUATE EDUCATION**

By virtue of its location in the Texas Medical Center and the excellence of its distinguished faculty, the School affords qualified students extraordinary opportunities for basic and clinical research. Didactic teaching and training activities are conducted in lecture rooms and laboratories of component UT institutions where faculty members hold their primary academic appointments. In addition to the resources available within UT institutions, cooperative arrangements with Baylor College of Medicine, Rice University, Texas Woman's University, and the University of Houston provide GSBS students excellent opportunities for developing educational and research programs appropriate to their academic backgrounds and future career interests.

Excellent library facilities are available to provide resource material for course work and research. Students have access to the Houston Academy of Medicine-Texas Medical Center Library (see general information) as well as the specialized GSBS, School of Dentistry, School of Public Health, and MDACC libraries. The Houston Public Library, Rice University (Fondren) Library, University of Houston MD Anderson Memorial Library, and numerous private library facilities also are available for use.

GSBS students have access to a wide range of computing hardware, from laptops to supercomputers, and to a vast array of computer software and services. Within the School itself

is a computing facility that includes a variety of desktop computers and printers. The Information Technology Access fee gives students remote access to the Internet and electronic resources of the University, subject to all UTHealth policies governing such access. The HAM/TMC Library makes available to students free of charge over 40 databases, including MEDLINE, GenBank, CancerLit and the Science Citation Index. Also online through the library are full-text versions of electronic journals and reference texts. The Library may be accessed at <http://www.library.tmc.edu>. Access to computing systems in the Texas Medical Center and to the UT System supercomputer at Austin is provided via the Internet.

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## **ADMISSION**

### **Admissions Statement**

The mission of the University of Texas Graduate School of Biomedical Sciences at Houston is to train and educate research scientists and scientist-educators, to generate new knowledge in the biomedical sciences and to increase public understanding of the biomedical sciences. To prepare students to meet these goals, the GSBS has identified a cohort of faculty and staff who are dedicated to this mission and prepared to meet these commitments to serve the State of Texas and the nation.

The GSBS strives for diversity in the student population to enrich the overall educational experience of the students. All applicants will be evaluated individually, based upon their overall merits; race and ethnicity will be considered as only one of the many criteria utilized in the evaluation. All faculty and staff involved in the evaluation of students for admission are informed of these criteria.

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### **Applicants for the PhD Degree Program**

Applicants must have a bachelor's degree or its equivalent from an accredited institution. Applicants are required to have a solid background in the basic sciences. It is recommended that this background include:

**Biology** - a minimum of two semesters (including a course in introductory biology)

**Biochemistry** - a minimum of one semester (with prerequisite organic chemistry)

**Calculus** - a minimum of one semester

**Physics** - a minimum of two semesters

The applicant should review the web site of the Program in which he/she has an interest for a listing of the undergraduate coursework recommended by the Program. The Admissions Committee will examine an applicant's educational history in order to ascertain the applicant's preparation for entry into graduate school. An MS degree is not required for admission to the PhD programs. Once an admitted student forms an approved Advisory Committee, this

Committee will review the student's undergraduate coursework, and, upon consideration of the student's research focus, make recommendations for any remedial work that would facilitate the successful completion of the dissertation research.

Applicants are expected to have a grade point average of at least 3.0 on a scale of 4.0 on all undergraduate and graduate level work taken previously (particularly in the recommended coursework listed above). The average undergraduate GPA of students entering the PhD program in recent years has been 3.4, although there is considerable variation allowed by the School Admissions Committee.

Applicants are required to take the General Test of the Graduate Record Examinations. A Subject Test is not required. The average GRE score (Verbal + Quantitative scores) of students entering the PhD program in recent years has been 1280; this score is for the GRE exam given prior to August, 2011.

A student who is initially admitted to the GSBS MS degree program may not submit an application to the PhD degree program prior to the completion of most or all of the research required for the M.S degree. A student in a GSBS MS program may not matriculate into a GSBS PhD program until the MS degree has been awarded.

Applicants may submit only one application per year for a particular degree program. If an application is rejected, the applicant may reapply to that degree program after one calendar year. In this case, the applicant is expected to complete a new application for admission and supply any additional materials to update their application.

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### **Applicants for the MS Degree Program**

Applicants for MS degree programs will be evaluated for academic qualification as evidenced by academic record, letters of recommendation and GRE results. Students enrolling in MS programs in recent years have had an average GRE score (Verbal + Quantitative) of 1130, and an average undergraduate GPA of 3.3.

### **Factors Considered in Admissions Decisions and Financial Assistance**

The School Admissions Committee may consider the following factors in evaluating applicants for admission and financial assistance:

- Previous research experience and accomplishments, including participation in science fairs, enrollment in laboratory and research-based courses, and involvement in research projects, presentations of research findings and publications;
- Expressed commitment to a career involving biomedical research;
- Undergraduate grade point average;
- Performance in undergraduate courses in the biological and physical sciences and mathematics;
- Trends in academic performance;
- Degree of difficulty of undergraduate academic program;

- Previous graduate-level study;
- Honors and awards for academic achievement;
- Performance on the Graduate Record Examination (and for international applicants, the Test of English as a Foreign Language (TOEFL)).
- Success in overcoming socio-economic and educational disadvantages;
- Multilingual proficiency;
- Region of residence;
- Non-academic responsibilities, such as employment and child-rearing;
- Involvement in community activities; and
- Race and/or ethnicity.

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## Application Procedures

Applications must be submitted electronically through: <https://apply.embark.com/Grad/UTHealth/GSBS/>.

All components of the application must be submitted electronically for both domestic and international applicants. Please note that there is no need to submit official transcripts or test scores as part of the preliminary application process. This information will be self-reported by the applicant. Copies of transcripts and test scores are to be uploaded into the application system.

**Application form** – Applicants will create an account at: <https://apply.embark.com/Grad/UTHealth/GSBS/> to apply.

- **Unofficial transcripts** - An unofficial copy of the transcript from each college and university attended is required.
- **GRE scores** – GRE Scores must be available at the time of application. The applicant will upload a copy of the ETS score report.
- **TOEFL scores** (International applicants) – The applicant will upload a copy of the ETS score report.
- **Application fee** - A \$10 application fee is required.
- **CV/Resume** - A CV or resume is required and should include academic honors, awards received in college, employment history, internships, summer research programs, education history, etc.
- **Personal statement** - The personal statement should be 1-2 pages in length and should be a discussion of the applicant's motivation and rationale for pursuing a graduate degree. The statement should specifically address research background, objectives in seeking advanced education, professional goals, areas of study in which the applicant wishes to specialize, reasons for seeking admission to GSBS, and how the applicant's professional goals may be met in the GSBS.
- **Presentation and publications listing with abstracts** – List of all publications. List the full citation giving the abstract for each in chronological order. For presentations (poster and oral presentations), indicate the type of presentation, the forum in which the presentation was made, the date of the presentation and the abstract.

- **Overcoming adversity statement** (optional) - A brief statement detailing any socioeconomic and/or educational disadvantages.
- **Three letters of recommendation** - Three letters of recommendation are required to be submitted via the online system by persons well-qualified to evaluate the applicant's scholastic performance, scientific ability, research interests and motivation, and personal attributes such as character and personality; contact information must also be provided. If the applicant is currently enrolled, or has completed a graduate program, one of the recommendations must be from the applicant's academic advisor or mentor.

Personal interviews may be requested by the School Admissions Committee and all admitted applicants must be interviewed by GSBS faculty. Final admission requires receipt of official transcript and ETS score report documents, and is contingent upon a satisfactory completion of the criminal background check.

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### **Special Information for Foreign and Non-English-Speaking Applicants**

Applicants who are not U.S. citizens or permanent residents, and who have not obtained a bachelors or masters degree from a U.S. school will submit the same application described above, but will apply as an international candidate.

The Test of English as a Foreign Language (TOEFL) is administered in foreign countries by the Educational Testing Service and used as a measure of the applicant's level of proficiency in English at the time of application. These tests are required of all foreign nationals whose native language is not English and who have not attended an English-speaking university.

These applications and supporting materials must be received by November 15 to be considered for admission for the following Fall semester.

All international students who are admitted to the Graduate School and who do not have a degree from an English-speaking institution will be required to take a diagnostic English language skills test administered in GSBS before the start of Fall semester classes. The test will evaluate the student's ability in the areas of listening and speaking, reading and writing, and grammar and vocabulary. Those admitted students whose English skills are found to be inadequate for successful performance in GSBS will be required to take and pass an English language skills course during the first Fall semester at GSBS. This course will be specified by GSBS. Students may take advantage of other instructional opportunities approved by the Dean in order to improve their English language skills.

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### **Application Deadlines**

The preferred deadline date for U.S. citizens seeking admission to the PhD program is December 5, and the final deadline is January 5. Applicants who are not U.S. citizens or permanent residents must submit the application no later than November 15. International applicants who

have obtained an advanced degree from a U.S. institution may submit the domestic application as described above for U.S. citizens.

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### **Essential Skills for Biomedical Scientists**

To be successful as biomedical scientists, individuals must possess necessary cognitive, motor, and sensory skills. These include cognitive abilities in creative problem- solving, quantitative methods, and the objective analysis and interpretation of data. Additionally, biomedical scientists normally require fine motor dexterity, physical strength, and coordination. In order to observe and report biological phenomena effectively, scientists must possess sufficient vision and hearing and must be able to effectively write, speak and comprehend English.

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### **Enrollment of Graduate Students from Affiliated Institutions**

Through reciprocal agreements, students at other components of The University of Texas System, as well as graduate students from Rice University, Baylor College of Medicine, Texas Woman's University, and the University of Houston, may take graduate courses for credit at the School, subject to the approval of the instructor. In addition, GSBS students may take courses for credit at any of the above institutions. The mechanisms for payment of tuition and registration fees vary according to the individual institution. Consult with the Office of the Registrar for specific details.

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### **Non-Degree Students**

Application to be a non-degree student requires submission of an application form, a statement of intention including a proposed course of study, official transcript(s), and two letters of recommendation.

A non-degree student will be admitted for one year. No commitment to eventual admission to a degree program is implied by admission as a non-degree student. Re-admission for additional periods of study as a non-degree student will be considered by the Dean, and is dependent in part on the student maintaining at least a 3.0/4.0 grade point average in GSBS courses. Application for re-admission requires a written statement by the applicant reviewing past performance and future goals.

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### **Employees**

Employees of institutions within the Texas Medical Center may, with consent of the instructor and the employee's supervisor, and with permission of the Dean, register for one GSBS course during each semester. Registration forms for this purpose are available from the Office of the Registrar. Employees must submit an official transcript from their undergraduate institution verifying that they have earned a bachelor's degree or the equivalent prior to enrollment.



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## Guidelines for Employees Who Wish to Pursue a PhD Degree

Any employee of an institution in the Texas Medical Center may, with consent of the instructor and the employee's supervisor, and with permission of the Dean, register for one GSBS course during each semester. The employee may register for up to two courses with permission of the Dean. If the employee is eventually admitted to the School, courses taken while an employee will appear on the student's transcript and may be used to meet GSBS degree requirements, with the approval of the student's advisory committee and the Academic Standards Committee.

One of the courses an employee may take is a laboratory research tutorial. To do so, the employee must register for the GSBS course entitled *Special Project: Research* (GS00 1530). This course must simulate, in its requirements, the GSBS course entitled *Tutorial Research Experience* (GS00 1514), i.e. it should represent a real learning experience in the laboratory of a GSBS faculty member (and not the activity of a laboratory technician). A minimum of 200 hours of effort are required for the four- credit hour tutorial/Special Project, generally a minimum of 20 hours per week. Employees do not need to complete their didactic coursework before registering for *Special Project: Research* (GS00 1530).

If the employee is admitted to a GSBS PhD program, one of these tutorial-like *Special Projects* may be used to fulfill one tutorial requirement of the PhD degree. Each of the three tutorial rotations required for the PhD must be performed under the guidance of a different GSBS faculty member, and at least one tutorial must be conducted while the student is registered full-time in the PhD program. However, one of the three required tutorials may be waived by the Academic Standards Committee if the student enters GSBS with an MS degree that involved laboratory-based research and a thesis, or with other appropriate research experience, such as experience resulting in publications.

Upon admission to the PhD program, the employee must become a full-time graduate student. The student's financial support will be in the form of a Graduate Research Assistantship at the standard GSBS level (currently \$26,000 per annum). The admitted student is eligible for GSBS-sponsored financial support for the first two years of PhD graduate study.

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## FINANCIAL SUPPORT

It is the expectation of the GSBS that each student in the PhD program be supported by a graduate research assistantship (GRA) or by a fellowship/traineeship. All students who are admitted to the PhD program and who do not have external financial support are eligible for School assistantships. The award of a GRA includes:

- A stipend of \$29,000 per annum;
- Payment of the student's tuition and required fees; and
- Health insurance

In the first year of study, GRAs support the student's degree-related activities (course work) and laboratory rotations. After completion of the laboratory tutorials, financial support is available through traineeships, research assistantships, and a number of special fellowships.

Students may be eligible for a number of internal fellowships and scholarships during their graduate education at the GSBS. These include, but are not limited to, the Aaron Blanchard Award in Medical Physics, the American Legion Auxiliary Fellowship, the Barbara Kennedy Scholarship, the Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences, the Faculty and Alumni Merit Fellowship, the Harry S. and Isabel C. Cameron Foundation Scholarship, the Presidents' Merit Scholarship, the Presidents Research Scholarship, the Roberta M. and Jean M. Worsham Endowed Scholarship, the Rosalie B. Hite Fellowship, the R.W. Butcher Achievement Award, the Schissler Foundation Fellowship, the Sowell-Huggins Scholarship, the Sowell-Huggins Graduate Fellowship in Cancer Research, the Sylvan Rodriguez/Cancer Answers Scholarship, the Internship in Communications and Public Affairs Award, and travel awards. Details concerning eligibility, application procedures, and criteria used to award fellowships and scholarships are available from the GSBS Assistant Dean for Outreach and Minority Affairs, or from the GSBS website, or at <http://www.uthouston.edu/gsbs/current-students/awards/>.

Stipends awarded to GSBS students are intended to assist in meeting educational and living costs so that students can devote full time to their studies. It is the expectation of the School that students holding stipends will not undertake activities, including employment of any kind (beyond the types of financial support employment described in this section) that will interfere with their educational program or delay their progress toward the degree. An exception to this policy will be made by the Dean only if the activity proposed by the student can be justified as contributing in some fashion to the student's training as a researcher/teacher, and involves no more than 80 hours of effort over the course of an academic year.

No PhD student may hold more than one training position at a time. That is, PhD students hold the Graduate Research Assistant (GRA) training position during their tenure as graduate students, and may not hold other training positions (e.g., post-doctoral fellow) concurrently with the GRA position.

Students who are awarded approved, competitive, external Fellowships are eligible, at their advisor's discretion, to be supplemented up to 130% of the standard GSBS graduate research assistantship.

Graduate School assistantships normally are not awarded to students in the individualized or specialized MS degree programs, although financial aid may be available from individual faculty members or the specialized MS programs. Students in MS programs are eligible to receive a stipend (not to exceed the current GRA level) for the duration of their degree training. MS students who do not receive Graduate Research Assistant stipends may pursue outside employment. If a student is employed in the laboratory in which the student is also performing MS thesis work, experiments performed and data generated in the normal work associated with employment may not be included in the MS thesis.

In addition to the types of financial aid mentioned above, other sources of support are available through UTHealth's Office of Student Financial Services (see general information section).

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## **FEES AND EXPENSES**

Tuition and fees will be paid for all students who qualify as Graduate Research Assistants. Those students GRAs who receive financial support from the School during their first two years will have their tuition and fees paid by the School. Student GRAs who receive financial support from faculty advisors will have their tuition and fees paid by their faculty advisors.

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### **Tuition for Fall and Spring Semesters**

Texas law provides for exemption from or the waiver of tuition and/or fees for students under certain conditions. For specific information, contact the Office of the Registrar. Under Texas law, UTHealth may charge a resident doctoral student who has in excess of 100 credit hours tuition at the rate charged non-resident doctoral students. For specific information, contact the Office of the Registrar.

Resident tuition is \$138 per semester credit hour. Non-resident tuition is \$489 per semester credit hour. Fees are dictated by the University of Texas System and are not mandated by the Legislature. Tuition for residents is at a semester credit hour rate without a minimum.

To maintain full-time student status, a student must register for at least 9 credit hours of GSBS coursework in the Fall and Spring semesters

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### **Tuition for Summer Sessions**

Resident tuition is \$138 per semester credit hour. If students register for additional courses during the second summer term, tuition and fees will be automatically adjusted.

To maintain full-time student status, a student must register for at least 6 credit hours of GSBS coursework in the Summer semester.

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### **Fees and Charges**

Student fees are authorized by state statute; however, specific fee amounts and the determination to increase fees are made by UTHealth administration and The University of Texas System Board of Regents. Please see the website of the Office of the Registrar at <http://registrar.uth.tmc.edu/> for information on fees.

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## **GENERAL REGULATIONS**

Following is a summary of general School regulations. Complete and specific regulations and requirements are included in the School's Policies and Procedures (<http://www.uthouston.edu/gsbs/current-students/academics/policies/index.htm>), developed under the auspices of the Academic Standards Committee. The provisions that apply to a particular student are those in the School Catalog (hard copy or web version) and GSBS Policies and Procedures in effect at the time the student is admitted to a GSBS degree program. However, the student may choose to be guided by the provisions of the Catalog and GSBS Policies and Procedures of any subsequent year in which he or she is in residence.

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### **Degree Requirements**

The general requirements for the PhD and MS degrees are described in previous sections of this Catalog. The specific requirements for the degrees and the timetable for meeting the requirements are presented in the School Policies and Procedures.

All research papers, theses, and dissertations authored by degree candidates are available to interested members of the general public upon request.

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### **Registration**

Full-time students must be registered for each term (Fall, Spring, Summer) of the academic year unless approved for an official leave of absence. Students who are not registered for a term or on an approved leave of absence are considered to have withdrawn from school. Once having withdrawn, a student who wishes to continue formal studies must apply and be readmitted to the GSBS. A student must be enrolled through the semester in which he or she completes all requirements for graduation.

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### **Transfer Credit**

No record of courses taken at other institutions prior to admission to the School will appear on a student's GSBS transcript. However, a student may include courses taken elsewhere in the Program of Work he or she prepares in the petition for admission to candidacy for the MS degree. If these courses (a maximum of two) are approved by the student's Advisory Committee and the Academic Standards Committee, the credits earned in these courses may count toward the 30-credit-hour minimum required for the degree. At the PhD level, particular courses taken at the graduate level at another institution, if approved by the Academic Standards Committee, may be considered as meeting individual PhD area requirements.

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### **Grading System**

Graduate students must be assigned letter grades (A, B, C, F) for completion of formal courses listed in the GSBS Catalog. For computation of the GPA: A = 4, B = 3, C = 2, and F = 0.

Grades received in approved courses taken at other institutions will be recorded as submitted by the institution and will be calculated in the GPA.

Literature Surveys, *Special Project: Research, Seminars, The Ethical Dimensions of the Biomedical Sciences, Tutorials*, and other research courses listed in the School Catalog are assigned grades of *Pass (P)* or *Fail (F)*. A grade of P will not be included in the computation of a student's GPA.

For *Special Project: Course*, the instructor may assign either a letter grade (A, B, C, F) or a Pass/Fail grade. However, the grading system must be the same for all students in the course. A letter grade will be included in the computation of a student's GPA; a grade of P will not.

*Thesis for Master of Science* and *Dissertation for Doctor of Philosophy* will be listed as Pass (indicating sufficient progress) or Fail.

The symbol "I" (Incomplete) is reported when the student has not completed all the assignments in a course before its conclusion, and is valid for one semester. Before the end of the semester following receipt of the "I" designation, the student must turn in the required work for a regular grade, or the "Incomplete" will be replaced with a failing grade. In unusual circumstances, the student may apply through the instructor for an extension of the "I" period until the next time the course is offered. Incompletes are not normally granted on the basis of poor academic performance.

The symbol *WP* is given when a student with satisfactory course performance withdraws from a course within the first nine weeks of class with the consent of the instructor. A *WP*, by itself, will not prevent the student from withdrawing from GSBS in good standing. The symbol *WF* is given if the student has unsatisfactory course performance up to the date of withdrawal. A *WF* grade is equivalent to an F in the calculation of the GPA. There will be no withdrawal after the last day of the ninth week of class.

A failing grade in any course taken while a student at GSBS is grounds for dismissal from GSBS. The student may request that the Dean allow him or her to retake the course the next time it is offered (usually within one year) rather than being subject to dismissal. If the request is granted, the student must earn a grade of A or B in that course; a grade of C when the course is retaken will result automatically in dismissal. During the interim, the student will be on academic probation. If the student passes the course, the F will remain on the transcript, but only the new grade will be calculated in the student's GPA.

Students may retake a GSBS course, in which case both the new and previous grades will appear on the transcript but only the second grade will be calculated in the GPA. Students whose GPA is less than 3.0 may not retake courses in which they received a B in an effort to raise their GPA to 3.0 or above.

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## **Grade Grievance Procedure**

In attempting to resolve any student grievance regarding grades or evaluations, it is the obligation of the student first to make a good faith effort to resolve the matter with the faculty member involved. Individual faculty members retain primary responsibility for assigning grades and evaluations. The faculty member's judgment is final unless compelling evidence suggests differential treatment or mistake. If the evidence warrants appeal, the student must submit a request in writing with supporting evidence to the Dean. The determination of the Dean is final.

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## **Probation**

*Causes* — Any of the following actions or conditions can cause the student to be placed on academic probation by the Dean:

Failure of any course;

Failure to maintain a School cumulative grade point average of 3.0 or better;

Failure to meet with his or her Advisory Committee within a six-month period;

Failure to meet the particular requirements for the MS or PhD degree in the time periods specified by the School; or,

Failure to make satisfactory progress toward the degree.

*Consequences* — Any student on probation will not be allowed to stand for the MS final oral thesis examination, petition for the PhD candidacy examination, or stand for the defense of the PhD dissertation.

More severe actions, up to and including dismissal may be considered by the Academic Standards Committee for a student's failure to make satisfactory progress toward the degree.

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## **Dismissal**

*Causes* – The following list describes the most common conditions or circumstances in which the Dean may dismiss a student from the Graduate School:

1. If the student fails any course; or
2. If the student's academic deficiencies are not resolved within the time period specified in policy or by the Dean; or

3. A student displays substantial deficiencies in his or her ability to perform effectively in a laboratory, or other research or training environment (as determined by one or more GSBS faculty members); or
4. If a student fails the PhD candidacy examination.

*Procedures* – The Academic Standards Committee will consider any questions concerning a student’s academic progress in which dismissal is a possible outcome, and will make the decision concerning the dismissal of the student. If the student wishes to appeal the decision of the Academic Standards Committee, he or she may appeal to the Dean, who will consider the evidence and the decision of the Academic Standards Committee and render a decision on the appeal. The Dean’s decision is final.

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### **Student Conduct and Discipline**

Students are responsible for knowledge of and compliance with University policies concerning student conduct and discipline as set forth UTHealth HOOP Policy 186, Student Conduct and Discipline. The GSBS Code of Conduct pledge must be signed by all students in School degree programs when they first enroll in GSBS and when they petition for MS and PhD candidacy.

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### **Leaves of Absence, Time Away from Duties and Withdrawals**

The GSBS allows students to request an official Leave of Absence (LOA) for up to one year. During an official LOA, the student cannot be paid by the advisor or the School, but may work at outside employment. Students may request an official LOA from the Office of Academic Affairs. Students must state a date when they will return from LOA. If they do not return by that date, and they have not been granted an extension of the LOA, they will be considered to have withdrawn from the GSBS.

Students may return prior to the date indicated on the LOA form. Students returning from LOA do not need to re-apply for admission, but they must notify the Office of Academic Affairs that they are returning at least two to three weeks prior to the semester in which they wish to re-enroll. Extensions of the official LOA for a maximum of up to one additional year may be requested through the Office of Academic Affairs, and must have the approval of the Dean. Requests for extensions must be submitted at least six weeks before the end of the initial leave.

Any student who fails to register for any semester and who has not been granted an official leave of absence or been approved as a non-registered candidate for a degree will be considered to have withdrawn from the School. Once having withdrawn, a student who wishes to continue formal studies must apply and be readmitted to the School.

## **Time Away from the Lab**

Students receive their stipends as employees from one of the GSBS parent institutions, each of which has their own employment policies and procedures with which the student must comply. UTHealth and MDACC each has its own policies on several issues, such as the amount of time graduate students are permitted to be away from their lab or workplace for purposes such as sick leave, vacation, family-related leave, etc., and the policy of the institution at which the student is employed shall apply. In all cases, however, the students should remember that he/she is employed by the advisor, and the advisor sets the standards for work ethic and policies of the lab, including attendance standards and expectations. The student and advisor should always explicitly discuss the advisor's expectations before they make a mutual commitment. In all cases, it is the student's responsibility to request time away from the lab (or expected lab activities; in advance, when possible) and to keep the advisor, or the advisor's designee, informed in a timely manner of any unanticipated absences, e.g., for illness, family emergencies, etc.

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## **GRADUATE STUDENT ASSOCIATION**

The GSBS Graduate Student Association (GSA) has as its purposes to provide a student forum for discussion of common needs, to work cooperatively with the faculty and administration to build a recognized and respected institution, and to develop student fellowship and social activities.

The GSA has a responsible position in the operation and development of the School, and it performs an important function as the official organization representing the School's student body. Students recommended by the GSA serve *ex officio* on each of the GSBS standing committees, excluding the Faculty Membership Committee.

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## **OUTREACH PROGRAM**

Many GSBS students participate in community service activities organized by the GSBS Outreach Program. Some of the services have included presentation of lectures for science classes and clubs, provision of judges for science fairs, and development of a science project handbook to assist in preparation for science fairs. The Outreach Program not only provides the community with the opportunity to utilize some important resources of the Health Science Center, but also provides our students with a unique opportunity to encourage young students to pursue an interest in science. GSBS has adopted two Houston inner-city elementary schools to support and promote science in a long-term relationship through activities that include "hands-on" science experiments, development of a science laboratory, promotion of science careers through role models, and tours of UTHealth schools and laboratories.





## COURSE OFFERINGS IN BIOMATHEMATICS

**GS01 1013**     *Bayesian Data Analysis.*     **3 sem. hrs.**

Fall, annually. Prerequisite: Calculus, linear algebra, prior probability and statistics course (or permission of instructor). Baladandayuthapani, Veera. This course will cover Bayesian methods for analyzing data. The emphasis will be on applied data analysis rather than theoretical development. A variety of models, including linear regression, hierarchical models, and models for categorical data will be considered.

**GS01 1014**     *Biomedical Statistics.*     **4 sem. hrs.**

Summer, annually. Prerequisite: None. Zhou, Shouhao. Course material will include the basic statistics usually found in introductory courses (t-tests, chi-square, contingency tables) but will also include a balanced emphasis on nonparametric methods, the analysis of variance and covariance through multi-way and hierarchical designs, and regression analysis from simple linear regression analysis through nonlinear methods. The use of personal computers and commercially available statistical analysis programs is emphasized in a computer laboratory. Presentation methods, graphics, and statistical word processing are also emphasized. This course fulfills the GSBS Quantitative area breadth requirement.

**GS01 1023**     *Survival Analysis.*     **3 sem. hrs.**

Spring, odd-numbered years. Prerequisite: *GS011033, Introduction to Biostatistics and Bioinformatics*, or permission of instructor. Shen, Yu. Survival data are commonly encountered in scientific investigations, especially in clinical trials and epidemiologic studies. In this course, commonly used statistical methods for the analysis of failure-time data will be discussed. One of the primary topics is the estimation of survival function based on censored data, which include parametric failure-time models, and nonparametric Kaplan-Meier estimates of the survival distribution. Estimation of the cumulative hazard function and the context of hypothesis testing for survival data will be covered. These tests include the log rank test, generalized log-rank tests, and some non-ranked based test statistics. Regression analysis for censored survival data is the most applicable to clinical trials and applied work. The Cox proportional hazard model, additive risk model, other alternative modeling techniques, and new theoretical and methodological advances in survival analysis will be discussed.

**GS01 1033**     *Introduction to Biostatistics and Bioinformatics.*     **3 sem. hrs.**

Spring, annually. Prerequisite: Calculus and linear algebra. Hess, Kenneth. This course is a one-semester overview of statistical concepts most often used in the design and analysis of biomedical studies. It provides an introduction to the analysis of biomedical and epidemiological data. The focus is on non-model-based solutions to one sample and two sample problems. The course also includes an overview of statistical genetics and bioinformatics concepts. Because this course is primarily for statistics majors, the applied methods will be related to theory wherever practical. Students will be given the opportunity to gain experience in the general approach to data analysis and in the application of appropriate statistical methods. Emphasis will be on the similarity between various forms of analysis and reporting results in terms of measures of effect or association. Emphasis will also be given to identifying statistical assumptions and performing analyses to verify these assumptions. Because effective communication is essential to effective collaboration, students will have the opportunity to gain experience in presenting results for statistically naive readers.

**GS01 1053      *Linear Regression and Statistical Computing.*                      3 sem. hrs.**

Fall, annually. Prerequisite: Introductory statistics, or permission of instructor. Shete, Sanjay. This course will cover basic linear regression analysis. Topics to be covered include simple and multiple regression, diagnostics, influence, and model construction. The emphasis will be on the practical aspects of the construction and validation of linear models. The course will include extensive samples of the use of computer software to perform such analyses. Statistical package "R" will be used primarily for these examples, although other packages will be illustrated as well. (Students will be permitted to use whatever software they prefer for class assignments.) This course is intended as an applied introduction to regression analysis. Theoretical results will be developed and presented as necessary, but the emphasis will be on applications.

**GS01 1062      *Introduction to Bioinformatics.*    2 sem. hrs.**

Fall, annually. Prerequisite: None. Chen, Ken; Navin, Nicholas and Rao, Arvind. This course is intended to be an introduction to concepts and methods in bioinformatics with a focus on analyzing data merging from high throughput experimental pipelines such as next-gen sequencing. Students will be exposed to algorithms and software tools involved in various aspects of data processing and biological interpretation. Though some prior programming experience is highly recommended, it is not a requirement.

**GS01 1083      *Mathematical Statistics I.*    3 sem. hrs.**

Spring, annually. Prerequisite: Advanced undergraduate course in probability and statistics; probability theory and the central concepts and methods of statistics. Berry, Donald. The course will include a review of probability theory, including generating functions, common families of distributions, multivariate distributions, and hierarchical modeling. Foundations of statistical inference, including sampling distributions, principles of data reduction, maximum likelihood methods, point and interval estimation, hypothesis testing, and decision theory, as well as applications to advanced statistical problem sets, will be discussed.

**GS01 01093      *Mathematical Probability I.*    3 sem. hrs.**

Fall, annually. Prerequisite: Calculus, real analysis, or permission of the instructor. Shete, Sanjay. This course is the first of a two-semester sequence covering advanced concepts in mathematical probability. Students will have the opportunity to learn the measure-theoretic foundations of probability. Topics covered include sigma-fields, probability spaces, random variables, measures, measurable functions, expectation, integration, convergence theorems, product spaces, Fubini's theorem, and convergence concepts.

**GS01 1113      *Introduction to Mathematical Statistics.*    3 sem. hrs.**

Spring, annually. Prerequisite: *Introduction to Mathematical Probability (GS011213)*, or permission of instructor. Cook, John. This course is the second of two courses intended to establish a theoretical foundation for the biostatistics and biomathematics curriculum. The material introduced in this course is a necessary prerequisite for GSBS courses in informatics, survival analysis, and advanced Bayesian inference. The focus will be on integrating both classical and Bayesian methods in a comprehensive but elementary survey. This course will discuss the general approach to statistical inference for data arising from an unknown probability distribution. Students will learn methods for characterizing specific properties of the distributions and use them in making future predictions. The course will discuss statistical inferential methods for data arising from continuous or discrete distributions.

**GS01 1133**     *Statistical Methods in Bioinformatics.*     **3 sem. hrs.**

Fall, annually. Prerequisite: Introduction to Mathematical Statistics (GS011113) or consent of instructor. Liu, Yin. The objective of this course is to introduce students to the concepts and statistical methods for analyzing large-scale biological data generated from emerging genomic and proteomic techniques. The course will focus on the integration of two disciplines - biology and statistics - by first describing statistical methods most often used in the field of bioinformatics and then discussing their applications on the computational analysis of gene sequence, expression and biological interactions at a large scale. The statistical methods covered include dynamic programming, maximum likelihood estimation, Bayesian inference, Hidden Markov Models, Markov chain Monte Carlo, classification and clustering methods. The students will master advanced applications of statistical computing in a wide range of biological and biomedical problems, including multiple sequence alignment, biomarker and disease gene identification, inference of protein interaction network, functional modules and signal transduction networks.

**GS01 1163**     *Analysis of Microarray Data.*     **3 sem. hrs.**

Fall, biannually. Prerequisite: Permission of instructor. Baggerly, Keith. This course is an introduction to the statistical and bioinformatic analysis of microarray data. The course covers both Affymetrix oligonucleotide arrays and two-color fluorescence cDNA microarrays. The course introduces students to the full range of processing microarray experiments, from experimental design, through image processing, background correction, normalization, and quality control, to the downstream statistical analysis of differential expression. The course includes coverage of the key statistical concept of multiple testing. The course covers common methods of pattern identification and pattern recognition in the context of microarrays. It also includes the bioinformatic interpretation of the results through tools to interact with public genome databases. All concepts will be illustrated through hands-on interaction with publicly available microarray data sets. Homework assignments will require some knowledge of statistical programming language “R.” The course will include a brief introduction to programming language R. In addition to biweekly assignments, student performance will be assessed through presentation of a final project.

**GS01 01183**     *Mathematical Statistics II.*     **3 sem. hrs.**

Fall, annually. Prerequisite: *Mathematical Statistics I.* Shete, Sanjay. This course is a continuation of Mathematical Statistics I. In this semester, the course covers the foundations of statistical inference, including the theory of point and set estimation, hypothesis testing, linear models, asymptotics, decision theory, and Bayesian theory.

**GS01 1213**     *Introduction to Mathematical Probability.*     **3 sem. hrs.**

Fall, annually. Prerequisite: Permission of instructor. Cook, John D. This course presents the basic ideas of probability theory in an axiomatic framework. The idea of a probability space is presented, and the idea of a random variable is given. Also included are conditioning and independence, and an introduction to Markov chains. The course also presents the idea of a function of a random variable and how to find its distribution and moments. Finally, the course presents probability distributions (discrete and continuous).

**GS01 1813**     *Topics in Clinical Trials.*     **3 sem. hrs.**

Spring, even years. Prerequisite: Prior courses in probability and statistics, permission of the instructor. Lee, Jack J. This course deals with fundamental concepts in the design of clinical studies ranging from early dose-finding studies (phase I) to screening studies (phase II) to randomized comparative studies (phase III). The goal is to explore the statistical issues involved in clinical trials, to introduce various

clinical trial designs, and to prepare the student to read the clinical trial literature critically. Additionally, faculty will introduce newer designs for clinical studies that incorporate prior knowledge and/or satisfy optimal considerations. Topics include basic study design options, sample size calculation, randomization, trial conduct, interim monitoring, data analysis, adaptive designs, multiple endpoints, meta-analysis, decision analysis, Bayesian methods, innovative phase I and II trial designs, and writing up the results of a clinical trial for publication.

## **COURSE OFFERINGS IN BIOPHYSICS, MEDICAL PHYSICS AND NUCLEAR MEDICINE**

**GS02 1011**     *Radiation-Induced Late Effects and Survivorship*     **1 sem. hr.**  
*Journal Club.*

Fall and Spring, annually. Prerequisite: Medical Physics Program or consent of instructor. Mirkovic, Dragan. Students will meet weekly to present and discuss a contemporary publication on the subject of late effects, cancer survivorship, and dosimetry following medical radiation exposures. Publications may include scientific articles, books, reports, review papers, etc. The late effects of interest to the participants of this course are radiation-induced second cancers, infertility, organ dysfunction, cardiovascular effects, lung damage, pregnancy and neonatal outcomes, cognitive deficit, auditory impairment, dental abnormalities, diabetes, other chronic disease, and other long-term radiogenic effects and public health concerns. Medical radiation exposures include those related to radiotherapy and diagnostic imaging. Radiation dosimetry, late effects, and survivorship publications will be based on radiological measurements, analytic calculations, Monte Carlo calculations, predictive risk models, epidemiological data, and any related studies. The presentation outline comprises 25 minutes of prepared slides and 25 minutes of discussion. Each student will be required to present at least once during the semester and will be expected to actively participate in the discussion period. A minimum of 80% attendance is required for a passing grade. Students and faculty will not present their own work. This course is intended for Medical Physics students but is open to students from other programs with instructor consent.

**GS02 1012**     *Physics of Positron Emission Tomography.*     **2 sem. hrs.**

Summer, biannually. Prerequisites: *Radiation Detection, Instrumentation, and Data Analysis (GS021053)* and *Introduction to Medical Physics II: Medical Imaging (GS021093)* or *Introduction to Medical Physics IV: The Physics of Nuclear Medicine (GS021193)*. Mawlawi, Osama. This course will focus on advanced Positron Emission Tomography (PET) physical principles, image formation and processing, and image correction techniques, as well as lay the foundations for understanding tracer kinetic modeling. Students will have the opportunity to obtain hands on experience with PET imaging and data analysis. The use of PET imaging in various medical and research applications will be presented.

**GS02 1014**     *Fundamental Biological Principles of Molecular*     **4 sem. hrs.**  
*Imaging and Therapeutics.*

Spring, annually. Prerequisites: Consent of instructor. Jackson, Edward. This course covers the biological principles that form the basis for molecular imaging and therapeutics. It is an introductory course that assumes that the student has completed at least one year of general chemistry and, preferably, at least one semester of biology. It is further assumed that the student has a firm understanding of calculus and ordinary differential equations. Topics covered include the fundamental aspects of biochemistry, cell biology, and cancer biology needed to appreciate and understand critical concepts in

the applications of modern molecular imaging and therapeutics. Applications and examples of key concepts to molecular imaging and/or therapeutics are provided throughout the course. The course is designed for students in the Medical Physics Program, but is also open to students in other programs who are in need of an introduction to molecular and cellular biology. This course fulfills the GSBS Molecular area breadth requirement.

**GS02 1022      *Special Radiation Treatment Procedures.*                      2 sem. hrs.**

Summer, annually. Prerequisite: *Introduction to Medical Physics I (GS021093)*, *Introduction to Medical Physics III: Therapy (GS021113)*, and *Introductory Radiation Therapy Physics Rotation (GS021154)*. Court, Laurence. The main goal of this course is to introduce students about special radiation therapy or image-guided therapy procedures that are considered “non-routine” or in “advanced” form relative to the current clinical practice and may require special consideration in the preparation and execution. Special procedures are important clinical services which are usually provided directly by the clinical medical physicist. The special procedures selected in this course may change overtime. Currently, the following topics are included: intra-operative HDR; stereotactic radiosurgery and radiotherapy; image-guided radiotherapy procedure; total skin and total body irradiation techniques; fetal and pacemaker dosimetry; commissioning of IMRT planning systems; 4D CT imaging procedures; and tomotherapy treatment techniques..

**GS02 1032      *Principles of Magnetic Resonance Imaging.*                      2 sem. hrs.**

Summer, biannually. Prerequisite: *Introduction to Medical Physics II (GS021103)* or consent of instructor. Jackson, Edward. The goal of this course is to provide a comprehensive understanding of the physics involved in magnetic resonance imaging (MRI), and prepare the students to carry out research or practice medical physics in this area. The topics include basic spin physics, contrast mechanisms, hardware, data acquisition, image reconstruction, and artifact recognition. Emphasis will be placed on practical issues encountered in research and clinical applications.

**GS02 1042      *Radiation Biology.*    2 sem. hrs.**

Fall, annually. Prerequisite: Permission of instructor. Ibbott, Geoffrey; Followill, David. This course will cover the fundamentals of radiation biology for graduate students of biophysics, radiation biology or medical physics.

**GS02 1053      *Radiation Detection, Instrumentation,  
and Data Analysis.*    3 sem. hrs.**

Spring, annually. Prerequisite: *Introduction to Medical Physics I (GS021093)* or equivalent, and permission of instructor. Howell, Rebecca. This course encompasses a study of the characteristics and applications of charged particle, photon, and neutron detectors. Modular analog and digital electronics required for signal processing and data recording will be used. Techniques of data analysis and error propagation of counting statistics will be introduced. The course will include two lectures and one laboratory exercise weekly. The applications of radiation detectors in radiotherapy, health physics, nuclear medicine, and radiobiology will be emphasized.

**GS02 1093      *Introduction to Medical Physics I:  
Basic Interactions.*    3 sem. hrs.**

Fall, annually. Prerequisite: Permission of instructor. Starkschall, George. This semester covers the basic interactions of ionizing and non-ionizing radiation important in medicine. Topics include photon,









Biochemistry and Molecular Biology.

## **COURSE OFFERINGS IN CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY**

**GS04 1012**     *Clinical Principles of Cancer Metastasis.*                                 **2 sem. hrs.**

Fall, annually. Prerequisite: Instructor approval and/or a passing grade in each of the following: GS041063: Cancer Biology; GS041133: Cancer Cell Signaling; GS041093: The Biology of Cancer Metastasis. Kopetz, Scott. This course will introduce fundamental principles and clinical experiences of the care of cancer patients, with an emphasis on the continuum of treatment modalities, interventional trials, and translation of scientific advances to clinic from the perspective of cancer patients and clinical care providers. Each week, students will attend a once-hour lecture followed by a two-hour patient care observation module in various clinical settings.

**GS04 1013**     *Cell Biology.*   **3 sem. hrs.**

Fall, annually. Prerequisite: General background in biology and biochemistry. Enrollment limited to GSBS degree-seeking students. Frost, Jeffrey. This course is designed to develop a functional understanding of cell biology. It is organized into four general sections: eukaryotic cell organization and function; dynamics of organellar components; physiological regulation of cell function; and, cell-cell interactions. The course format includes lectures, round-table discussions, and didactic presentations. This is an introductory course with an interdisciplinary emphasis for students in cell and regulatory biology programs. This course fulfills the GSBS Cellular area breadth requirement.

**GS04 1022**     *Vascular Biology: Basic Science to Clinical Research.*   **2 sem. hrs.**

Spring, annually. Prerequisite: None. Open to all GSBS students after their first year. Geng, Yong-Jian. This advanced biomedical science course is designed to explore modern concepts of vascular biology and human vascular diseases, and will introduce and discuss current basic and clinical advances in the field. The course will emphasize molecular aspects of vascular biology, physiopathological processes, and the development of advanced therapeutic technology in vascular disease. A unique feature of the course is its integration of basic and clinical research, with a focus on translational research. The aspects of vascular biology to be covered include development, cell biology, genomics, disease processes, and therapeutic approaches. Lecturers will be drawn from researchers and clinicians in the field from several institutions in the Texas Medical Center, including the UTHealth Medical School, M.D. Anderson Cancer Center, Baylor College of Medicine, and Rice University. The focus on current research directions will provide excellent opportunities for students interested in vascular biology as they plan their own research careers.

**GS04 1032**     *Molecular Epidemiology.*   **2 sem. hrs.**

Spring, even-numbered years. Prerequisite: None. Wu, Xifeng. The causes of most chronic diseases in the general population involve the interaction of inherited genotypes, somatic genetic damage, exogenous exposures, and endogenous metabolic pathways. A complete understanding of disease etiology may therefore require a multidisciplinary approach that draws on methods from epidemiology, statistics, classical genetics, and molecular biology. In addition to an overview of molecular biology and epidemiology, this course will present methods and techniques for molecular epidemiology studies. Emphasis will be placed on the application of biomarkers. Advantages and limitations of using biomarkers in epidemiologic studies will be discussed.

**GS04 1042     *Stem Cells in Biomedicine.***

**1 sem. hr.**

Spring, annually. Prerequisite: Permission of instructor. Wassler, Michael. A stem cell is a cell from the embryo, fetus, or adult that , under certain conditions, has the ability to reproduce itself for long periods or, in the case of adult stem cells, throughout the life of the organism. It also can give rise to the specialized cells that make up the tissues and organs of the body. Much basic understanding about embryonic and adult stem cells has come from animal research and from stem cell lines established from embryonic tissues. The objective of this course is to provide students information on stem cell biology and the latest development in animal and human stem cell research and application. This course will offer students an opportunity to improve their knowledge of adult and embryonic stem cells and master this research tool for their studies. The long-term objective of this course is to increase the number of researchers who have both the knowledge and skills in the use of animal and human stem cells. Students will receive a review of basic stem cell biology and experimental/clinical application of stem cells in biomedicine for the use of human biological materials, including proper exposure precautions, safe methods of disposal, and scientific record keeping. Students will also have the opportunity to learn recent development in stem cell research in both basic and clinical medicine. A group of scientists with broad expertise on stem cell biology, biochemistry, and clinical application will teach portions of this course.

**GS04 1043     *Molecular Principles of Virology.***

**3 sem. hrs.**

Fall, annually. Prerequisite: None. Fang, Bingliang. This is a general course in virology designed to serve as the introductory course for the Graduate Program in Virology. Emphasis is placed on both DNA and RNA animal viruses in terms of their properties, identification, classification, virus-host cell interactions, mechanisms of virus replication, and virus-induced transformation. The involvement of tumor viruses in the neoplastic disease process also is presented.

**GS04 1062     *Methods in Cancer Mestastasis Research.***

**2 sem. hrs.**

Summer, annually. Prerequisite: Permission of instructor, and all students will comply with the M.D. Anderson IACUC resolutions and must have completed appropriate animal care and handling training tapes prior to taking the course. Gallick, Gary; Fidler, Isaiah J. This course is designed to provide students with in-depth training in some of the most important methods in cancer metastasis research: microscopy, tumor histopathology, and the use of orthotopic mouse models for tumor growth (primary and metastasis). The course will be taught over two weeks - four hours a day for the first week and six hours a day for the second week. The first week will cover principles of tumor histopathology and will be taught by a practicing board-certified pathologist from UT MD Anderson Cancer Center and an expert microscopist. The second week will cover the use of orthotopic mouse models for the study of human tumor growth and pathogenesis. Didactic lectures will begin each day, but the majority of the course will be “hands-on” bench work, and provide the opportunity for students to learn firsthand the most important techniques being used in the study of cancer metastasis.

**GS04 1063     *Cancer Biology.***

**3 sem. hrs.**

Fall, annually. Prerequisite: General knowledge of biochemistry or permission of instructor. Gallick, Gary. This is a lecture course on aspects of recent progress and active research in cancer biology. Topics will include tumor/host interactions, metastasis and invasion, tumor cell biochemistry, tumor heterogeneity, therapy, cell surfaces, and development aspects, and is an introductory course for the Program in Cancer Biology. This course fulfills the GSBS Systems area breadth requirement.

**GS04 1072**     *Principles of Stem Cell Biology.*

**2 sem. hrs.**

Spring, annually. Prerequisite: None. Simmons, Paul. Stem cells, be they embryonic or somatic, play crucial roles in the development and functional maintenance of individual organ systems and complete organisms. As has already been well demonstrated for the blood-forming system through bone marrow transplantation, stem cells can be utilized clinically for treatment of genetic or acquired diseases. The ensuing decades will undoubtedly provide many more successful clinical applications of stem cells in regenerative medicine. Stem cells may also play critical roles themselves in the initiation and maintenance of certain diseases, such as cancer. This course will provide a present-day understanding of the precise definition, molecular characterization, and biological function of stem cells. The course focus will primarily be on fundamental issues regarding stem cells, and less on their wide range of potential future applications. Completion of this course should adequately prepare students to both identify and understand fundamental issues in current stem cell research, as well as to permit students themselves contribute to advancing this field through research.

**GS04 1073**     *Developmental Biology.*

**3 sem. hrs.**

Spring, annually. Prerequisite: Consent of instructor. Behringer, Richard. Developmental Biology is one of the fundamental modern biological disciplines. This course provides an in-depth examination of the basic cellular, molecular, and genetic mechanisms by which a fertilized zygote transforms into an organism with fully differentiated and functioning tissues. Topics covered will include cell-to-cell communication, patterning of the embryo, tissue morphogenesis, cell differentiation and stem cells, advantages and disadvantages of classical and genetic model organisms for analyzing development, postembryonic development and regeneration, and the profound implications of developmental biology for medicine and evolution. The course is lecture-based but will emphasize the experimental evidence underlying the basic principles of Developmental Biology and will discuss current debates and recent findings that have yet to be simplified for textbook presentation. This course fulfills the GSBS Systems area breadth requirement.

**GS04 1083**     *Basic Concepts of Tumor Biology.*

**3 sem. hrs.**

Fall, even-numbered years. Prerequisite: Consent of instructor. Richie, Ellen. This is a comprehensive survey course of cancer biology including tumor pathology, initiation, progression and metastasis, genetic instability, DNA damage and repair, cell cycle control, oncogenes, tumor suppressor genes, and the immune response. This course is taught at the UT MD Anderson Cancer Center Science Park in Smithville, Texas.

**GS04 1093**     *The Biology of Cancer Metastasis.*

**3 sem. hrs.**

Spring, annually. Prerequisite: Consent of instructor. Gallick, Gary. This is a didactic introductory level course entirely dedicated to the study of the cellular biological processes that underpin cancer metastasis. This course will cover basic, translational, and clinical knowledge, with specific emphases on the metastatic cascade: seed and soil hypothesis, organ-specific metastasis, cell cycle and metastasis, multiple therapies for various metastatic cancers, and will address the process of taking basic research to the clinic (“bench-to-bedside”) for three major metastatic human cancers.

**GS04 1103**     *Principles of Therapeutics.*

**3 sem. hrs.**

Spring, annually. Prerequisite: Basic understanding of biochemistry and cell biology. Hittelman, Walter. This course will establish a foundation of the principles of therapeutics and will introduce students to the



Presentation on ethical, regulatory, intellectual property, and industrial considerations, as well as engineered plants as human therapeutics, will give a comprehensive picture of this topic. Lectures will be presented by experts in the field using examples and data from their studies.

**GS04 1181     *The Molecular Basis of Programmed Cell Death.*     1 sem. hr.**

Fall, annually. Prerequisites: *Metabolic Biochemistry (GS031014)* and *Molecular Basis of Oncogenes (GS041134)*. McDonnell, Timothy. This course will examine the process of programmed cell death, or apoptosis. Details regarding the molecular regulation and biochemical mechanisms of apoptosis will be discussed. The relevance of apoptotic cell death to normal development, carcinogenesis and cancer treatment, and other disease states will be demonstrated.

**GS04 1183     *Molecular Methods and Biotechniques.*     3 sem. hrs.**

Spring, even years. Prerequisite: One semester of core coursework. Wood, Richard and Shen, Jianjun. This course will introduce graduate students, at an early stage of their research careers, to a wide variety of methods and techniques especially applicable to research in modern molecular biology. The course will feature a diverse group of instructors, each of them possessing a specialized research knowledge of a particular group of molecular methods and biotechniques. Each instructor will combine classroom lecture with an in-laboratory demonstration. The lecture-demonstrations are grouped into three modules covering the general areas of biochemical, cell biology, and whole organism methods and techniques. Students will learn about the theoretical basis of commonly used modern methods and techniques for research in molecular biology, about the different types of information that can be gained by application of different techniques to a problem, about which techniques are most appropriate in a given situation, and about data interpretation. Students will also be introduced in a laboratory setting to the actual apparatus, equipment or devices available for most techniques.

**GS04 1203     *Experimental Genetics.*     3 sem. hrs.**

Fall, annually. Prerequisite: None. Mattox, William and Behringer, Richard. This course provides students with a base of knowledge about concepts central to contemporary genetics (i.e. complementation, recombination, mutational screens, mosaic analysis, gene targeting) and covers current approaches used in the analysis of classical eukaryotic genetic systems including humans, mice, flies, nematodes, and yeast. In addition to lectures, students will participate in several computer workshops where they will have the opportunity to learn to navigate through various Internet-based bioinformatic resources useful to geneticists. This course fulfills the GSBS Systems area requirement.

**GS04 1213     *Mechanisms in Cancer Therapeutics.*     3 sem. hrs.**

Fall, annually. Prerequisite: Basic understanding of biochemistry and cell biology. Robertson, Fredika. This course will establish a foundation of the principles of cancer therapy, including pharmacologic rationales, consideration of biological targets, and mechanism-based approaches to combinations. A major emphasis will be placed on agents that damage DNA, and the response of tumor cells to such insults. In depth presentations will consider all classes of chemotherapeutic agents, their metabolism, and mechanisms of action, and the resistance mechanisms of tumor cells. Mechanistic rationales for other therapeutic modalities used for cancer treatment such as radiotherapy, gene therapy, and immunotherapy will also be covered. Students will have the opportunity to learn to identify novel therapeutic targets, and the procedures used to develop new agents for clinical evaluation.

**GS04 1223     *Fundamental Mechanisms of Cancer Development.*     3 sem. hrs.**

Fall, annually. Prerequisite: None. Flores, Elsa and Galko, Michael. This course emphasizes the developmental roots of cancer biology, covering major signaling pathways (RTK signaling, Hh signaling, etc.) and cell processes (cell death/apoptosis, epithelial-to-mesenchymal transitions) that are important both in normal development/homeostasis of the organism, and, when mutated or misregulated, in the progression of cancer. A series of lectures will introduce each pathway or process in cancer and then backtrack to highlight the normal developmental/homeostatic roles of the pathway/process being covered. These will be tied to a class-wide discussion of a recent or classic paper in the field that will occur every third lecture. The teaching philosophy emphasizes development of critical thinking and understanding of central concepts.

**GS04 1731     *Seminar in Developmental Biology.*                             1 sem. hr.**

Spring, annually. Prerequisite: Permission of instructor. Galko, Michael and Arur, Swathi. This course involves weekly 90-minute meetings for student presentations on contemporary topics in developmental biology. The topics will be drawn from the current literature and will emphasize genetic and molecular approaches.

**GS04 1751     *Seminar in Regulatory Biology.*                                 1 sem. hr.**

Fall, annually. Prerequisite: None. Schonbrunn, Agnes and Cabral, Fernando. This course has two major objectives. The first objective is to familiarize students with current research in regulatory biology with particular emphasis on molecular mechanisms of cell regulation and signaling. The second objective is to teach students how to give outstanding research seminars. Weekly 90-minute meetings involve alternate faculty and student presentations on current problems in regulatory biology. Faculty presentations introduce each topic and provide a broad and critical overview of approaches used to tackle research problems. Student presentations cover recent articles from leading journals on the same topic. Students are instructed in the preparation of slides/overheads, seminar organization and techniques of oral presentation and are given detailed feedback by faculty and fellow students following their presentations. Three to four topics are covered each year and the topics discussed vary annually. Students can, and often do, register for the course multiple times during their graduate careers.

**GS04 1761     *Current Topics in Oncogene Research.*                             1 sem. hr.**

Spring, annually. Prerequisite: None. Hung, Mien-Chie. This is a seminar course in which students will meet once every week. Each student is expected to give at least one seminar per semester. The seminar topic will be mainly on oncogene-related subjects from current leading journals. The objectives of the course are to develop students' oral communication skills in science and to become familiar with up-to-date literature in oncogene research.

**GS04 1771     *Current Topics in Tumor Progression.*                             1 sem. hr.**

Fall and Spring, annually. Prerequisite: None. Gallick, Gary. This is a seminar course in which students meet weekly and analyze current topics in the molecular regulation of tumor progression and metastasis. Alternate faculty and student presentations of the current literature not covered in depth in other courses or formats will fulfill two objectives. First, students will learn to critically analyze, evaluate, and present current articles in this area. Second, students will learn how to critically write an NIH-type grant application which will be peer-reviewed by both the Coordinator and the students. The extension of this course to two semesters is intended for students who wish to use the Current Topics course as an accompaniment to GS040063 and GS040134, although each of these courses can also be taken

independently.

**GS04 1791**     *Current Topics in Programmed Cell Death.*                     **1 sem. hr.**

Spring, annually. Prerequisite: Permission of instructor. McDonnell, Timothy. This is a seminar course that will review recent findings regarding the regulation of programmed cell death (apoptosis) and its relevance to multistep carcinogenesis.

**GS04 1801**     *Current Topics in Genes and Development.*                     **1 sem. hr.**

Fall and Spring, annually. Prerequisite: Student must be in at least their second year to take the class, or permission of instructor. Gladden, Andrew; Arur, Swathi; Picus, Mark (Fall); Behringer, Richard (Spring). This is a seminar course in which students will meet once every week. Instruction will be given to develop students' oral presentation skills in science. Students will participate in the critique of presentations and present seminars on their research at least once a year.

**GS04 1812**     *Seminars in Molecular Mechanisms  
of Human Cancer.*                     **2 sem. hrs.**

Fall, annually. Prerequisite: None. Nagarajan, Lalitha and Lee, Mong-Hong. This is a seminar course to provide in-depth knowledge on recent developments in human cancer research. The focus will be on the molecular basis of human neoplasia. Each week, two students will discuss background knowledge and current developments on a specific human cancer.

## **COURSE OFFERINGS IN IMMUNOLOGY**

**GS06 1014**     *Immunology I.*                     **4 sem. hrs.**

Fall, annually. Prerequisite: Knowledge of basic biochemistry and genetics. Zhu, Chengming. Topics covered in this lecture series include anatomy and development of the immune system; structure, function and genetics of antibodies; T-cell antigen receptors; functions and cooperative interactions of lymphoid cells; structure and function of molecules encoded by the Major Histocompatibility Complex (MHC); lymphokines and their receptors; cellular interaction molecules; and specific immunological tolerance. Medically-related subjects that will be covered from a basic science perspective include immunopathology, immunodeficiency, allergy and other hypersensitivities, autoimmunity, organ transplantation, tumor immunology, and AIDS. This course fulfills the GSBS Cellular area breadth requirement.

**GS06 1073**     *Molecular Signaling in Immune Responses.*                     **3 sem. hrs.**

Spring, annually. Prerequisite: *Immunology I (GS061014)* or *Cancer Biology (GS041063)*. Watowich, Stephanie. This course will explore the biological and biochemical properties of cytokines involved in natural immunity, inflammation, growth and differentiation of normal and malignant lymphocytes, and hematopoiesis. Lectures will cover background information including cytokine discovery, cloning, signaling and potential therapeutic application in autoimmune, infectious, and malignant disease. The course will emphasize student presentations and discussions of recently published research findings related to the major cytokine families.



**GS06 1102     *Immunology II: Regulation of Immune Responses.*     2 sem. hrs.**

Spring, annually; first half of the semester. Prerequisite: *Immunology I (GS061014)* or permission of instructor. McIntyre, Bradley. Topics in this course will include antigen processing, lymphokines, development of T and B lymphocytes, antigen recognition by T lymphocytes, cellular activation, and cell interactions. Each student will read selected papers in cellular immunology and make several oral presentations.

**GS06 1112     *Immunology III: Special Topics  
in Molecular Immunology.*     2 sem. hrs.**

Spring, annually; second half of the semester. Prerequisites: *Immunology I (GS061014)* and *Immunology II (GS061102)* or permission of instructor. Dong, Chen. This course will approach the subject of immunology from the current literature. Selected readings from the primary literature will be presented by each student, which will be used to develop a research proposal.

**GS06 1611     *Advanced Topics in Immunology.*     2 sem. hr.**

Spring, annually. Prerequisite: Immunology I and Biochemistry or permission of instructor. Ullrich, Stephen. This course is an analysis of current topics in immunology. Weekly oral presentations of an assigned topic will be made by participating students. Course emphasis is on the development of communication skills and analysis of current research areas.

**GS06 1711     *Seminar in Immunobiological Research.*     1 sem. hr.**

Fall, annually. Prerequisite: None. Lizee, Greg and Cao Wei. This seminar course will provide basic training for delivery of effective scientific presentations. The course will outline the skills and techniques most suitable for presenting both completed research studies and grant funding proposals in the field of immunology. Students are required to be actively involved in giving and critiquing seminar presentations. Completion of this course is a recommended prerequisite for Immunology II (GS060102).

## **COURSE OFFERINGS IN MICROBIOLOGY**

**GS07 1011     *Topics in Bioterrorism.*     1 sem. hr.**

Fall, annually. Prerequisite: None. Koehler, Theresa and Norris, Steven. The broad impact of bioterrorism on scientific research and the role of scientists in preparedness and response will be addressed in a series of seminar presentations. Speakers with expertise in diverse areas, including public health response, select agent biology, diagnosis and disease management, and public policy, will present talks which will be followed by group discussion.

**GS07 1023     *Medical Microbiology - Medical Bacteriology.*     3 sem. hrs.**

Fall, odd-numbered years. Prerequisite: One undergraduate course in microbiology. Goldschmidt, Millicent. This course is a study of medically important bacteria, their transmission, host relationships, mechanisms of pathogenicity, diagnosis and therapy. Examples of research methodology used in determining these parameters will also be presented.

**GS070014 GS07 1063 *Microbial Molecular Genetics.* 3 sem. hrs.**

Fall, annually. Prerequisite: Permission of instructor. van Hoof, Ambro. This course is an introductory graduate level course that provides the students with broad knowledge in molecular genetics, with an emphasis on molecular genetics of prokaryotic and eukaryotic microbes. Topics covered include gene and genome organization, gene expression, genetic mechanisms and genetic experimental strategies. The course is recommended for, but not limited to first-year students. This course fulfills the GSBS molecular area requirement.

**GS07 1082 *Microbial Sensing and Signal Transduction.* 2 sem. hrs.**

Fall, annually. Prerequisites: *Microbiology and Molecular Genetics I (GS071014)* and *Microbiology and Molecular Genetics II (GS071024)* and/or *Cell Biology (GS041013)* are recommended. Moreno, Kevin. This is an advanced course on sensory reception and signal transduction in response to environmental stimuli. Chemoreception, photoreception, and development will be examined in prokaryotic organisms. Signaling in model eukaryotic systems, including G protein-mediated signaling, MAP kinase cascades, and other mechanisms underlying eukaryotic cell chemotaxis, differentiation, and stress responses, will also be explored.

**GS07 1092 *Molecular Basis of Microbial Pathogenesis.* 2 sem. hrs.**

Spring, annually. Prerequisites: *Microbiology and Molecular Genetics I (GS071014)* and *Microbiology and Molecular Genetics II (GS071024)* or permission of instructor. Ton-That, Hung. This is an advanced level course covering current areas of interest in microbial pathogenesis. The goal of the course is to provide a comprehensive overview of the molecular basis of pathogenesis through a critical evaluation of recent scientific papers and reviews. Students, with faculty guidance, will also develop an original grant proposal on a subject of their choosing in microbial pathogenesis. Topics for discussion will include: host-pathogen signal exchange, environmental control of gene expression, genotypic rearrangements associated with pathogenesis, toxin structure and function, bacterial attachment to host cells, invasion of host cells, intracellular growth, and cell-to-cell spread.

**GS07 1113 *Microbial Physiology.* 3 sem. hrs.**

Spring, annually. Prerequisite: *Microbial Molecular Genetics (GS071014)* is recommended, but not required, or permission of instructor. Koehler, Theresa. This course offers a comprehensive examination of the structure and function of prokaryotic and eukaryotic microbial cells and their physiology. Topics covered include Structure and Biogenesis (cell cytoplasm, envelop and surface structures), Energy and Metabolism (nutrient acquisition, membrane transport, respiration, fermentation, and biosynthetic networks), Signaling and Development (signal transduction, cell-cell communication, and cell differentiation), and Pathogenesis (virulence factors and host response). The course is recommended for, but not limited to first-year students. This course fulfills the GSBS Cellular area requirement.

**GS07 1731 *Seminar in Infectious Diseases.* 1 sem. hr.**

Fall, odd-numbered years. Prerequisite: Coursework or work experience in microbiology. Norris, Steven. This is a seminar course which covers the biologic and clinical basis of infectious diseases. Students will read assigned research articles, participate in group discussions, and critically analyze articles in the general areas of microbial pathogenesis, host-parasite interactions, diagnosis, therapy, and prevention.

**1741 *Literature Survey in Microbiology and Molecular Genetics.* 1 sem. hr.**

Fall and Spring, annually. Prerequisite: None. Hung, Ton-That. In this course, students will present and critically evaluate recent journal articles. The specific articles will be chosen by the presenter from the literature in the fields of microbiology and molecular genetics. Students will be evaluated on their presentation and participation in discussions.

**GS07 1751 *Microbiology and Molecular Genetics Seminar Series.* 1 sem. hr.**

Fall and Spring, annually. Prerequisite: None. Ton-That, Hung. Students will attend the weekly departmental seminars series in the Department of Microbiology and Molecular Genetics.

## **COURSE OFFERINGS IN HUMAN GENETICS**

**GS11 1012 *Cancer Genetic Counseling.* 2 sem. hr.**

Spring, annually. Prerequisite: *Psychosocial Issues in Medical Genetics (GS110082)*. Hecht, Jacqueline. This course is taught by the faculty and staff of UT M.D. Anderson Cancer Center and includes lectures by experts in basic science cancer research, clinical oncology, pathology, psychology and cancer genetic counseling. Some of the topics covered include overview of cancer biology and clinical oncology, hereditary colon cancer syndromes, hereditary breast-ovarian cancer syndrome, rare cancer syndromes, management of high risk patients, collecting a cancer-focused family history, hereditary cancer risk assessment models and tools, and psychosocial aspects of cancer risk assessment and counseling. Discussions led by genetic counselors and involving student presentations focus on various hereditary cancer topics and the genetic counseling, ethical, legal, and family issues unique to this area. Students will expand and refine the knowledge and skills learned in this course during their cancer genetics rotation. This course provides students with the background necessary to offer genetic counseling services to individuals referred for cancer risk assessment and genetic testing for cancer susceptibility.

**GS11 1013 *Genetics and Human Disease.* 3 sem. hr.**

Fall, annually. Prerequisite: Permission of instructor; general genetics and statistics recommended. Hanis, Craig; Boerwinkle, Eric. This course introduces principles and methods of human genetic analysis with special reference to the contribution of genes to our burden of disease. Although molecular, biochemical, and morphogenic processes controlled by genes will be briefly surveyed, the course objective is to provide descriptions of the analytical processes whereby genetic mechanisms are inferred and genes located on chromosomes. This course fulfills the GSBS Quantitative area breadth requirement.

**GS11 1021 *Psychosocial Genetic Counseling.* 1 sem. hr.**

Fall and Spring, annually. Enrollment required of all Genetic Counseling MS students. Open only to Genetic Counseling MS students. Czerwinski, Jennifer and Singletary, Claire. This is a two-year course focusing on psychosocial issues in genetic counseling as well as ultrasound findings and current topics in prenatal genetic counseling. The Fall semesters are devoted to ultrasound and prenatal topic presentations, while the Spring semesters are comprised of various units focusing on psychosocial issues in genetic counseling. Topics surrounding cultural competency are also included as part of each semester. Students will have the opportunity to practice presentation skills and participate in various in-class activities, discussions and role-plays. Role-plays allow students to practice different counseling





**GS11 1092      *Genetic Epidemiology of Chronic Disease.*                      2 sem. hrs.**

Spring, annually. Prerequisite: None. Hanis, Craig. This course will expose students to the evidence and logic involved in inferring the contribution of genetic mechanisms to those diseases of public health importance. Emphasis will be on developing a framework for assessing the impact of genes on common disease, but will not include detailed methodological developments or statistical techniques. The format will be a weekly two-hour session in which a single disease will be examined. In this way students will be exposed to a broad spectrum of diseases and see both the uniqueness and the similarities of the problems inherent to each.

**GS11 1103      *Evolution of DNA and Protein Sequences.*                      3 sem. hrs.**

Fall, odd-numbered years. Prerequisite: Calculus, statistics, and consent of instructor. Rodin, Andrei; Fu, Yun-Xin and Hewett-Emmett, David. This course will provide basic principles for understanding factors that govern the evolution of DNA and protein sequences. Students will be provided with the opportunity to learn about the formation and evolution of multigene families and other evolutionary phenomena. They will also be introduced to statistical methods and computer programs for analyzing DNA and protein sequence data. There will be computer demonstrations of some topics. The application of these principles and methods to genome-wide epidemiology will be discussed.

**GS11 1132      *Introduction to Genetic Counseling.*                      2 sem. hrs.**

Fall, annually. Prerequisite: permission of instructor; course is intended for students admitted to the specialized master of science program in Genetic Counseling. Singletary, Claire and Noblin, Sarah. In this course, students learn the foundation of the genetic counseling profession, including the history of the profession, intake and pedigree skills, ethnic carrier screening, and basic prenatal, pediatric, and cancer genetic counseling concepts. Material is delivered in small group presentation and discussion format, as well as via lecture and practice-based role-play. The course is taught by the Program Director with supplemental instruction from the genetic counseling program faculty. Students in the first semester of the genetic counseling program are eligible for this course.

**GS 11 1142      *Approaches to Genetic Counseling Research I.*                      2 sem. hrs.**

Fall, annually. Prerequisite: *Introduction to Genetic Counseling* (GS11 1132). Hashmi, S. Shahrukh and Hecht, Jacqueline. This course provides an introduction to basic concepts in epidemiology, statistics and research instruction on how to use STATA to perform univariable statistical analysis. Students will also be exposed to research ideas in cancer, perinatal and pediatric research that would help them formulate their own thesis research questions. Genetic counseling students in their first year of study are eligible for this course.

**GS11 1152      *Approaches to Genetic Counseling Research II.*                      2 sem. hrs.**

Spring, annually. Prerequisite: *Approaches to Genetic Counseling Research I.* Hashmi, S. Shahrukh and Hecht, Jacqueline. This course provides an introduction to advanced concepts in epidemiology and statistics and instruction on how to use STATA to perform advanced multivariable statistical analysis. Students will also receive instruction on concepts in human research and rationale for IRB reviews. Group discussions during this course will help students polish their research questions and methodology. Genetic counseling students in their first year of study who have passed *Approaches to Genetic Counseling Research I* are eligible for this course.

**GS11 1162**     *Case Studies in Gene-Environment Interaction.*     **2 sem. hrs.**

Fall, annually. Prerequisite: Molecular Genetics. Boerwinkle, Eric. This course will focus on the link between environmental factors and individual genetic factors on the incidence and progression of human disease. The method of study will be classic case studies of gene-environment interactions resulting in human diseases. The course will be taught by expert faculty and involve student presentations of classic papers. The methods of discovery and the impact of the discovery on human health will be emphasized as policies of public health are conceptualized. Experts from outside GSBS who made these sentinel discoveries will be visiting faculty.

**GS11 1173**     *Introductory Clinical Rotation in Genetic Counseling.*     **3 sem. hrs.**

Spring, annually. Prerequisite: Introduction to Genetic Counseling. Noblin, Sarah and Singletary, Claire. This course provides genetic counseling students with the opportunity to become familiar with each clinical setting, including clinical operations, patient population, and other members of the health care team. Students learn how to obtain general and specialty-focused family, pregnancy, and medical histories. They also provide the evaluation and assessment of cases including medical record and literature review. Differential diagnoses are discussed and students observe counseling sessions as well as some diagnostic and medical procedures. As the semester progresses, students begin assuming some of the roles of the genetic counselor during the session, focusing on accurate risk assessment and patient education, and progressing to conducting an entire session. Genetic counseling students in their first year are eligible for this course.

**GS11 1174**     *Advanced Clinical Rotation in Genetic Counseling.*     **4 sem. hrs.**

Spring, Summer and Fall, annually. Prerequisite: Introductory Clinical Rotation - Genetic Counseling. Singletary, Claire and Noblin, Sarah. This course provides genetic counseling students with the opportunity to provide the majority of the genetic counseling during sessions, focusing on refining their clinical counseling skills and further developing their psychosocial counseling skills. Students are encouraged to tackle even the most complex cases coupled with appropriate supervisor support. At the conclusion of the advanced rotations, students will be expected to be fully trained genetic counselors. Genetic counseling students in their second year are eligible for this course.

**GS11 1611**     *Special Topics in Cytogenetics.*     **1 sem. hr.**

Fall and Spring, annually. Prerequisite: None. Sen, Subrata. This is a special topics course in cancer cytogenetics, clinical cytogenetics, prenatal diagnosis, molecular cytogenetics, and gene mapping.

**GS11 1622**     *Topics in Medical Genetics I.*     **2 sem. hrs.**

Fall, annually. Prerequisite: None, however, *Genetics and Human Disease* (GS111013) may be taken concurrently. Singletary, Claire and Raia, Marianna Horz. The first semester course focuses on the fundamentals of Medical Genetics. It combines didactic lectures and discussions. The human genetics faculty teach this "state of the art" course.

**GS11 1631**     *Current Topics in Human and Molecular Genetics.*     **1 sem. hr.**

Fall and Spring, annually. Prerequisite: Second year or higher Program students, or by permission of instructor. Cote, Gilbert and Scheet, Paul. This is a seminar course in which program students and faculty, as well as invited speakers, will meet weekly to present their own research or, on occasion, present critical









## COURSE OFFERINGS IN PHARMACOLOGY AND TOXICOLOGY

**GS13 1011**     *Computer-Aided Drug Design.*     **1 sem. hr.**

Fall, annually. Prerequisites: None. Zhang, Shuxing. This course gives introductory knowledge of computer-aided drug design, including both cheminformatics and bioinformatics. All drug discovery stages will be discussed with emphasis on the application of computational approaches in the pipeline, consisting target identification and validation, hit and lead discovery and optimization, and ADME/Toxicity studies. The objectives of this course are to introduce the participants to different computational methods for drug discovery and development. After finishing this course, the students are expected to be familiar with modern cheminformatics and bioinformatics approaches, including QSAR, pharmacophore modeling, molecular docking, virtual screening, ADME/Toxicity predictions, sequence alignment, homology modeling, and protein structure prediction.

**GS13 1013**     *Medical Pharmacology I.*     **3 sem. hrs.**

Fall, annually. Prerequisite: Permission of instructor. Dessauer, Carmen. This introductory course covers the cellular, molecular, and other pharmacological aspects of drug action in humans. Topics include a thorough discussion of the principles of pharmacology, including pharmacokinetics, drug absorption, distribution, metabolism, and excretion. Examples will include drugs that are used to regulate the activity of the autonomic nervous system, cardiovascular, pulmonary, and renal systems, and the central nervous system. This course fulfills the Pharmacology Track requirement for the Cell and Regulatory Biology Program.

**GS13 1024**     *Molecular Basis of Cell Signaling.*     **4 sem. hrs.**

Spring, annually. Prerequisite: Background in biochemistry and cell biology; Consent of the instructor. Clark, Richard. This course provides a detailed exploration of the molecular basis of cell signaling with emphasis on recent developments, structure-function, and quantitation. The course will include both the regulation of second messenger systems (GPCRs, G proteins, cAMP, IP3 and lipid), ion channels, growth factor regulated tyrosine kinases, small G proteins (ras, GEFs, Gaps), kinase/phosphatase pathways, steroid hormones/transcription, and the modeling of these systems. This course fulfills the GSBS Molecular area breadth requirement.

**GS13 1063**     *Toxicology I: Principles of Toxicology.*     **3 sem. hrs.**

Fall, annually. Prerequisites: Biology and chemistry (organic); physiology, biochemistry desirable, and permission of instructor. Smith, Mary Ann. Basic principles of toxicology and their applications to the understanding of xenobiotic-induced target organ toxicity will be presented in this course. Topics covered include toxicant disposition, mechanisms of toxicity and target organ responses to toxic agents. This course is designed to provide a foundation for understanding the complex interactions between toxicants and biologic systems.

**GS13 1073**     *Mutagenesis and Carcinogenesis.*     **3 sem. hrs.**

Summer annually. Prerequisite: Permission of instructor. El-Zein, Randa. This is a basic course in genetic toxicology, which includes current research involving environmental mutagenesis and carcinogenesis. Guest lectures on the following topics will be: oncogenes, metabolic activation, DNA repair, radiation effects on humans, male reproductive toxicity, antimutagenesis and anticarcinogenesis, cancer risk assessment, cancer cytogenetics, gene identification and mapping, and cancer epidemiology.



Anthony A. This course is designed to provide students with the skills necessary to become successful cognitive neuroscientists. Students will receive instruction in designing experiments and analyzing data, selecting research topics, relating theory to their work, and how to stay up-to-date on current research. Students will be instructed in making presentations including PowerPoint, handouts, and effective use of white board, and will be given feedback by faculty and fellow students following their presentations. Students can register for the course multiple times during their graduate careers. Among topics covered each term will include: comparative cognition, evolution of behavior, cognitive modules, brain disorders including neurologic, developmental, and psychiatric disorders, voluntary and reflexive orienting, perception, spatial attention, feature-selective attention, item-specific learning, if-then rule learning, relational learning, abstract concept learning, familiarity memory, recollective memory, what-where-when memory, episodic memory, and working memory. These issues will be thoroughly discussed during the Theory, Content, and Execution in Cognitive Neuroscience I, II, & III courses. The particular combinations of issues in any one of these courses will vary depending upon the background and needs of the students registered for the courses and the nature of the important articles appearing in journals covering these areas.

**GS14 1023**     *Cognitive Neuroscience I.*

**3 sem. hrs.**

Fall, odd numbered years. Prerequisite: prior exposure to neuroscience and cognitive psychology, or permission of the instructor. Sereno, Anne. The course will begin with a brief review of the history of understanding mental processes. The course will then cover basic concepts of brain organization and various methods used in cognitive neuroscience. The course will cover a number of cognitive processes, including the perception of color, motion, objects, and faces, as well as higher order cognitive processes, including aspects of multisensory integration, attention, and inattention. A primary goal of cognitive neuroscience is to bridge the gaps between cognitive science, systems neuroscience, computational neuroscience, and cellular neuroscience. The selected topics will illustrate examples where these bridges are being made. Reading assignments will assist in the acquisition of the basics of perception, human neuroanatomy, and neurophysiology. These readings will also be used to expose students to a number of different techniques used in Cognitive Neuroscience. Finally, some of the readings will aim to foster an understanding of how disruption of these functions are related to neurological, psychopathological, and developmental disorders, with the ultimate goal of showing how a better understanding of the underlying biological mechanisms of these cognitive functions may be useful in diagnosis or treatment

**GS14 1024**     *Systems Neuroscience*

**4 sem. hrs.**

Spring, annually. Prerequisite: none. Dragoi, Valentin. This course covers the key concepts in systems neuroscience that allow students to understand how individual neurons and circuits process information and how they modulate behavior. Emphasis is placed on the basic structure and function of cells and networks residing in the nervous system. The course covers the major available techniques to examine the operation of neurons and networks *in vivo*. The principles of functional neuroanatomy are presented by highlighting the main types of neuronal circuits that constitute the building blocks of systems neuroscience. The neural development section is intended to offer students insight into the early 'shaping' of neuronal circuits as computational units. An important concept in systems neuroscience is the fact that information is processed in a hierarchical manner. Covering this issue will allow students to learn about the different stages of cortical processing that constitute the foundations of cognition. Finally, a fundamental property of neurons and circuits, i.e., the capacity to adapt, is discussed in the context of short and long-term plasticity, adaptation, and learning. The overall goal of this course is to provide students with fundamental knowledge of the function, development, and plasticity of neuronal circuits by emphasizing how neural circuits analyze sensory information, form perceptions of the external worlds, make decisions, and execute movements. This course fulfills the GSBS Systems area breadth requirement.

**GS14 1031     *Advanced Seminar in Learning and Memory.*                             1 sem. hr.**

Fall, Spring and Summer, annually. Prerequisite: Permission of instructor. Wright, Anthony. This course is an advanced seminar intended for those familiar with the principles of learning and conditioning. Discussions will center around major issues in learning and memory.

**GS14 1041     *Seminars in Neuroscience.*     1 sem. hr.**

Fall and Spring, annually. Prerequisite: none. Beauchamp, Michael. The Department of Neurobiology and Anatomy sponsors seminars by visiting scientists and, when there are no visitors, sponsors colloquia given by faculty members and postdoctoral fellows at UTHSC-H. The speakers are chosen by graduate students, postdoctoral fellows, and faculty members in the Department of Neurobiology and Anatomy. The presentations are typically at a level appropriate for graduate students. There are no prerequisites, but attendance is required.

**GS14 1043     *Experimental Analysis of Behavior.*     3 sem. hrs.**

Fall and Spring, even-numbered years. Prerequisite: Permission of instructor. Wright, Anthony. This is a lecture, discussion, and laboratory course in behavioral control. Topics covered will include theoretical issues and applications of classical conditioning, instrumental learning, stimulus control, aversive control, and animal cognition.

**GG14 1051     *Seminar in Neurobiology of Learning  
and Memory.*     1 sem. hr.**

Fall, Spring and Summer, annually. Prerequisite: none. Byrne, John. This course has two major objectives. The first is to familiarize students with current research in learning and memory with particular emphasis on the cellular and molecular mechanisms. The second goal is to teach students how to give outstanding research seminars. Weekly 90-minute meetings involve alternate faculty and student presentations on current problems in the neurobiology of learning and memory. Faculty and student presentations cover recent articles from leading journals on the same topic. Students are instructed in the preparation of PowerPoint presentations, seminar organization, and techniques of oral presentation and are given feedback by faculty and fellow student following their presentations. Students can register for this course multiple times during their graduate career.

**GS14 1053     *Introduction to Functional Magnetic  
Resonance Imaging.*     3 sem. hrs.**

Fall, even-numbered years. Prerequisite: *Neuroscience* (GS14 1017). Beauchamp, Michael. Functional Magnetic Resonance Imaging (fMRI) is an exciting new technique that allows brain activity to be measured non-invasively in human subjects. fMRI has revolutionized research in neurobiology and psychology by allowing direct observation of the neural processing that underlies interesting human behaviors, such as learning, memory, language, perception and decision-making. This course provides a comprehensive introduction to all aspects of fMRI. In the lecture portion of the course, participants will learn about the methods and applications of fMRI. In the hands-on section of the class, participants will have the opportunity to design experimental paradigms and collect and analyze fMRI data using the research-dedicated 3 Tesla scanner in the UT MRI Research Facility.

**GS14 1063**      *Molecular Neurobiology.*      **3 sem. hrs.**

Fall, annually. Prerequisite: none. Waxham, M Neal. This course is a graduate level treatment of the molecular, cellular, and biochemical events that underlie neuronal function. Emphasis is placed on the basic chemistry and biology of cells residing in the nervous system. The course also covers the structure and function of receptors, channels and pumps necessary for neuronal function and the neurochemistry of specific transmitter systems. The unique demand of neurons as specialized secretory cells is also covered. Finally, development and maturation of the central nervous system is taught at the cellular level along with a discussion of the diseases of the nervous system focusing on the molecular aspects of the disease process. The intent is to provide students with fundamental knowledge of the workings of cells generally and neurons specifically. An undergraduate level course in cell or molecular biology is highly recommended. This course satisfies the GSBS Molecular area breadth requirement.

**GS14 1072**      *Seminar in Molecular Neuroscience.*      **2 sem. hrs.**

Fall, Spring and Summer, annually. Prerequisite: none. Bean, Andrew. This course will cover a variety of topics in Molecular Neuroscience. Each semester will emphasize a particular area. Examples of topic areas include development, receptor trafficking, neurotransmitter secretion, olfaction, and synaptic transmission. The objectives of the course are to familiarize students with current research in the topic areas and to teach students effective presentation skills. Weekly meetings (90 minutes) will have both faculty and student presentations drawn from primary literature. Students will be given feed-back on their presentation content and style. This course can be taken multiple times during a student's graduate career.

**GS14 1073**      *Visual Science I.*      **3 sem. hrs.**

Spring, odd-numbered years. Prerequisite: Permission of instructor. Mills, Stephen. Visual Science I is a comprehensive introduction to visual neuroscience and the first steps in vision. The anatomy, physiology, and pharmacology of retinal function will be discussed. Topics will include color vision, neurotransmitters, receptors, ion channels, rod and cone pathways, and adaptation. The course will emphasize phototransduction and retinal circuitry.

**GS14 1081**      *Seminar in Neural Coding and Behavior.*      **1 sem. hr.**

Fall, Spring and Summer, annually. Prerequisite: None. Dragoi, Valentin. It is increasingly being realized that neural systems encode information through the ensemble activity of large populations of neurons. The Seminar in Neural Coding and Behavior will review papers that address how neurons use population codes to represent information via the correlated activity of many neurons. The course will address issues related to information coding by individual neurons, sparse coding schemes, population coding and decoding, and the relationship between the response properties of different brain systems and the natural statistics of their inputs. Finally, the course will discuss how neurons encode and decode information to produce behavioral responses.

**GS14 1091**      *Current Topics in Neural Stem Cell Research.*      **1 sem. hr.**

Fall and Spring, annually. Prerequisites: Basic neuroscience and permission of course coordinator. Majumder, Sadhan. The recent flurry of scientific research on stem cells has opened an exciting new era in biological research and underscored the tremendous potential of stem cells in regenerative medicine and cancer. The objective of this course is to gain an advanced understanding of stem cell biology, with an emphasis on the potential therapeutic application of stem cells for neurodegenerative diseases, such as Alzheimer's disease, Parkinson's disease, and Huntington's disease, and neural cancers such as

medulloblastoma and glioma. The introductory lecture by the course coordinator on the basic concepts of stem cell biology will be followed by student presentations and discussions of assigned journal articles intended to illuminate the cutting edge of neural stem cell research. Students will be evaluated based on their presentations, active participation in discussions, and attendance.

**GS14 1101     *Advanced Seminar in Human Neuroimaging.*                    1 sem. hr.**

Fall and Spring, annually. Prerequisite: none. Beauchamp, Michael S. The aim of this course is to keep students updated in the most recent advances in the field of human neuroimaging, to provide them with background regarding these recent results, and to teach them how to present high quality research seminars. Each week a different student or faculty member will present a research paper of interest. Presentations will be well prepared and include surveys of the background motivation and methods. The presentations will be informal as questions would be asked throughout the presentation, in order to facilitate true understanding and a free flow of ideas. The course will meet weekly for 60 minutes at least but the room will be reserved for 90 minutes to allow for a more detailed and thorough discussion. Student presenters will be given feedback about the quality of their presentations and what they should do to improve the presentations. The instructor will be available for students to assist them in choosing a research paper and helping them prepare it for presentation. Faculty presentations will be included both in order to teach the students specific high interest topics as well as to provide them with examples of how such presentations should be carried out.

**GS14 1103     *Cellular Neurobiology: Molecular and Developmental.*                    3 sem. hrs.**

Fall, annually. Prerequisite: *Neuroscience* (GS140017) or permission of instructor. Waxham, M. Neal. This course focuses on recent advancements in understanding the molecular, biochemical, and cellular events that underlie functions of neuronal metabolism, plasticity, and development. Emphasis is placed on neuronal cell biology, neurochemistry, and second messenger systems related to neuronal function. This course fulfills the GSBS Cellular area breadth requirement.

**GS14 1111     *Seminar in Theoretical & Computational Neuroscience.*                    1 sem. hr.**

Fall and Spring, annually. Prerequisite: none. Shouval, Harel Z. The aim of this course is to keep students updated in the most recent advances in the field of Theoretical and Computational Neuroscience, to provide them with background regarding these recent results, and to teach them how to present high quality research seminars. Each week a different student or faculty member will present a research paper of interest. Presentations will be well prepared and include surveys of the background motivation and methods. The presentations will be informal as questions would be asked throughout the presentation, in order to facilitate true understanding and a free flow of ideas. The course will meet weekly for at least 60 minutes, but the room will be reserved for 90 minutes to allow for a more detailed and thorough discussion. Student presenters will be given feedback about the quality of their presentations and what they should do to improve the presentations. The instructor will be available for students to assist them in choosing a research paper and helping them prepare it for presentation. Faculty presentations will be included in order to teach the students specific high interest topics as well as to provide them with examples of how such presentations should be carried out.

**GS14 1113     *Advanced Topics in Systems Neuroscience.*                    3 sem. hrs.**

Spring, annually. Prerequisites: *Neuroscience* (GS141017) and *Advanced Neurobiology: Cellular and Molecular* (GS141103), or permission of instructor. Dragoi, Valentin. This is a lecture and discussion

















## MEMBERS OF THE FACULTY

The following is a roster of the nearly 600 active members of the GSBS Faculty. The first line of each entry includes the faculty member's institution of primary appointment; the following abbreviations are employed:

For the institutions of The University of Texas Health Science Center at Houston:

UTHealth-GSBS.....Graduate School of Biomedical Sciences  
UTHealth-MS.....Medical School  
UTHealth-SBMI.....School of Biomedical Informatics  
UTHealth-SOD.....School of Dentistry  
UTHealth-SPH.....School of Public Health  
UTHealth-G.....Health Science Center-General Administration

For The University of Texas MD Anderson Cancer Center: MDACC

For Texas A&M University-Institute of Biosciences and Technology: TAMU-IBT

A more complete description of the faculty's current research activities and publications, together with the projects available to students in their laboratories, may be obtained from the Graduate School's Web site.

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### Regular Members

**James L. Abbruzzese**, Gastrointestinal Medical Oncology, MDACC. M.D., Pritzker School of Medicine, 1978.

**Christian R. Abee**, Veterinary Sciences, MDACC. D.V.M., Texas A&M University, 1971

**Lynne V. Abruzzo**, Hematopathology, MDACC. M.D., Ph.D., University of Chicago, 1986, 1984

**Jeffrey K. Actor**, Pathology & Laboratory Medicine, UTHealth-MS. Ph.D., University of Massachusetts, 1991.

**Bharat B. Aggarwal**, Experimental Therapeutics, MDACC. Ph.D., University of California Berkeley, 1977.

**Joseph L. Alcorn, Jr.**, Pediatrics, UTHealth-MS. Ph.D., University of Texas at Dallas, 1988.

**Kenneth Aldape**, Pathology, MDACC. M.D., University of California-San Francisco, 1991.

**C. Marcelo Aldaz**, Molecular Carcinogenesis, MDACC. M.D., University of Buenos Aires, 1980.

**Catherine G. Ambrose**, Orthopaedic Surgery, UTHealth-MS. Ph.D., University of Texas at Austin, 1992.

**Hesham M. Amin**, Hematopathology, MDACC. M.D., Cairo University Faculty of Medicine, 1982.



**Zhiqiang An, IMM, UTHealth-MS. Ph.D., University of Kentucky, 1991.**

**Michael Andreeff, Leukemia, MDACC. M.D., University of Heidelberg Medical School, 1968; Ph.D., University of Heidelberg Medical Faculty, 1976.**

**Wadih Arap, Genitourinary Medical Oncology & Cancer Biology, MDACC. M.D., University of Sao Paulo Medical School, 1983; Ph.D., Stanford University, 1996.**

**Ralph B. Arlinghaus, Molecular Pathology, MDACC. Ph.D., University of Cincinnati College of Medicine, 1961.**

**Jaroslav A. Aronowski, Neurology, UTHealth-MS. Ph.D., Polish Academy of Sciences, 1992.**

**Banu Arun, Breast Medical Oncology and Clinical Cancer Prevention, MDACC. M.D., University of Istanbul Medical School, 1990**

**Swathi Arur, Genetics, MDACC. Ph.D., All India Institute for Medical Sciences, 2002.**

**Keith A. Baggerly, Bioinformatics & Computational Biology, MDACC. Ph.D., Rice University, 1994.**

**Veerabhadran Baladandayuthapani, Biostatistics, MDACC. Ph.D., Texas A&M University, 2005.**

**Gábor Balázsi, Systems Biology, MDACC. Ph.D., University of Missouri-St. Louis and Rolla, 2001.**

**James A. Bankson, Radiation Physics, MDACC. Ph.D., Texas A&M University, 2001.**

**Menashe Bar-Eli, Cancer Biology, MDACC. Ph.D., Hebrew University, 1978.**

**Michelle C. Barton, Biochemistry & Molecular Biology, MDACC. Ph.D., University of Illinois, 1989.**

**Robert C. Bast, Jr., Experimental Therapeutics, MDACC. M.D., Harvard Medical School, 1971.**

**Andrew J. Bean, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Yale University, 1990.**

**Michael S. Beauchamp, Neurobiology & Anatomy, UTHealth-MS. Ph.D., University of California, 1997.**

**Sam Beddar, Radiation Physics, MDACC. Ph.D., University of Wisconsin, 1990.**

**Mark Bedford, Molecular Carcinogenesis, MDACC. Ph.D., Weizmann Institute of Science, 1996.**

**Richard R. Behringer, Genetics, MDACC. Ph.D., University of South Carolina, 1986.**

**Michael Beierlein, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Brown University 2000.**

**Rebecca Berdeaux, Integrative Biology & Pharmacology, UTHealth-MS. University of California at Berkeley, 2003.**

**Donald A. Berry, Quantitative Sciences, MDACC. Ph.D., Yale University, 1971.**

**Michael R. Blackburn**, Biochemistry & Molecular Biology, UTHealth-MS. Ph.D., Thomas Jefferson University, 1993.

**Eric A. Boerwinkle**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH & IMM, UTHealth-MS. Ph.D., University of Michigan, Ann Arbor, 1985.

**Oliver Bögl**, Neurosurgery, MDACC. Ph.D., Ludwig Institute for Cancer Research, 1991.

**Douglas Boyd**, Cancer Biology, MDACC. Ph.D., Edinburgh University, 1985.

**Ghislain Breton**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., University of Quebec, Montreal, 2004.

**Russell R. Broaddus**, Pathology, MDACC. M.D., Ph.D., UTHealth-MS, UTHealth-GSBS, 1994.

**Powel H. Brown**, Clinical Cancer Prevention, MDACC. Ph.D., New York University, 1984; M.D., New York University, 1985.

**Nathan S. Bryan**, IMM, UTHealth-MS. Ph.D., Louisiana State University School of Medicine, 2004.

**L. Maximilian Buja**, Pathology & Laboratory Medicine, UTHealth-MS. M.D., Tulane University School of Medicine, 1967.

**Jan A. Burger**, Leukemia, MDACC. M.D., Ph.D., Albert Ludwigs University School of Medicine, 1994.

**Lauren A. Byers**, Thoracic/Head & Neck Medical Oncology, MDACC. M.D., Baylor College of Medicine, 2003.

**John H. Byrne**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Polytechnic Institute of Brooklyn, 1973.

**Fernando R. Cabral**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., University of Rochester, 1973.

**George A. Calin**, Experimental Therapeutics, MDACC. M.D., "Carol Davila" University of Medicine and Pharmacy (Romania), 1992; Ph.D., "Carol Davila" University of Medicine and Pharmacy (Romania), 2000.

**Wei Cao**, Immunology, MDACC. Ph.D., University of North Carolina at Chapel Hill, 1995.

**Phillip B. Carpenter**, Biochemistry & Molecular Biology, UTHealth-MS. Ph.D., University of Illinois at Urbana-Champaign, 1994.

**Joya Chandra**, Pediatrics, MDACC. Ph.D., UTHealth-GSBS, 1998.

**Jeffrey T. Chang**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., Stanford University, 2004.

**Shine Chang**, Epidemiology, MDACC. Ph.D., University of North Carolina-Chapel Hill, 1995

**Jichao Chen**, Pulmonary Medicine, MDACC. Ph.D., Johns Hopkins University School of Medicine, 2006.

**Junjie Chen**, Experimental Radiation Oncology, MDACC. Ph.D., University of Vermont, 1993.

**Ken Chen**, Bioinformatics & Computational Biology, MDACC. Ph.D., University of Illinois at Urbana-Champaign, 2004.

**Taipng Chen**, Molecular Carcinogenesis, MDACC. Ph.D., McGill University, 2000.

**Zheng (Jake) Chen**, Biochemistry & Molecular Biology, UTHealth-MS. Ph.D., Columbia University, 2003.

**Paul J. Chiao**, Molecular and Cellular Oncology, MDACC. Ph.D., UTHealth-GSBS, 1991.

**Lynda Chin**, Genomic Medicine, MDACC. M.D., Albert Einstein College of Medicine, 1993.

**Peter J. Christie**, Microbiology & Molecular Genetics, UTHealth-MS. Ph.D., Cornell University, 1986.

**Yeonseok Chung**, IMM, UTHealth-MS. Ph.D., Seoul National University, 2003.

**Francois X. Claret**, Systems Biology, MDACC. Ph.D., University of Lausanne, 1993.

**Leonard J. Cleary, Jr.**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Columbia University, 1984.

**Dianna D. Cody**, Imaging Physics, MDACC. Ph.D., University of Michigan, 1987.

**Kevin R. Coombes**, Bioinformatics & Computational Biology, MDACC. Ph.D., University of Chicago, 1982.

**Laurence J. N. Cooper**, Pediatrics, MDACC. Ph.D., Case Western Reserve University, 1993; M.D., Case Western Reserve University, 1994.

**Gilbert J. Cote**, Endocrine Neoplasia & Hormonal Disorders-Research, MDACC. Ph.D., University of Vermont, 1987.

**Laurence E. Court**, Radiation Physics, MDACC. Ph.D., University of London, 1995.

**Shane R. Cunha**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., Northwestern University, 2002.

**Steven A. Curley**, Surgical Oncology, MDACC. M.D., UTHealth-MS, 1982.

**Nachum Dafny**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Hadassah Medical School, 1968.

**Stephen P. Daiger**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. Ph.D., Stanford University, 1976.

**Robert Dantzer**, Symptom Research, MDACC. D.V.M., University Paul Sabatier, 1967; Ph.D., University Paul Sabatier, 1977.

**Bryant G. Darnay**, Experimental Therapeutics, MDACC. Ph.D., Purdue University, 1992.

**Pramod Dash**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Carnegie-Mellon University, 1986.

**Michael A. Davies**, Melanoma Medical Oncology and Systems Biology, MDACC. M.D., Ph.D., UTHealth-MS and UTHealth GSBS, 2001.

**Brian R. Davis**, IMM, UTHealth-MS. Ph.D., California Institute of Technology, 1980.

**R. Eric Davis**, Lymphoma & Myeloma, MDACC. M.D., Medical University of South Carolina, 1984.

**Catherine Denicourt**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., University of Montreal, 2003.

**Sharon Y.R. Dent**, Molecular Carcinogenesis, MDACC. Ph.D., Rice University, 1986.

**Ronald A. DePinho**, Cancer Biology, MDACC. M.D., Albert Einstein College of Medicine, 1981.

**Carmen W. Dessauer**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., Louisiana State University, 1993.

**Kim-Anh Do**, Biostatistics, MDACC. Ph.D., Stanford University, 1990.

**Chen Dong**, Immunology, MDACC. Ph.D., University of Alabama at Birmingham, 1996.

**Patrick M. Dougherty**, Anesthesiology and Pain Medicine, MDACC. Ph.D., UTHealth-GSBS, 1988.

**William Dowhan**, Biochemistry & Molecular Biology, UTHealth-MS. Ph.D., University of California at Berkeley, 1969.

**Valentin Dragoi**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Duke University, 1997.

**Scott M. Drouin**, IMM, UTHealth-MS. Ph.D., University of Alabama at Birmingham, 1997.

**Guangwei Du**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., Peking Union Medical College, 1999.

**Raymond N. DuBois, Jr.**, GI Medical Oncology/Cancer Biology, MDACC. Ph.D., UTHSC/Dallas, 1981; M.D., UTHSC/San Antonio, 1985.

**Herbert L. DuPont**, Epidemiology, Human Genetics & Environmental Sciences, SPH. M.D., Emory University School of Medicine, 1965.

**Madeleine Duvic**, Dermatology, MDACC. M.D., Duke University, 1977.

**Lee M. Ellis**, Surgical Oncology & Cancer Biology, MDACC. M.D., University of Virginia School of Medicine, 1983.

**Randa El-Zein**, Epidemiology, MDACC. M.D., University of Alexandria, Egypt, 1984; Ph.D., UT Medical Branch at Galveston, 1997.

**Francisco J. Esteva**, Breast Medical Oncology, MDACC. M.D., Ph.D., University of Zaragoza (Spain), 1988, 2001.

**Scott E. Evans**, Pulmonary Medicine, MDACC. M.D., UTHSC/San Antonio, 1999.

**Zhen Fan**, Experimental Therapeutics, MDACC. M.D., Shanghai Medical University, 1985.

**Bingliang Fang**, Thoracic & Cardiovascular Surgery, MDACC. M.D., Zhejiang Medical University, 1982; Ph.D., Hamburg University Institute/Human Genetics, 1989.

**Daniel J. Felleman**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., Vanderbilt University, 1981.

**Isaiah J. Fidler**, Cancer Biology, MDACC. D.V.M., Oklahoma State University, 1963; Ph.D., University of Pennsylvania, 1970.

**Susan P. Fisher-Hoch**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. M.B.B.S., University of London, 1976; M.D., University of London, 1981.

**Elsa Flores**, Biochemistry & Molecular Biology, MDACC. Ph.D., University of Wisconsin-Madison, 1999.

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**Myriam Fornage**, IMM, UTHealth-MS. Ph.D., UTHealth-GSBS, 1996.

**Marsha L. Frazier**, Epidemiology, MDACC. Ph.D., Pennsylvania State University, 1978.

**Emil J. Freireich**, Adult Leukemia Research, MDACC. M.D., D.Sc.(Hon.), University of Illinois College of Medicine, 1949, 1982.

**Peter Friedl**, Genitourinary Medical Oncology, MDACC. M.D., University of Bochum, 1992; Ph.D., McGill University, 1996.

**Jeffrey A. Frost**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., University of California at San Diego, 1993.

**Yun-Xin Fu**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. Ph.D., Reading University, 1988.

**Juan Fueyo-Margareto**, Neuro-Oncology, MDACC. M.D., University Autonomous of Barcelona (Spain), 1984.

**Gregory N. Fuller**, Pathology, MDACC. Ph.D., UTHealth-GSBS, 1983; M.D., Baylor College of Medicine, 1987

**Michael J. Galko**, Biochemistry & Molecular Biology, MDACC. Ph.D., University of California, San Francisco, 1999.

**Gary E. Gallick**, Genitourinary Medical Oncology, MDACC. Ph.D., University of Illinois at Urbana, 1981.

**Boyi Gan**, Experimental Radiation Oncology, MDACC. Ph.D., Cornell University, 2006.

**Varsha Gandhi**, Experimental Therapeutics, MDACC. Ph.D., Delhi University, 1980.

**Guillermo Garcia-Manero**, Leukemia, MDACC. M.D., Faculty of Medicine, University of Zaragoza, 1991.

**Danielle A. Garsin**, Microbiology & Molecular Genetics, UTHealth-MS. Ph.D., Harvard University, 1999.

**Yong-Jian Geng**, Center for Cardiovascular Biology, UTHealth-MS. M.D., Suzhou Medical College, 1982; Ph.D., Gothenburg University, 1994.

**Don L. Gibbons**, Thoracic, Head/Neck Oncology and Molecular & Cellular Oncology, MDACC. M.D., Ph.D., Albert Einstein College of Medicine, 2004.

**Kent A. Gifford**, Radiation Physics, MDACC. Ph.D., UTHealth-GSBS, 2004.

**Michael T. Gillin**, Radiation Physics, MDACC. Ph.D., University of California at Davis, 1970.

**Andrew B. Gladden**, Genetics, MDACC. Ph.D., University of Pennsylvania, 2005.

**Candelaria Gomez-Manzano**, Neuro-Oncology, MDACC. M.D., University of Barcelona, 1989.

**Vidya Gopalakrishnan**, Pediatrics, MDACC. Ph.D., The University of Pittsburgh, 1995.

**David G. Gorenstein**, IMM, UTHealth-MS. Ph.D., Harvard University, 1969.

**Alemayehu A. Gorfe**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., University of Zurich, 2003.

**Raymond J. Grill**, Neurosurgery, UTHealth-MS. Ph.D., University of Cincinnati, 1995.

**Elizabeth A. Grimm**, Experimental Therapeutics, MDACC. Ph.D., University of California at Los Angeles School of Medicine, 1979.

**Thomas Guerrero**, Radiation Oncology, MDACC. M.D., Ph.D., University of California-Los Angeles, 1997, 1994.

**Howard B. Gutstein**, Anesthesiology & Pain Medicine, MDACC. M.D., Johns Hopkins University, 1982.

**John F. Hancock**, Integrative Biology & Pharmacology, UTHealth-MS. M.B., B.Chir., University of Cambridge, 1981; Ph.D., University of London, 1989.

**Craig L. Hanis**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. Ph.D., University of Michigan, 1981.

**Barrett R. Harvey**, IMM, UTHealth-MS. Ph.D., University of Texas at Austin, 2003.

**Khader M. Hasan**, Diagnostic & Interventional Imaging, UTHealth-MS. Ph.D., University of Utah, 2000.

**John D. Hazle**, Imaging Physics, MDACC. Ph.D., UTHealth-GSBS, 1989.

**Jacqueline T. Hecht**, Pediatrics, UTHealth-MS. Ph.D., UT-Houston School of Public Health, 1988.

**Ruth Heidelberger**, Neurobiology & Anatomy, UTHealth-MS. M.D., Ph.D., State University of New York at Stony Brook, 1993, 1991.

**Kenneth R. Hess**, Biostatistics, MDACC. Ph.D., UTHealth-SPH, 1992.

**John V. Heymach**, Thoracic/Head & Neck Medical Oncology, MDACC. Ph.D., Stanford University Medical School, 1996; M.D., Stanford University Medical School, 1998.

**Diane L.M. Hickson-Bick**, Pathology & Laboratory Medicine, UTHealth-MS. Ph.D., Baylor College of Medicine, 1993.

**Walter N. Hittelman**, Experimental Therapeutics, MDACC. Ph.D., University of California at Berkeley, 1972.

**James E. Hixson**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. Ph.D., University of Michigan, 1983.

**Magnus Höök**, Center for Extracellular Matrix Biology, TAMU-IBT. Ph.D., University of Uppsala, 1974.

**Rebecca M. Howell**, Radiation Physics, MDACC. Ph.D., UTHSC/San Antonio, 2005.

**Hongzhen Hu**, Integrative Biology & Pharmacology, UTHealth-MS. Ph.D., The Ohio State University, 2004.

**Peng Huang**, Molecular Pathology, MDACC. M.D., Zhongshan Medical College, 1982; Ph.D., UTHealth-GSBS, 1990.

**Suyun Huang**, Neurosurgery, MDACC. M.D., Anhui Medical University, 1985; Ph.D., UTHealth-GSBS, 1997.

**Vicki Huff**, Genetics, MDACC. Ph.D., University of Michigan, 1987.

**Dennis P. M. Hughes**, Pediatrics, MDACC. Ph.D., M.D., Yale University, 1995, 1996

**Mien-Chie Hung**, Molecular & Cellular Oncology, MDACC. Ph.D., Brandeis University, 1983.

**Robert L. Hunter, Jr.**, Pathology & Laboratory Medicine, UTHealth-MS. M.D., Ph.D., University of Chicago, 1965, 1969.

**Lu-Yu Hwang**, Epidemiology, Human Genetics & Environmental Sciences, UTHealth-SPH. M.D., National Taiwan University, 1975.

**Patrick Hwu**, Melanoma Medical Oncology, MDCC. M.D., Medical College of Pennsylvania, 1987.

**Geoffrey S. Ibbott**, Radiation Physics, MDACC. Ph.D., Colorado State University, 1993.

**Edward F. Jackson**, Imaging Physics, MDACC. Ph.D., UTHealth-GSBS, 1990.

**Chinnaswamy Jagannath**, Pathology & Laboratory Medicine, UTHealth-MS. Ph.D., University of Madras, 1984.

**Roger Janz**, Neurobiology & Anatomy, UTHealth-MS. Ph.D., University of Cologne, 1993.

**Vasanthi Jayaraman**, Biochemistry & Molecular Biology, UTHealth-MS. Ph.D., Princeton University, 1995.

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