Provisions of this Catalog

The provisions of this catalog do not constitute a contract, express or implied, between any applicant, student, or faculty member and The University of Texas System and The University of Texas Medical Branch at Galveston (UTMB).

The University reserves the right to withdraw courses at any time and to change fees and tuition, academic calendars, curricula, degree requirements, graduation procedures, and any other requirement affecting students. Changes will become effective whenever the proper authorities so determine and will apply both to prospective students and to those already enrolled.

The catalog of The University of Texas Medical Branch at Galveston consists of five separately published components:
- UTMB General Information Catalog
- School of Nursing Bulletin
- School of Medicine Bulletin
- School of Health Professions Bulletin
- Graduate School of Biomedical Sciences Bulletin

The UTMB Catalog provides general information, including degrees and programs offered, admission, orientation and registration, tuition and fees, academic policies, student life, student support services, and the institutes.

Each bulletin for the four UTMB schools provides the school’s calendars, program–specific degree requirements, course offerings, and other school–specific information.

The catalog is effective with the 2017–2018 academic year, and each of the component bulletins is effective until a subsequent bulletin is published. Copies of the most current issue of the catalog or any of the bulletins are available online at http://www.utmb.edu/enrollmentservices/. Approved corrections, edits, deletions and additions to the catalog and bulletins are also available at this site.

Policy on Equal Opportunity/Affirmative Action
The University of Texas Medical Branch at Galveston, in accordance with applicable federal and state laws and regulations, does not discriminate on the basis of race, color, national origin, sex, age, religion, disability, or status as a Vietnam–era veteran in any of its policies, practices, and procedures. Also, The University of Texas does not discriminate on the basis of sexual orientation to the extent allowed by law. This includes, but is not limited to, admissions, employment, financial aid, educational services, access to facilities, and services. The University, in accordance with applicable federal and state laws and regulations, is committed to developing and implementing affirmative action strategies with respect to minority individuals, women, Vietnam–era veterans, and persons with disabilities. The Office of Equal Opportunity and Diversity located on the ground floor of Rebecca Sealy Hospital is available for individuals needing more information or who have a complaint.

Policy on Release of Student Academic Data
The University of Texas Medical Branch at Galveston is in compliance with the Family Educational Rights and Privacy Act of 1974 (FERPA) (20 U.S.C. Section 1232g) and the Texas Public Information Act (Chapter 552, Texas Government Code), which protect the privacy of educational records and establish the rights of students to inspect and review their educational records. Students have the right to file complaints with the FERPA Office concerning alleged failures by the institution to comply with the act.

Copies of the act are available through the Office of Enrollment Services. Written requests for inspection of a student’s own file may be made to the registrar, dean, head of the academic department, or other appropriate official.

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The following categories of student information will be released upon written request and may be released upon verbal request to the registrar: name (including previous names), date of birth, enrollment (full time, half time, less than half time, undergraduate, graduate, etc.), campus phone and campus address, email address, student classification, previous institution(s) attended, major field of study, dates of attendance, degree(s) conferred and date(s) of degree(s) (including degrees from previous institutions), honors and awards, photographs, participation in officially recognized activities, and postgraduate training site for M.D. and Ph.D. graduates and degree candidates.

Students have the right, under the provisions of FERPA, to cause the withholding of disclosure of information categorized in the preceding paragraph. A student's consent is presumed, unless a written request to restrict the information as confidential is made by the student in the Office of Enrollment Services (Attention: Registrar) on a prescribed form no earlier than the first day of registration and no later than the census date (normally the 12th class day) in a term. In cases in which the student files a request for restriction of information, such information is treated as confidential, except as provided by law. The request to withhold directory information is effective until the end of the academic year during which it is submitted. UTMB may disclose directory information about former students without providing the student notice of the opportunity to opt out of providing directory information to the public. However, UTMB will continue to honor any valid request to opt out of the disclosure of directory information made while the student was in attendance unless the student rescinds the opt out request.

Campus Security Report
In compliance with the Campus Security Act of 1990, UTMB prepares an annual Campus Security Report that is available to applicants, students, and employees online at (www.utmb.edu/securityreport). Printed copies of the report are available upon request from the University Police at (409) 772–1503.

Compliance with Americans with Disabilities Act
The University of Texas Medical Branch at Galveston complies with the Americans with Disabilities Act (ADA) as amended, Section 504 of the Rehabilitation Act of 1973, and state and local requirements regarding students with disabilities. Under these laws, no otherwise qualified and competitive individual with a disability shall be denied access to or participation in services, programs, and activities of UTMB solely on the basis of the disability. Copies of the ADA and Section 504 of the Rehabilitation Act of 1973 are available in the Office of Student Services.

The University of Texas Medical Branch at Galveston is committed to equal opportunity for students with disabilities. If you have a documented disability or would like to obtain information regarding services for students with disabilities, a complete copy of the “Student with Disabilities: Guidelines for Compliance” may be obtained from the University's Office of Equal Opportunity and Diversity or the Office of Student Affairs of any of the four UTMB schools.

Services for students with disabilities is a program within the Office of Student Services in coordination with the Office of Equal Opportunity and Diversity and the Student Affairs offices of the four UTMB schools. By law all students with disabilities are guaranteed a learning environment that provides reasonable accommodation of their disability. The legal protections mentioned above are civil rights provisions aimed at ending discrimination against persons with disabilities. All programs and offices at UTMB are committed to providing a supportive and challenging environment for students with disabilities who choose to attend UTMB. The Office of Student Services is located on the second floor of the Lee Hage Jamail Student Center. The
Office of Equal Opportunity and Diversity is located on the ground floor of Rebecca Sealy Hospital.

**Accreditation**
The University of Texas Medical Branch at Galveston is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award the baccalaureate, master’s, doctoral, and professional degrees. For questions about the University of Texas Medical Branch accreditation contact the Commission on Colleges at:

18666 Southern Lane  
Decatur, GA 30033–4097  
Telephone (404) 679–4500  
Fax (404) 679–4556

**HIPAA**
HIPAA is the Health Insurance Portability and Accountability Act of 1996. It includes stringent standards defining appropriate and inappropriate disclosures of individually identifiable health information and how patient rights are to be protected. All UTMB students, along with faculty and staff, are provided and required to complete training to assure understanding of and compliance with HIPAA privacy rules.
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The University of Texas System Office of the Chancellor
The University of Texas Medical Branch Executive Leadership
History of the Graduate School of Biomedical Sciences
In 1952, a branch of the University of Texas Graduate School was formally established at the University of Texas Medical Branch (UTMB) campus in Galveston. An associate dean was appointed, and graduate programs in anatomy, physiology, pharmacology, population health sciences, microbiology, biochemistry, and pathology were developed and approved. Although these programs were relatively autonomous and the degrees were conferred in Galveston, the ultimate control and direction of graduate education and membership in the graduate faculty were determined by the dean of the Graduate School in Austin and by the graduate faculty of the University of Texas System. During this period the graduate faculty at UTMB, under the direction of the associate dean for graduate studies, performed all functions of the graduate faculty subject to the policies and procedures of the Graduate School in Austin. When the University of Texas Health Science Centers were established in 1969, the graduate schools for each center were granted complete autonomy and the associate dean for graduate studies at UTMB became the dean of the University of Texas Medical Branch Graduate School. In 1970, a full-time dean of the Graduate School at UTMB was appointed. In 1979, the Graduate School of Biomedical Sciences (GSBS) assumed the responsibility for the administration of the graduate program in nursing, which leads to the Master of Science Degree in Nursing (M.S.N.). Effective January 1, 1997, the M.S.N. Program was transferred to the School of Nursing. The most recent program addition is the Doctor of Philosophy degree in clinical science. The size of the student body of the Graduate School has increased from two or three students in 1952 to 361 in 2005–2006. Membership in the graduate faculty has grown from less than 10 in 1952, to 400 in 2016–2017. Funding for research by the graduate faculty has been significantly augmented in recent years.

Mission Statement

UTMB Mission and Core Values
The mission of The University of Texas Medical Branch at Galveston is to provide scholarly teaching, innovative scientific investigation, and state-of-the-art patient care in a learning environment to better the health of society. UTMB’s education programs enable the state’s talented individuals to become outstanding practitioners, teachers, and investigators in the health care sciences, thereby meeting the needs of the people of Texas and its national and international neighbors. UTMB’s comprehensive primary, specialty, and sub-specialty care clinical programs support the educational mission and are committed to the health and well-being of all Texans through the delivery of state-of-the-art preventive, diagnostic, and treatment services. UTMB’s research programs are committed to the discovery of new innovative biomedical and health services knowledge leading to increasingly effective and accessible health care for the citizens of Texas.

UTMB Vision Statement
The University of Texas Medical Branch at Galveston’s vision for the future is captured in the following standards. UTMB sets a standard for leadership and excellence in health sciences education, research, clinical care and service, and for integrating these missions within a single governance structure. UTMB’s programs are in the top 25 percent of comparable programs nationally, and at least five are recognized as unsurpassed worldwide. UTMB is widely recognized as a public trust, one that makes the most of finite resources to improve the health of the many communities it serves. UTMB demonstrates good stewardship by remaining true to its mission—supporting programs that are consistent with its core values, discontinuing programs in which excellence cannot be achieved, and eschewing programs that are incompatible with its societal purpose. The university community functions as a
seamless coalition of health professionals who understand and embrace their roles, take collective pride in their accomplishments, share their scholarship and innovations, and participate in shaping and securing UTMB’s future and fulfilling its pledge to society.

**GSBS Mission Statement**
The Graduate School of Biomedical Sciences at the University of Texas Medical Branch promotes the advancement of human understanding and knowledge in health-related disciplines through scholarly teaching and research in the biomedical sciences. Foremost, the Graduate School embraces excellence in all of its academic pursuits and activities. Academic curricula and programs are available that emphasize developing individual leadership, communication, motivation, and scholarship to meet the challenges of today’s society.

**GSBS Administration**

David Niesel, Ph.D.
Senior Vice President and Dean, GSBS

Joan E. Nichols, Ph.D.
Associate Dean for Student Affairs

Jose M. Barral, M.D., Ph.D.
Associate Dean for Academic Affairs

M. Kristen Peek, Ph.D.
Associate Dean for Recruitment

Andrew McNees, Ph.D., M.B.A.
Administrator, GSBS

**Tammie Taylor, M.L.A.**
Program Manager, Postdoctoral Affairs & Training
General Information

Student Organizations
For more information regarding any of these organizations, visit their web sites, contact the officers, or speak with the Office of Student Life, 2.110 Jamail Student Center, (409) 772-1996.

Biological Chemistry Student Organization
The BCSO is an educational association that exists to foster the development and growth of graduate students enrolled in the Graduate Program in Biochemistry and Molecular Biology at the University of Texas Medical Branch. The organization shall serve to disseminate pertinent information among the members and to further the interests of the membership by promoting participation in University affairs.

Chinese Student Association
The purpose of CSA is to serve the Chinese community at UTMB.

Committee for Career Development
The goal of the CCD is to expose students and post-docs to career opportunities and help them acquire the skills needed to further their professional lives.

Committee on Public Policy
The Committee on Public Policy seeks to expose students and post-docs to career opportunities in the field of public policy where science, technology, and policy intersect.

Doctoral Nursing Student Organization
This group develops and encourages a spirit of unity, support, cooperation, and democratic self-government; coordinates activities; and provides a channel of communication and representation between doctoral nursing students and faculty.

Experimental Pathology Graduate Student Organization
The EPGSO is an organization that enables experimental pathology students to address their program- and school-wide concerns, and whose officers will serve as liaisons between students and administration.

Graduate Student Organization
The GSO facilitates and directs all graduate student functions in the best interest of both graduate students and the Graduate School.

International Student Organization
The ISO seeks to improve English language skills and promote cultural exchange between members.

Microbiology and Immunology Graduate Student Association
The organization facilitates professional interaction and student participation in activities of the M&I department and graduate program.

Organization of Postdoctoral Scientists
The mission of the OPS is to serve UTMB by providing information, support, and encouragement to all postdoctoral fellows progressing towards advancement in each of their respective scientific careers.

Population Health Sciences Graduate Student Organization
The PHS-GSO exists to foster the development and growth of graduate students enrolled in the graduate program in PHS at UTMB. The organization shall disseminate pertinent information among the membership and further the interests of the membership by promoting participation in University affairs. The organization will work cooperatively and collaboratively with the faculty members of the program to achieve these goals.

Society for Cell Biology
SCB is a nonprofit professional society dedicated to promoting careers and research in cell biology by encouraging interactions between students and senior investigators and sponsoring campus-wide educational events.

Admission
Each applicant for admission to the GSBS must complete the following steps:

1. Submit a properly completed application for admission. Applicants may complete an online application by visiting the Office of Enrollment Services home page at http://web.utmb.edu/enrollmentservices/ or may request a copy of the application form directly from the Graduate School.

2. Submit the appropriate application fee: see http://intranet.utmb.edu/enrollmentservices/prospect/admissions/index.html

3. Submit an official transcript from each college-level institution in which the student has ever been enrolled, directly from the issuing institution to the Office of Enrollment Services, 301 University Boulevard, Galveston, Texas 77555-1305.

4. Request that an official copy of scores earned on the GRE and, if applicable, the TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing System) be submitted to Enrollment Services.

Candidates for admission to the Graduate School must have a bachelor's degree from a regionally accredited college or university in the United States or proof of equivalent degree and training from an acceptable foreign institution of higher education. An applicant who holds a graduate degree or first professional degree (e.g., M.D., D.D.S., J.D.) from a regionally and programmatically accredited college or university in the United States or proof of equivalent degree and training from an acceptable foreign institution of higher education may be considered on an individual basis even though he or she does not hold a bachelor's degree or equivalent as defined above. Final recommendation by the graduate program faculty will be based on competitive evaluation of the qualifications of the applicant plus consideration of the availability of space and resources. Each graduate program has specific requirements, but common factors considered by the admissions committees include the following:

1. undergraduate overall and upper division grade point average and, if applicable, graduate grade point average and the appropriateness of the curriculum as preparation for graduate study. (There is no minimum required GPA, but a cumulative undergraduate GPA above 3.0 on a 4 point scale is preferred);

2. scores on the Graduate Records Examination;

3. a minimum score on the TOEFL of 550 (paper) or 213 (computer-based) or a minimum score of 6.5 on the IELTS for applicants whose native language is not English;

4. research or other relevant experience;

5. letters of reference;

6. background for and commitment to a career of scholarly endeavor in the field of study;

7. availability of opportunity for training in the desired field of scholarship;

8. unique educational, career, or life experiences;

9. personal statement;
10. socioeconomic background;
11. ability to communicate in English; and
12. race and ethnicity.

Additional requirements and qualifications are needed for some specific fields of study. In all cases applicants should refer to the specific program information given below for possible additional requirements. Applicants to the Nursing Doctoral program must hold at least the bachelors of science in nursing degree, the masters of science in nursing is preferred. Applicants for the Master of Public Health degree must be a licensed physician graduate of an accredited medical school and have successfully completed at least one year in a residency in another field, be a doctoral level faculty member at UTMB, or be in a doctoral degree program at UTMB. Candidates not currently at UTMB must complete concurrent admissions to both a preventive medicine residency program in the UTMB School of Medicine and the MPH Program.

Applicants for the Master of Medical Science degree must be a licensed physician graduate of an accredited medical school. Applicants must be a resident, fellow or faculty member of a UTMB School of Medicine clinical department.

Tuition

Please refer to the General Information Catalog for current information on tuition and fees.

GSBS Scholarship Awards

- **Ann and John Hamilton Endowed Scholarship**—This award is presented to recognize distinguished academic performance.
- **Ann Anderson Scholarship**—This award was established in recognition and appreciation of the years of dedicated service by Ms. Anderson to the GSBS and to UTMB. This scholarship is to be used to support students who are in good standing and enrolled in any program in the GSBS.
- **Arthur and Dorothy Barrett Scholarship**—This award supports a Graduate Student based on research merit and not academic grades in the area of Virology.
- **Arthur V. Simmang Academic Scholarships**—This scholarship is awarded to degree-seeking students enrolled in a GSBS program who have excellent academic achievement and demonstrated financial need.
- **Arun Kumar Chopra, Nirmal Rani Chopra and Dharam Dev Chopra Memorial Scholarship**—This scholarship recognizes students performing research in infectious diseases with emphasis on the molecular basis of pathogenesis and drug/vaccine development in Microbiology and Immunology.
- **Biochemistry Student Organization Graduate Student Award**—This award is presented for the first time in 2006 and will recognize an outstanding student who exemplifies the tradition of service to the institution and is in the graduate program of biochemistry and molecular biology or biophysical, structural or computational biology program.
- **Barbara Bowman Scholarship**—This scholarship is presented to an outstanding student in the graduate program of biochemistry and molecular biology or biophysical, structural or computational biology program.
- **Betty Williams, Ph.D. Tuition Scholarship**—This scholarship recognizes an outstanding bench scientist with special consideration for disadvantaged students.
- **Bohdan Nechay Tuition Scholarship**—This scholarship recognizes an outstanding student enrolled in the GSBS.
- **Don W. Micks Scholarship in Population Health Sciences**—This award honors an outstanding graduate student in the Population Health Sciences graduate program with
outstanding research accomplishments and career goals that demonstrate substantial evidence of motivation, dedication, creativity, independence, productivity and an enthusiastic attitude.

- **Eva Yznaga Seger, MD Presidential Scholarship** – Endowment is to provide need based scholarships to students enrolled in any UTMB school who are in good academic standing. Rotating scholarship awarded by GSBS every four years.

- **James W. McLaughlin Fellowships** - Since 1954, in keeping with its charge to advance the study of infectious diseases and immunity at UTMB, the James W. McLaughlin Endowment Fund has provided fellowships to outstanding predoctoral students and postdoctoral fellows who are conducting research in those areas and planning careers as productive scientists.

- **Jeane B. Kempner Scholar Award** - The Jeane B. Kempner Scholar Award was established in the will of Daniel W. Kempner, for the purpose of giving financial aid to exceptionally brilliant students attending the Medical Branch of the University of Texas at Galveston, to assist and encourage them in pursuing advanced studies in any area of medicine, such assistance to be given following the student's normal undergraduate years of study. Candidates have received their PhD or MD degree from UTMB within the past five (5) years and have strong backgrounds in research with the ability to work independently. Candidates have achieved academic excellence during their graduate career. A Kempner fellowship supports research at UTMB or any other accredited national or international institution.

- **Kay and Cary W. Cooper, Ph.D. Scholarship** – This scholarship is awarded to an outstanding student and citizen of UTMB and is open to all students enrolled in the GSBS.

- **Charles F. Otis Endowed Award For Clinical Research** – This award is presented to a student in Clinical or Rehabilitation Science for health services or patient-oriented research that improves outcomes of health care in older populations.

- **Chester R. Burns Institute for the Medical Humanities Alumni Award** – The award is presented to an outstanding student enrolled in the Medical Humanities graduate program. Special preference will be given to applicants whose major interests are in the traditional humanities disciplines (including history, literature, philosophy, religious studies, and visual studies).

- **Curtis W. Lambert Scholarship** – This scholarship recognizes a regularly enrolled second-year and above graduate student who has succeeded academically (overall GPA of at least 3.0) and who is in financial need.

- **Janet and David Niesel, PhD Scholarship** – This award is open to all students enrolled in the GSBS, and rewards an outstanding student and citizen of UTMB.

- **Dr. David C. Eiland, Jr. Scholarship Award in Health Care and Humanities** – This award is presented to a full-time student in the Institute for the Medical Humanities who has demonstrated academic excellence and who has displayed self-knowledge and a commitment to moral and humanistic teaching, health care, and/or styles of institutional leadership.

- **Dennis Bowman Memorial Scholarship** – Open to all students enrolled in the GSBS and awarded to an outstanding student and citizen of UTMB.

- **Edith and Robert Zinn Presidential Scholarship** – Open to all students enrolled in the GSBS demonstrating the highest standing in all aspects of graduate education, academics, research and citizenship.

- **Edward S. Reynolds, M.D., Experimental Pathology Graduate Scholarship** – The scholarship recognizes a promising graduate student performing meritorious research in Experimental Pathology. The nominee should be a regularly enrolled student in the GSBS, demonstrated satisfactory performance in his/her graduate work to date, and have good grades in formal course work.

- **Eleanor Dupree Otis Biostatistics** - This scholarship was established by dedicated UTMB faculty members Drs. Dan and Jean Freeman. Both doctors have served as extraordinary resources in the UTMB research community. Both have been appointed to prestigious professorships, recognizing their contributions to UTMB's renowned program.
in geriatric research. Together, they have created endowments at UTMB to support biomedical research among students and encourage the professional development of underrepresented faculty. This award will be used to benefit the Graduate School of Biomedical Sciences for promotion, education and research in biostatistics. The award was created to celebrate and honor Eleanor Dupree Otis, mother of Dr. Jean Freeman.

- **Medical Humanities Endowed Scholarship**—This scholarship is given to a student pursuing a degree in the Medical Humanities who has demonstrated financial need and/or distinguished academic achievement.

- **Elferink Scholarship for Academics**—UTMB faculty members Drs. Cornelis J. Elferink and Lisa A. Elferink have dedicated their careers to advancing health care across the globe since they left their native Australia to continue experimental medicine in the U.S. in 1988. Dr. Cornelis J. Elferink is a professor at the Sealy Center for Cancer Cell Biology in the Department of Pharmacology and Toxicology and director of the Center for Environmental Toxicology. His wife, Dr. Lisa A. Elferink is an assistant dean for educational affairs. The Elferkins see medicine as an expression of one of humanity’s most noble values: easing suffering by serving others. That dedication motivated the couple to establish the Elferink Scholarship for Academic Excellence. This award supports an annual scholarship to a PhD student in the Graduate School of Biomedical Sciences. This was a wonderful contribution to the Working Wonders Campaign that will benefit and promote the next generation of biomedical scientists.

- **Emily E. Dupree Endowed Award for Excellence in Rehabilitation Science**—This award is to be presented to a student in Clinical or Rehabilitation Science for interdisciplinary research that promotes function and independence in older adults.

- **George Palmer Saunders II Memorial Scholarship**—This scholarship is provided to a Ph.D. student enrolled in the Pharmacology and Toxicology program who has demonstrated outstanding research capability, and the potential for significant contributions to the field of pharmacology. This one-year scholarship is available to students in years 1-5.

- **Drs. Giovanni & Maria Grazia Micci Award for Mentoring Excellence**—Funds distributed from the endowment shall be used to support a graduate student in the GSBS who has shown excellence and dedication to mentoring students, (for example, junior graduate students, high school interns, or undergraduate interns), in an effort to help them move forward in their career path.

- **GSBS Associates Scholarships**—Graduate school alumni provide support for scholarships and awards through their annual giving to the GSBS Associates Fund. The scholarship is to recruit outstanding Ph.D. candidates to UTMB or recognize students of exceptional merit early in their career (usually 1st or 2nd year).

- **GSBS Associates Travel Award**—Graduate school alumni provide support for scholarships and awards through their annual giving to the GSBS Associates Fund. This scholarship will be used to award scholarship each year for outstanding students in the School of Medicine and the Graduate School of Biomedical Sciences.

- **Christina Fleischmann Travel Awards**—These awards are to supplement Ph.D. candidates’ travel to present their work at national and international meetings.

- **Harold T. Sanders Endowed Fellowship in Vaccine Development**—As a tribute to his father, Harold T. Sanders, Dr. Paul Sanders established an award to advance research aimed at treating and preventing acute and chronic diseases with vaccines.

- **Harry Huntt Ransom Fellowship**—The Harry Huntt Ransom Fellowship in the Institute for the Medical Humanities was established in 1993 to provide financial support for Dissertation Fellows in the Institute for the Medical Humanities. Those selected for this award must demonstrate (1) outstanding academic and professional credentials in the medical humanities, (2) superior research aptitude skills in the medical humanities, (3) outstanding professional and personal leadership among his or her peers, and (4) have successfully completed their written and oral qualifying examinations. Students would remain eligible through the year they complete their dissertation.

- **James Hokanson Endowed Scholarship**—The scholarship is presented for students engaged in population health and public health research in the Graduate School of
Biomedical Sciences.

- **Irma Mendoza Scholarship**—This scholarship is presented to an outstanding student of high academic achievement and service in the graduate program of Biochemistry and Molecular Biology.

- **James E. Beall II Memorial Award in Anatomy and Neurosciences**—Awarded to a Ph.D. candidate involved in research related to the function or structure of the nervous system. Applicants will be judged on their teaching ability and the quality and scientific merit of their research.

- **James E. Beall II Memorial Scholarship**—This scholarship is available for a student who is enrolled as a regular, full-time Ph.D. degree-seeking student based on academic qualifications including GRE scores, TOEFL scores (where required), grade point average, advanced degrees, research experience, and motivation and dedication to a career in biomedical research.

- **Jane Welsh Award for Excellence in Cardiovascular Research**—This award recognizes outstanding achievement and research. Nominee should be a regularly enrolled graduate student at UTMB at Galveston, have good grades in formal course work and should have demonstrated excellence in the conduct of original research in the cardiovascular area.

- **Jason E. Perlman Research Award**—This award recognizes a student who has made a significant contribution toward the advancement of knowledge in the area of behavioral sciences or the humanities. The nominee should be a regularly enrolled graduate student at UTMB and should have good grades in formal course work.

- **Jen Chieh and Katherine Huang Scholarship**—This award is presented for the first time in 2006 to recognize a graduate student for research excellence in neuroscience.

- **Katherine Siebert Award for Excellence in Oncologic Research**—This award recognizes outstanding achievement and research. Nominee should be a regularly enrolled graduate student at UTMB at Galveston and should have good grades in formal course work and should have demonstrated excellence in the conduct of original research in oncology.

- **Laura Ray Scholarship**—The Laura Ray Scholarship was established to recognize and reward outstanding students enrolled in the Graduate Program in Population Health Sciences and to provide a perpetual tribute to Laura Ray by honoring her work and contributions to UTMB faculty, staff and students.

- **Leroy Olson, Ph.D. Scholarship**—This scholarship is awarded to an outstanding student enrolled in the Graduate School based on merit and high academic standards.

- **Margaret Saunders Memorial Graduate Student Travel Award**—In memory of his wife, Margaret Saunders, Dr. J. Palmer Saunders established an award to supplement PhD candidates’ travel to present their work at national and international meetings.

- **Lois E. Nickerson, R.N. Endowed Scholarship**—Lois E. Nickerson established The Lois E. Nickerson, R.N. Scholarship in 2006. Lois earned a bachelor’s degree from the School of Nursing at The University of Texas Medical Branch at Galveston in 1955. She enlisted in the United States Navy Nurse Corps in 1957 and remained on active duty for twenty-seven years. She retired from the Navy in 1984 as a Captain. The Lois E. Nickerson Endowed Scholarship is awarded to students in the Nursing Ph.D. Program.

- **Marianne Blum, Ph.D. Endowed Scholarship**—The scholarship recognizes an outstanding student conducting research in the area of Biochemistry and Molecular Biology in the Graduate School of Biomedical Sciences.

- **Marie and Talbert Aulds Scholarship Award**—Established by Jerry Aulds and Cheyenne Darlene Martin, PhD, RN. This School of Nursing award is available to a student committed to obtaining a doctorate degree in Nursing, with a preference given to students pursuing ethics, having excellent academic achievement and demonstrating financial need.

- **Dr. Mary Faggard Kanz Travel Award for Environmental Toxicology**—This
scholarship provides travel awards for students to attend national or international scientific meetings for environmental toxicology. Recipients of the Dr. Mary Faggard Kanz Travel Award for Environmental Toxicology shall be chosen by a committee appointed by the Dean of the Graduate School of Biomedical Sciences.

- **Mason Guest Scholar Award**–The award is presented to a student in the Cellular Physiology and Molecular Biophysics program who shows excellent scholastic and research potential in the fields of cell physiology, molecular biophysics, cell biology, or bioengineering.

- **Michael Gilles Purgason Memorial Scholarship** - This scholarship provides support for PhD students in good academic standing and who are enrolled in the Graduate Program in the Department of Preventive Medicine and Community Health at UTMB. In addition, student(s) must show evidence of participation in activities and career goals which align with service to students and/or the community.

- **Michael Tacheeni Scott Endowed Scholarship**–The scholarship recognizes an outstanding student conducting research in the areas of neuroscience, pharmacology or addiction studies in the Graduate School of Biomedical Sciences.

- **Peyton and Lydia Schapper Endowed Scholarship (School of Health Professions)**– These scholarships recognize an accepted degree seeking graduate student who has an expressed interest in the area of gerontology and health promotion, and who has demonstrated outstanding professional and personal leadership among his/her peers.

- **Ralph and Mary John Spence Centennial Scholarship** – This scholarship provides an annual award to an outstanding student from one of the four schools, the School of Medicine, the School of Nursing, the School of Allied Health Sciences, or the Graduate School of Biomedical Sciences. The endowment rotates therefore the scholarship is awarded by the GSBS every four years.

- **Regina R. and Alfonso J. Mercatante Memorial Scholarship**–This will provide for a student enrolled in the nursing doctoral program. The amount is to be determined.

- **Robert A. Welch Award for Excellence in Graduate Research in Chemistry**–The Welch Award recognizes a graduate student who has made outstanding contributions to the biomedical sciences through research in chemistry.

- **Robert Bennett Tuition Scholarship**–This scholarship recognizes an outstanding student enrolled in the GSBS.

- **Robert Harrison, M.D. Memorial M.D.-Ph.D. Scholarship**–The scholarship is awarded to a student enrolled in the M.D.-Ph.D. Combined Degree Program based on outstanding academic performance and credentials, superior medical aptitude and plans for a career in academic medicine, and demonstrated leadership among peers.

- **Robert Shope PhD Endowed Scholarship**–This award recognizes a student based on academic credentials, recommendations and demonstration of a commitment to pursuing a career in infectious disease research.

- **Rose and Harry Walk Research Award**–This award recognizes a graduate student who has made significant contributions toward a better understanding of aging or of mechanisms leading to significant pathologic changes in the human organism. Nominee should be a regularly enrolled graduate student at UTMB at Galveston and have good grades in formal course work.

- **Samuel Baron, MD Research Scholarship** – To support graduate students and fellows working with infectious disease/host defense to attend national and international meetings and present their work.

- **Samuel N. Kolmen, PhD and Barbara Kass Kolmen, MD Travel Scholarship** - To support graduate students as they travel for fellowships around the world, for temporary research rotations with other institutions and for conferences where they can learn from global luminaries in biomedical science.

- **Satish Srivastava Endowed Scholarship** - Provide financial assistance for incoming Graduate Students in the field of research and basic research.

- **Sealy Center on Aging Graduate Student Award**–This award is given to an outstanding graduate student who has significantly contributed to the knowledge of aging studies through independent research in the basic sciences, epidemiology, behavioral
science or the medical humanities.

- **Sealy Center for Vaccine Development Graduate Student Award** – The Center invites nominations for its award recognizing excellence in research in the field of vaccine development. This award is given to an UTMB graduate student who has made a significant contribution to a vaccinology related projects that is consistent with the mission statement of the center (see www.utmb.edu/scvd). Students may be enrolled in any graduate program at UTMB, and projects may involve basic science, translational biology, clinical trials, public health policy, community outreach or education.

- **Sharon Nelson, PhD and Odd Steinsland, PhD Endowed Scholarship** - The Sharon Nelson, PhD and Odd Steinsland, PhD Endowed Scholarship was created through the generosity of former University of Texas Medical Branch faculty members Dr. Odd Steinsland and his wife, UTMB alumnus Dr. Sharon Nelson Steinsland, who both served UTMB for more than 30 years. Dr. Odd Steinsland came to UTMB by way of New York in 1974. He dedicated his career to the UTMB Department of Pharmacology and Toxicology until his retirement in 2002, at which time he was named professor emeritus. Dr. Sharon Nelson Steinsland graduated from UTMB in 1982 and served as associate professor in the Department of Anesthesiology until her retirement 2009. Due to their great affection and admiration for UTMB, they established a permanently endowed scholarship to assist the Graduate School of Biomedical Sciences in recognizing and awarding outstanding students who are accomplishing exceptional research and academic achievements in the Pharmacology and Toxicology graduate program.

- **Shirley and Albert Sanders Presidential Scholarship** - This scholarship will be used to award scholarship each year for outstanding students in the School of Medicine and the Graduate School of Biomedical Sciences.

- **Shirley Patricia Parker Scholarship** – This scholarship honors a graduate student doing research in the field of oncology and who is in financial need.

- **Stephen C. Silverthorne Memorial Scholarship** – This award is presented to a student on the basis of perseverance and excellence in any field of research.

- **University Federal Credit Union Scholarship** – This scholarship, sponsored by the UFCU, honors excellence in academics and citizenship for outstanding students in the GSBS.

- **UTMB Retirees Scholarship Award** – The UTMB Retirees Association established a scholarship fund to reward and recognize outstanding students in each of the four schools at UTMB. The Association pays tribute to the members who have made this generous award possible.

- **William Bennett Bean Scholarship in the Medical Humanities** – This scholarship is awarded to a degree-seeking graduate student pursuing a career in the Medical Humanities. The student must demonstrate distinguished academic achievement.

- **William Bennett Bean Scholarship in the Medical Humanities** – This scholarship is awarded to a degree-seeking graduate student pursuing a career in the Medical Humanities. The student must demonstrate distinguished academic achievement.

- **Zelda Zinn Casper Scholarship** – A full stipend plus a travel award is available to an outstanding student showing superior accomplishments and promise for achieving excellent dissertation research. The student must be a U.S. citizen and may receive this scholarship only once.

- **Zhou Sisters Great Expectations Scholarship** – The scholarship was established to recognize an outstanding student in one of the following programs: Population Health Sciences, Experimental Pathology, Microbiology and Immunology or Pharmacology and Toxicology.
Academic Policies

Student Responsibility

The student is responsible for knowing degree requirements and enrolling in appropriate courses. The student is likewise responsible for knowing the University regulations for the standard of work required for continuation in the Graduate School. The policies of the Graduate School of Biomedical Sciences are based on the Rules and Regulations of the University of Texas System (http://www.utsystem.edu/bor/rules.htm), the UTMB Institutional Handbook of Operating Procedures (http://intranet.utmb.edu/Policies_And_Procedures/index.htm), and the Bylaws of the Graduate School of Biomedical Sciences (http://gsbs.utmb.edu/_pdf/BylawsandPolicies.pdf). This information has been provided for the convenience of the reader, but amendments and changes may not be reflected here. Readers are advised to refer to the references cited for the most current information.

Adding, Dropping and Withdrawing from Courses

Courses may be added or dropped with appropriate approvals. Students may drop or add full-term courses prior to the official census date (twelve class day). For shorter-term courses, students have until the sixth class day for Fall and Spring terms; and the fifth class for Summer term to drop or add courses. Students will be billed for the additional cost in tuition and fees for each course added. Courses dropped by these deadlines will not be recorded on the transcript. Courses dropped after these deadlines are recorded on the transcript with a grading symbol of Withdraw (“W”—no Grade), Withdraw Failing (“WF”), or Withdraw Passing (“WP”) based upon the level of student’s performance on the date of request.

Tuition and fees paid for the course are not charged when the course is dropped within the stated deadlines or an appropriate refund will be made if tuition and fees already have been paid.

There are no refund for tuition and fees for W, WP, or WF grades. In some circumstances a full refund of tuition fees and the complete removal of the course from the student’s academic record may occur with the approval of the assistant or associate dean for student affairs.

A student officially withdrawing from school during a fall, spring or summer term is entitled to a refund in tuition and certain fees according to the schedule printed in the UTMB all schools bulletin.

A W or WP have no effect on the GPA whereas a WF is the same as an F and is calculated as a failing grade in the GPA. Students may petition the GSBS for a late withdrawal consideration.

Students with more than two (2) grading symbols of any withdrawals (W, WP, or WF) on their transcript or more than one (1) W, WP, or WF in the same course shall be placed on probation and may be subject to dismissal from the graduate school. The total registration must be no less than nine credit hours for the student to remain eligible for a stipend.
Grades and Grade Point Average

Grades Used by the Graduate School
The only grades used by the graduate school to compute the grade point average are A, B, C, F, and U, where on a 100 point scale A=90-100, B=80-89, C=70-79, F=0-69. The grade point average is calculated on the 4.0 system; a grade of U is computed as equal to a grade of F. A grade shall be provided for each course taken in every term and shall be based solely on performance in that term. When a student retakes a course both grades will be computed into the overall grade point average.

Incomplete (I)
The symbol for “incomplete” (I) will be reported in cases where a student has, with the permission of the instructor, failed to complete all of the required work of the course by the end of that term. An “incomplete” (I) is valid for a period not to exceed one term. By the end of that time the student must have completed the required work of the course, and a proper grade must have been reported to the dean, or the “I” will be changed to an F. An “I” shall not be used for courses graded S/U (satisfactory/unsatisfactory).

Credit (CR)
The grade of “credit” (CR) may be granted upon recommendation by the program director and approval of the dean, and shall be used to designate that a student has been given credit for a course, competence for which has been demonstrated by previous work or by taking an examination for credit. Courses graded CR may count toward degree requirements, but the grade is not computed in the grade point average.

Grading and Maximum Credit for Research
Quality of work in research courses is evaluated as “satisfactory” (S), “needs improvement” (N) or “unsatisfactory” (U). An S grade qualifies the student to receive course hour credits towards the degree. No more than nine credit hours for research courses may be credited toward the minimum hour requirements for a degree. A part of the requirement for successful completion and credit for research shall be that the student submit to the instructor a brief written synopsis describing the research done in that term. This report shall be submitted by the last day of the term for review and approval by the instructor and the program director. The program director submits the reports and grading sheets to the dean. The grade of “incomplete” is inappropriate for research courses.

Grading and Maximum Credit for Seminar
Seminar (6195) is a one-credit course. Each student presenting a seminar shall receive a letter grade, while students not making a presentation will receive a grade of “satisfactory” (S) or “unsatisfactory” (U). No more than 3 credit hours of seminar may be counted toward the minimum hour requirements for a degree.

Grading and Maximum Credit for Thesis and Dissertation
Quality of work in thesis (6098) and dissertation (6099) courses is evaluated as satisfactory (S), needs improvement (N) or unsatisfactory (U). An S or N grade qualifies the student to receive course hour credits toward the degree. No more than six hours of thesis courses will be credited toward the minimum hour requirements for a degree. Students registering only for thesis or dissertation must register for a total of nine credit hours to be counted as a full time student. The grade of “incomplete” is inappropriate for thesis and dissertation courses.
Course Load

A full-time course load is defined as 9 or more credit hours per term. The maximum course load for a graduate student is 15 hours. Students registering for more than this maximum course load must have the consent of the graduate program director which will be given only under exceptional circumstances.

Transfer of Credit

Graduate courses taken at another institution may be transferred only on the basis of a recommendation by the student’s graduate program faculty and approval by the dean of the Graduate School. In cases where such transfer is approved, the student must still meet the residence requirement of one year. Grades received for courses transferred for credit shall not be used in computing the grade point average. Work taken by correspondence will not be allowed for graduate credit.

Leave of Absence

A leave of absence is an extended interruption in academic activities for personal, medical or administrative reasons of such length of time that the work missed cannot be made up and an alteration in the academic schedule is required.

Voluntary Leave of Absence

Permission for three terms of leave of absence from a graduate program may be granted by the dean, subject to approval by the program director. Such permission will be granted only on written application and after an interview with the program director and the assistant or associate dean for student affairs. Conditions for approval of the student’s return to the program and school may be included in any approval of a voluntary leave of absence. Students requesting a voluntary leave of absence will be required to complete the term in which they are enrolled before the leave is granted. Otherwise, the student must withdraw from the Graduate School of Biomedical Sciences.

Emergency Leave of Absence

The dean of the Graduate School of Biomedical Sciences may determine that under certain emergency circumstances such as severe illness or injury, a student may be granted an emergency leave of absence. The grades assigned for courses in which the student is enrolled at the time of the emergency will be determined by application of the appropriate Graduate School policies and by the dean in consultation with the student's program director and the instructor(s) for the course(s) in which the student is enrolled. The dean will include in the approval of such a leave the conditions to be met prior to approval of the return of the student to the school. The student reinstated in the Graduate School after an emergency leave will have a course of study designed by the student's program.

Administrative Leave of Absence

The graduate school may determine under some conditions to place a student on Administrative leave when (1) the GSBS administration needs time to determines what type of leave and duration of a leave may be required (2) waiting for acceptance of a medical leave from the university ADA officer or (3) a student has completed all program course work and is waiting for a decision regarding publishing of a manuscript.

Medical Leave of Absence

For information related to medical leave of absence please contact the institutional ADA office.
Voluntary Withdrawal from the Graduate School
Upon written request by the student, permission for withdrawal from the graduate school (dropping all courses in the current registration) may be granted by the assistant or associate dean for student affairs after the dean has consulted with the program director. Students who withdraw are required to submit an official Financial Clearance Form, which may be obtained from the registrar’s office. In the case of withdrawal before the end of a term from all courses, the grading symbol "W" (withdrawn with no indication of level of performance), WP (withdrawn passing) or WF (withdrawn failing) will be recorded for each course not completed, depending on the student's standing on the last day of enrollment. In the case of withdrawal at the end of a term, the appropriate grading symbol, A through F or S or U, will be recorded for each completed course, and W, WP or WF for each course not completed. To receive the grade of W, the request for that grade for a specific course must be contained in the letter of resignation.

Following voluntary withdrawal from the graduate school students may reapply for admission to GSBS programs at a later date.

Satisfactory Academic Progress for Financial Aid Eligibility
To make satisfactory academic progress for financial aid eligibility in the Graduate School of Biomedical Sciences, a student must complete with a passing grade at least 5 semester credit hours during any semester or summer session of enrollment. A student who fails to meet this requirement is placed on financial aid probation by the Office of Enrollment Services for the next period of enrollment. If, during this subsequent semester or summer session of enrollment, the student fails to complete at least 5 semester credit hours with a passing grade, the student will no longer be eligible for financial aid, even if continued enrollment is permitted. In addition, the student must complete all requirements for the degree sought in no more than one academic year beyond the normal length of the training program. Students may be placed on academic probation regardless of their status relative to financial aid.

Student Non-Academic Issues and Concerns

Guidelines for Filing A Written Complaint
Students have a right and responsibility to report issues of concern. This may be done either verbally, in writing or by accessing the student professionalism concerns form on the UTMB Professionalism web site located at http://www.utmb.edu/professionalism/student_help/ form.htm.

The assistant/associate dean for student affairs, the associate vice president for student services, the students’ ombudsman and the director of The Title IX Office can provide guidance with any of the issues listed below.

Seeking Assistance. Contact the Associate Dean for Student Affairs, GSBS.

Discrimination. Written allegations of violations of the UTMB Nondiscrimination Policy (IHOP Policy 3.2.3) should be filed with the Title IX Office.

Sexual Harassment. Written allegations of violations of the Sexual Harassment and Misconduct Policy (IHOP Policy 3.2.4) should be filed with the Title IX Office.

Sexual Assault. In cases of Sexual Assault (IHOP Policy 7.1.12), campus or local police should be notified immediately.

Other Non Academic Issues. Written allegations of the Other Non-Academic Concerns (IHOP Policy 7.1.13) should be submitted to the assistant/associate dean for student affairs. Americans with Disabilities Act. Formal written complaints pertaining to violations of the Students with Disabilities Policy (IHOP 7.1.1) can be filed with the ADA officer, Lela-Locket Ware.

Conduct and Discipline. Written allegations of violations of the Student Conduct and Discipline Policy (IHOP Policy 7.1.3) should be submitted to the assistant/associate dean for student affairs of the GSBS.
Faculty Issues. Students are encouraged to seek guidance from the student affairs officer or the student ombudsman to determine the appropriate route for the formal written complaint.

**Student Academic Appeal Process**

**Course Content and Methodology**
Student grievances (IHOP 7.1.15) regarding a faculty member’s course content or teaching methodology are concerns of the department/division/program in which the course is taught and should be brought to the attention of the faculty member, course director, and/or department chair/program director. The decision of the department chair/program director is final.

**Grading and Evaluation**
A student may challenge an examination score, evaluation, or course grade using the following procedures:

**Challenges to Grading and Evaluation**
- After receiving a score or grade that a student wishes to challenge, the student should schedule an appointment with the faculty member administering the grade, stating the reason for the appointment. In the conference with the faculty member, the student whose evaluation is being appealed should be specific about parts of the examination, paper, or subject of grading. Ten business days from the date a graded document is returned to the student or the final grade is submitted to the Graduate School office are allowed for a student to pursue the informal appeal of a grade.
- Should the issue fail to be resolved to the student’s satisfaction in the meeting with the faculty member, the student may request that a conference be scheduled with the director of the program in which the course is taught. The student conference with the program director will be held at such a time that the faculty member will be available to participate in the conference. The program director shall render an opinion regarding the student challenge of the grade within three business days of the conference with the student.

**Appeals of Grading and Evaluation**
- If the program director rules in favor of the faculty member, the student has the right to appeal in writing to the dean of the Graduate School. This appeal must be made within 5 business days following the rendering of a decision by the program director. The dean may choose to personally investigate the grievance or may refer it to an ad hoc appeals committee. If the ad hoc appeals committee is involved in hearing the appeal, that committee will recommend a resolution of the appeal to the dean of the Graduate School. The decision of the dean will be final.
- Failure by the student to carry forward the appeal at any level and within the specified time frames shall nullify the right to pursue the appeal of the grade in question.
- The ad hoc appeals committee is appointed by the dean of the Graduate School from members of the Executive Committee of the graduate faculty. The committee shall consist of three voting members and the associate dean for the Graduate School who shall serve as chair (without vote). These members cannot be from the program with which the student is associated or from the program offering the course in which the evaluation, examination score, or course grade is being appealed.
- When all parties have been identified, the student and the faculty member will be
notified in writing of the implementation of the formal appeal procedure and informed of the members identified to serve on the committee. Should the student or faculty member involved in the grievance question the composition of the committee, they may request a replacement of the member(s). This is to ensure to the extent possible that prior to the review of the appeal no member of the committee has a bias for either party involved in the appeal.

- The hearing should be held at the earliest possible date, usually within five business days, to ensure efficient remediation of the grievance, but the hearing does not have to be held within the five days described above. The chair of the committee has the responsibility at this point to gather all pertinent data related to the grievance. The faculty member also has the right to provide the committee with a written statement regarding justification for the grade or score in question. All documentation pertaining to the appeal procedure will remain confidential and will be provided only to the student, faculty and graduate program director in charge of the course in question, and each member of the committee. It must be distributed at least 24 hours prior to the scheduled hearing.
- The number of people present during the hearing is limited to committee members, grievant, respondent, their respective advisors, and a recording secretary. Both parties have the right to an advisor during the hearing. At no time may the advisors address the committee. Advisors may, however, confer privately with their advisees during the hearing. Witnesses may be called into the room as needed. Deliberation of the three voting committee members will commence at the close of the exchange of information when all parties have been dismissed from the hearing. A vote of two-thirds of the total membership of the committee is required to finalize its conclusion.
- The recommendation of the committee shall be presented within three business days to the dean of the Graduate School. The dean shall present his decision to the student within three business days of receiving the recommendation of the committee. The decision of the dean shall be final.

**Academic Dismissal Appeals**

- A student will be informed in writing that he or she has been dismissed from the Graduate School when the student’s record reflects any of the bases for academic dismissal. 
- A student who has received a letter of dismissal from the dean of the Graduate School may appeal the dismissal to a special academic review committee, provided the appeal is filed in writing with the dean of the Graduate School within two weeks of the date of the notice of dismissal. Failure to appeal in writing within the specified time will nullify the student's right to appeal the dismissal.
- The special academic review committee shall be appointed by the dean of the Graduate School and be composed of at least three faculty members, one of whom shall be an associate or assistant dean for the Graduate School and who shall serve as chair. When the committee has been confirmed, the student, student affairs officer of the Graduate School, and the director for the student’s graduate program will be notified in writing of the initiation of the appeal procedure and informed of the members identified to serve on the committee.
- Should the student, student affairs officer of the Graduate School, or graduate program director question the composition of the appeals committee, he or she may request replacement of the member(s). This is to ensure that prior to the review of the appeal and to the extent possible no member of the academic review committee has a bias for either party involved in the appeal.
- At a time usually not to exceed five business days from the date of receipt of the student’s written statement by the dean of the Graduate School, a hearing should be scheduled when all parties involved will be available.
- The number of people present during the hearing is limited to the committee,
the student, their respective advisors, and the recording secretary. Both parties have the right to an advisor during the hearing. At no time may the advisors address the committee. Advisors may, however, confer privately with their advisees during the hearing. The hearing should be held at the earliest possible date to ensure efficient remediation of the appeal.

- All documentation pertaining to the appeal will remain confidential and be provided only to the student, the student’s program director, Associate Dean of the Graduate School, and members of the academic review committee. This documentation shall be distributed at least 24 hours prior to the scheduled hearing.
- The written conclusion of the review committee shall be presented within three business days to the Dean of the Graduate School. The Dean has the right to question any party involved as he or she deems necessary, including any member of the review committee, before reaching a final decision on the matter. The Dean shall render a written decision usually within three business days of receiving the conclusion of the academic review committee. The decision of the Dean shall be final.

Compliance with Americans with Disabilities Act

It is the policy of The University of Texas Medical Branch at Galveston to comply with the Americans with Disabilities Act, Section 504 of the Rehabilitation Act of 1973, and state and local requirements regarding students and applicants with disabilities and the ADA Amendments Act of 2008 which are civil rights provisions aimed at ending discrimination against persons with disabilities. Under these laws, no otherwise qualified and competitive individual with a disability shall be denied access to or participation in services, programs, and activities of UTMB-Galveston solely on the basis of the disability (IHOP 7.1.1).

If you have a documented disability or would like to obtain information regarding services for students with disabilities at UTMB, please contact the ADA officer at (409) 747-4818.

Accepted Students: A student who has been accepted into a program within one of the schools at UTMB and plans to matriculate will:

- Read the essential functions of the program in question. These will be contained in the acceptance letter from the admissions director (or designated administrative official) of each program. The student will sign and date the document that verifies his/her capacity to complete the essential functions, either with or without accommodations. The essential functions for each academic program in the GSBS can be found in this bulletin under the section devoted to that program.
- Return the signed and dated document related to essential functions to the director of admissions along with the response to the program’s acceptance letter. The signed and dated document will be placed in the student’s file. If a student indicates a need for accommodations, the director of admissions shall forward information to that student about the institutional policy on students with disabilities and about the need to contact the school ADA liaison if that has not been done already.
- Send the school ADA liaison within his or her school a completed Formal Request for Accommodation Due to a Disability and documentation of disability from a qualified professional diagnostician. These materials should be provided to the school ADA liaison as soon as possible but no later than 60 days after receipt of the acceptance letter (or within 30 working days after being diagnosed with a disability or becoming disabled). This timeline ensures that these requests can be assessed by the ADA coordinator and enhances the probability that accommodations will be dealt with in a timely manner.
- The documentation from the student must specify the disability, the professional individual who determined the disability status, how the status was determined, and reasonable and specific ways to accommodate the student’s disability within the context of the program.
Students who are diagnosed with a disability or become disabled after matriculation will follow the relevant procedures enumerated above and then:

- Review and adhere to the institutional policy on students with disabilities;
- Inform the course (academic or clinical) instructor/director, if needed, (through the school ADA liaison) of the authorization for accommodation at the start of a course/clinical experience, so that the student and course instructor/director can coordinate the specified accommodation(s); and
- Notify the school ADA liaison in writing within 24 hours of any problem/concern relating to the implementation of any approved accommodation(s) based on a disability. This time period allows the school ADA liaison to investigate and administratively oversee the situation.

**Background Checks**

Recognizing that a sound character is vital to the biomedical sciences and health care professions, The University of Texas Medical Branch requires an applicant or admitted student to undergo a criminal background check and clear a drug test before admission is final.

**Graduate Degree Programs**

The Graduate School of Biomedical Sciences is composed of 11 graduate programs: seven based in departments of the School of Medicine, one in the School of Nursing, one in the Institute for the Medical Humanities, and two that are interdisciplinary. The graduate programs and degrees are:

- Biochemistry and Molecular Biology ............................................. M.S., Ph.D.
- Cell Biology ................................................................. M.S., Ph.D.
- Clinical Science ............................................................... M.S., Ph.D.
- Experimental Pathology ......................................................... M.S., Ph.D.
- Human Pathophysiology and Translational Medicine ............. M.S., Ph.D.
- Master of Medical Science .................................................... M.M.S.
- Medical Humanities ........................................................... M.A., Ph.D.
- Microbiology and Immunology ................................................ M.S., Ph.D.
- Neuroscience ................................................................. Ph.D.
- Nursing ................................................................. Ph.D.
- Pharmacology and Toxicology .............................................. M.S., Ph.D.
- Population Health Sciences ............................................... M.S., M.P.H., Ph.D.
- Rehabilitation Sciences .................................................. Ph.D.

Students in the programs in Cell Biology, Experimental Pathology, Biochemistry and Molecular Biology, Microbiology and Immunology, Neuroscience, and Pharmacology and Toxicology participate in a common curriculum for the first year of graduate study. This common curriculum is called the Basic Biomedical Science Curriculum (BBSC). Students in the first year of Graduate School studying in the BBSC are not yet in a program and consequently do not have a program director. For these students, the director of the curriculum handles any requirement necessitating action by a program director.

**Requirements for the Doctor of Philosophy Degree**

**Doctoral Degree**

The GSBS offers the Doctor of Philosophy degree. The basis for awarding the degree is the candidate’s demonstrated ability to master a selected field and to pursue independent
research. The supervisory committee must recommend that the graduate faculty certify that the student has fulfilled all the requirements for the Doctor of Philosophy degree before the faculty may grant the certification.

General Regulations

Residence
Each doctoral degree candidate must spend at least one year or its equivalent enrolled as a full-time student in residence in the GSBS. Exceptions to the residence requirement must be obtained in writing from the candidate’s supervisory committee and the dean of the Graduate School.

Foreign Language Requirement
The GSBS does not require demonstration of proficiency in a foreign language for admission.

Time Limits
There are four time limits for the Doctor of Philosophy degree:

1. All students must be accepted into the laboratory of a supervising professor (or be accepted by a supervising professor for a non-laboratory course of study) no later than four terms after matriculation as a full time student.
2. After successful completion of the written portion of the qualifying examination, students will be allowed to register for Research (6097) a maximum of three terms. Failure to be admitted to candidacy by the end of the third term after successfully completing the qualifying examination is grounds for dismissal from the GSBS.
3. All requirements for the doctoral degree must be completed within five years after admission to candidacy. Any student who fails to complete the requirements within this specified time must reapply for admission to candidacy.
4. A final, approved copy of the dissertation and all related forms must be submitted to the graduate dean within 90 days of successful completion of the defense of the dissertation.
5. 

Graduation
Degrees are awarded at the end of fall, spring, and summer terms, but formal, public ceremonies are held only at the spring commencement.

In Absentia Registration
In absentia registration provides a mechanism for a student to register for the sole purpose of receiving a degree. Eligible students are those who finish all requirements for a degree, including submission of an approved thesis or dissertation, too late for the term deadline but before the first day of class for the subsequent term.

Procedures to be Followed by All Doctoral Students
Detailed instructions and procedures to be followed by all doctoral students are provided in two documents: “Information for Master’s and Doctoral Candidates” and “Instructions for Preparation of the Doctoral Dissertation and Master’s Thesis and Instructions for Use of Published Manuscript in Lieu of Master’s Thesis” supplied by the Office of the Dean of the Graduate School and available at http://gsbs.utmb.edu. The author of the dissertation will provide an electronic copy of the approved document to the GSBS for deposit in the Texas Digital Library.
Course Requirements
Although advanced course work is an integral part of the candidate’s preparation, no minimum number of semester credit hours has been set by the GSBS for attainment of the Doctor of Philosophy degree. However, all doctoral work is subject to review by the graduate program and the dean of the GSBS. The basis on which the degree is awarded is the candidate’s demonstration of mastery of a selected field and ability to perform independent research. In addition, the candidate will undertake appropriate work to broaden or supplement the field of specialization.

Enrollment in Graduate School Without Admission to Graduate School: Special Students
Individuals holding the Baccalaureate or equivalent or higher degree who wish to take graduate courses at The UTMB Graduate School of Biomedical Sciences at Galveston may be permitted to enroll as special students with the approval of the dean of the Graduate School. Under normal circumstances, an applicant who has been denied admission to the Graduate School will not be permitted to enroll as a special student. Permission to enroll as a special student is granted for the term for which the application is submitted and special students are expected to maintain the same academic standing as regular students. Any further enrollment as a special student must be approved by the GSBS assistant/associate dean for student affairs on a term-by-term basis. Special students may not hold state-funded graduate assistantships or enroll in thesis or dissertation courses. Permission to enroll as a special student in no way guarantees subsequent admission into a graduate program or into the Graduate School. Credit earned as a special student may be applied to a degree program only with the approval of the appropriate graduate program director and the dean of the Graduate School.

Requirements and Conditions for Permission to Enroll as a Special Student
Permission to enroll as a special student does not confer on an individual any of the privileges of a regular student except the right to attend classes, take examinations, receive credit, and obtain an official transcript of work completed. To request special student status, the student must complete an Application for Admission form available from the Graduate School, have an appropriate undergraduate and/or graduate degree, have an undergraduate graduating grade point average of at least 3.0 at the degree awarding college/university and submit an official transcript showing award of the degree from that college/university. Applicants for special student status must also specify the course or courses in which they wish to enroll. Applicants with a doctoral degree may be permitted to enroll as non-matriculating students based on a letter or official transcript from the Registrar at the awarding institution certifying graduation with the qualifying degree. Students from other graduate schools wishing to take courses to transfer back to the home institution to apply toward degree requirements there may be permitted to enroll as non-matriculating students on the basis of a letter from the dean of the student's home school giving permission to transfer the courses and a letter of good standing from the registrar of the student's home school. Special students will not normally be allowed to enroll in more than one course in any term.

Qualifying Examination Requirements
Each graduate program faculty shall develop written procedures for administering a qualifying examination for admission to candidacy. This shall be a comprehensive written examination and may be supplemented with an additional oral examination. The qualifying examination will ordinarily be completed by the end of the second year of study and is a prerequisite for admission to candidacy. When possible or appropriate, and as a means of ensuring breadth and consistency, the same written examination shall be given to a group of students simultaneously.
**Supervisory Committee Selection**
Prior to admission to candidacy, the student shall select a supervisory professor who, with the approval of the dean and the program director, will be in charge of the candidate’s doctoral dissertation. The student, in consultation with the selected supervisory professor, will recommend the other members of a supervisory committee. The selected supervisory professor and the recommended other members of the supervisory committee are appointed by the dean. The supervisory professor will serve as chair of the supervisory committee unless the program director recommends to the dean that someone other than the supervisory professor serve as chair. The dissertation supervisory committee will normally consist of at least five members, including four UTMB graduate faculty members, associate members or special members, and one special member or appointee from another institution. Of the UTMB members, at least three should be from the student’s program (one being the supervisory professor), while the fourth should have a primary area of scientific expertise that is different from that of the supervisory professor. In general, this person will be from a graduate program other than that of the student. Approval by the program director and the GSBS dean is required to ensure the appropriate scientific qualifications and diversity of the committee.

The supervisory committees for M.D.-Ph.D. Combined Degree Program students have additional specifications. The committee must include an M.D. faculty member with a primary appointment in a clinical department and a member of the M.D.-Ph.D. Combined Degree Program advisory committee. These specifications may be satisfied by the appointees to the five positions required by the GSBS for a Doctor of Philosophy supervisory committee or by the appointment of additional members. The director of the M.D.-Ph.D. Combined Degree Program must approve these supervisory committees before the dean considers the proposed members. The dean will write the members of the approved committee and ask if they agree to serve. An affirmative response from all committee members is a prerequisite to admission to candidacy.

**Requirements for Admission to Candidacy**
Admission to candidacy for the degree Doctor of Philosophy requires:
1. submission of an application for candidacy and an approved research proposal;
2. a report from the program director that the student has passed the qualifying examination;
3. conversion of all incomplete (I) or not reported (NR) grades to regular grades;
4. resolution of any failing grades (F, WF, or U) on the transcript;
5. an overall grade point average of 3.0 or higher on all courses taken in the UTMB Graduate School of Biomedical Sciences;
6. good academic standing;
7. written agreement to serve from complete supervisory committee as defined above;
8. fulfillment of all program requirements; and
9. approval by the dean of the Graduate School.

After successful completion of the written portion of the qualifying examination students will be allowed to register for Research 6097 for a maximum of three terms. Failure to be admitted to candidacy at the end of the third term after successfully completing the qualifying examination is grounds for dismissal from the Graduate School.

**Following Admission to Candidacy**
The supervisory committee shall ensure that the candidate satisfies all of the requirements of the doctoral degree. The on-campus members of the supervisory committee shall meet with the candidate at least twice before the defense of the dissertation to monitor and evaluate the candidate’s progress. The chair of the supervisory committee shall periodically apprise the graduate program director of the progress of the candidate’s research. In every instance, final approval of the candidate’s program shall be the responsibility of the dean of the Graduate School.
Doctoral Dissertation
All students registering for dissertation are expected to register for a total of 9 semester credit hours; however, no student will be permitted to register for dissertation until he or she has been admitted to candidacy for the degree of Doctor of Philosophy. A dissertation is required of every candidate and must be an original contribution to scholarship based on independent investigation. The candidate’s supervisory committee shall ensure that the candidate’s dissertation meets these criteria. Copies of the dissertation (unbound) shall be made available to the supervisory committee at least three weeks prior to the scheduling of the final oral examination (defense of dissertation) in order to enable the members to evaluate its contents. The dissertation must be approved by the supervisory committee and the dean of the Graduate School.

Final Oral Examination (defense of dissertation)
The final oral examination will cover the dissertation, the general field of the dissertation, and such other parts of the candidate’s program as the supervisory committee may determine. The dissertation is not approved until after successful completion of this examination. If the examiners are satisfied that the candidate has met all the academic requirements for the doctoral degree, they sign the signature page of the dissertation and the Report of the Final Oral Examination.

Requirements for Master’s Degrees
The master’s degrees offered by the Graduate School are the Master of Public Health, Master of Science, Master of Arts, and Master of Medical Science.

General Regulations

Residence
Each master’s degree student must spend at least one calendar year or the equivalent enrolled as a student in residence in the Graduate School of Biomedical Sciences. Exceptions to the residence requirement must be obtained in writing from the candidate’s supervisory committee and the dean of the Graduate School.

Foreign Language Requirement
The GSBS does not require demonstration of proficiency in a foreign language for admission to candidacy; however, each graduate program faculty may set its own language requirement to be satisfied by a student before the student is recommended to the dean for admission to candidacy. Such language requirements must be made known to the student before admission to the Graduate School. Any decision by a graduate program faculty that a student should demonstrate language proficiency shall be subject to approval of the dean.

Time Limits
All requirements for the master’s degree must be completed within four years from the date of first admission as a regular graduate student. If the work for the master’s degree requires longer than a four-year period, permission to continue must be obtained from the dean.

Graduation
Degrees are awarded at the end of fall, spring, and summer terms, but formal, public ceremonies are held only at the spring commencement.

In Absentia Registration
In absentia registration provides a mechanism for a student to register for the sole purpose of
receiving a degree. Eligible students are those who finish all requirements for a degree, including submission of an approved thesis or dissertation, too late for the term deadline but before the first day of class for the subsequent term.

_Procedures to be Followed by All Master's Students_
Detailed instructions and procedures to be followed by all master's students are provided in two documents: “Information for Master’s and Doctoral Candidates” and “Instructions for Preparation of the Doctoral Dissertation and Master's Thesis and Instructions for Use of Published Manuscript in Lieu of Master's Thesis” supplied by the Office of the Dean of the Graduate School and available at http://gsbs.utmb.edu. The author of the thesis will provide a bound copy of the approved thesis to the Moody Medical Library for circulation.

_Course Requirements_
For a Master of Science or Master of Arts degree, a minimum of 36 semester credit hours of graduate instruction is required. At least 18 semester credit hours, including thesis, must be in the major program area. Until the students have a supervisory committee appointed by the dean of the Graduate School, they shall be under the direction of the graduate faculty in the students’ graduate program. The Master of Public Health degree requires a minimum of 42 semester credit hours. The Master of Medical Science degree requires a minimum of 30 semester credit hours.

_Course Transfer Policy_
Upon recommendation of the graduate program director and approval by the dean of the Graduate School, a student registered in the Graduate School may earn up to 6 graduate semester credit hours for work done at another institution. In cases where such transfer is approved, the student still must meet the residence requirement of one year. Grades received for courses transferred for credit shall not be used in computing the GPA. Work taken by correspondence will not be accepted for graduate credit.

_Supervisory Committee_
Prior to admission to candidacy, the student shall nominate a supervisory professor who, with the approval of the dean, will be in charge of the candidate’s master's thesis. The student, in consultation with the nominated supervisory professor, will recommend the other members of a supervisory committee to be appointed by the dean. The supervisory professor will serve as chair of the supervisory committee, unless the program director recommends to the dean that someone other than the supervisory professor serve as the chair. The supervisory committee shall ensure that the student satisfies all the requirements of the master’s degree and must recommend that the graduate faculty certify the student has fulfilled all the requirements for the Master of Public Health, Master of Arts, Master of Science, or Master of Medical Science degree before the graduate faculty may grant the certification. The supervisory committee for Master of Public Health, Master of Science, or Master of Arts degree students will nominally consist of at least three regular or special members of the graduate faculty, two of whom are from the student's program (one being the supervisory professor), and one whose primary area of scientific expertise is different from that of the supervisory professor. In general, this person will be from a graduate program other than that of the student, but in some cases a faculty member who holds an appointment within the student's program may qualify. Approval by the program director and the GSBS dean is required to ensure the appropriate scientific qualifications and diversity of the committee.

For the Master of Medical Science degree, the supervisory committee is composed of five members, one of whom is the supervisory professor. At least two members of the committee shall be from basic sciences departments and two shall be from clinical departments. Not more than two members shall be from the student's department.
Admission to Candidacy
Students seeking a master’s degree are admitted to candidacy upon the recommendation of the appropriate graduate program faculty, or by a committee appointed by the graduate Program Director in consultation with the graduate faculty. Admission to candidacy for a master’s degree requires:
1. submission of an application for candidacy and an approved research proposal;
2. satisfactory performance on any required qualifying examination;
3. conversion of all incomplete (I) or not reported (NR) grades to regular grades;
4. resolution of any failing grades (F, WF, or U) on the transcript;
5. an overall grade point average of 3.0 or higher on all courses taken in the UTMB Graduate School of Biomedical Sciences;
6. good academic standing;
7. a written agreement to serve from a complete supervisory committee as defined above;
8. fulfillment of all program requirements; and
9. approval by the dean of the Graduate School.

Following Admission to Candidacy
The supervisory committee shall ensure that the candidate satisfies all of the requirements of the master’s degree. The members of the supervisory committee shall meet with the candidate periodically to monitor and evaluate the candidate’s progress. The supervisory professor shall periodically apprise the graduate program director of the progress of the candidate’s research. In every instance, final approval of the candidate’s program shall be the responsibility of the dean of the Graduate School.

Thesis
All students registering for thesis are expected to register for a total of 9 semester credit hours; however, no student will be permitted to register for thesis until he or she has been admitted to candidacy for a master’s degree. The candidate for a master’s degree writes the thesis under the direction of a supervisory committee. The supervisory committee and the dean of the Graduate School must approve the thesis. Except for the Master of Medical Science degree, no more than 6 credit hours awarded for the preparation of the thesis may be counted toward the credit hour requirement for a degree.

Publication in Lieu of Thesis
A student’s supervisory committee may accept an in-press or published manuscript(s) in lieu of the conventional thesis in partial fulfillment of the requirements for the degree Master of Arts, Master of Science, or Master of Medical Science. The supervisory committee shall list appropriate refereed journals that would be deemed acceptable for such publication. In addition, the work reported in the publication must have been performed at the Graduate School of Biomedical Sciences or under the supervision of a member of its faculty, and the student must be the primary author on the publication(s).

Capstone Report
Candidates for the MPH degree typically complete a Capstone Report instead of a thesis. A Capstone Report is a scholarly product that represents the culminating experience of the Master of Public Health Program. The Capstone Report is focused on a topic of public health significance. It represents a thorough investigation, analysis, and evaluation of pertinent issues on the topic. It is based on a review of relevant and available literature that presents a critical synthesis and elaborates issues in a unique way. It is guided by an appropriate philosophical underpinning and reflects methodological rigor, including data analysis suitable to a scientific discourse. Its singular distinction is that it purveys a novel approach to issues that relate to public health and it advances the state of knowledge or practice on the topic.
The format for the Capstone Report is similar to that of the thesis and follows the style approved by the Graduate Program in PHS and the GSBS. In addition, a formal manuscript is submitted to the GSBS and is published in the same manner as the thesis.

**Final Examination (Defense of Thesis)**
A graduate program faculty may require all candidates for the Master of Public Health, Master of Arts, or Master of Science degrees to pass a final examination (oral, written, or both) conducted by the supervisory committee. The examination need not be related exclusively to the research area of the thesis. Notice of this requirement shall be given to the candidate on admission to the program. Master of Medical Science students shall take a final oral examination. This defense of the data (either thesis or manuscript) will be considered an obligatory part of the degree requirement and must be completed before final preparation of the document.
Basic Biomedical Science Curriculum
The first-year Basic Biomedical Science Curriculum (BBSC) offers an extraordinary graduate experience that furnishes a breadth of biomedical concepts and a strong foundation for advanced work. The BBSC provides an integrated, multidisciplinary, first-year curriculum for students in these eight participating programs and curricula:

- Biochemistry and Molecular Biology
- Cell Biology
- Experimental Pathology
- Microbiology and Immunology
- Neuroscience
- Pharmacology and Toxicology

This curriculum is designed to prepare students for advanced studies leading to completion of the Doctor of Philosophy degree in a variety of areas of research strengths in the Graduate School of Biomedical Sciences (GSBS). The following research areas are widely represented among the nationally and internationally known faculty who participate in the eight GSBS graduate programs listed above:

- Aging
- Biochemistry, biophysics, and structure of membrane proteins
- Bioinformatics and genomics
- Cancer biology and carcinogenesis
- Cell and molecular mechanisms in health and disease
- Cellular physiology, signal transduction, and hormone action
- Genetic and environmental toxicology, mutagenesis, DNA repair, DNA damage
- Immunology and host defenses
- Mechanisms of drug action, metabolism, and toxicity
- Microbial and viral pathogenesis and infectious diseases
- Molecular biology, genetics, and molecular virology
- Neural injury, regeneration, repair, and pain
- Neurobiology and neuropharmacology
- Pathobiology and experimental pathology
- Reproductive biology and development
- Structure and function of macromolecules, structural biology
- Tropical and emerging infectious diseases

The Basic Biomedical Science Curriculum (BBSC) is composed of foundational courses (Cell Biology, Biochemistry, and Molecular Biology & Genetics, Biostatistics, Big Data Sampling, and Responsible Conduct in Biomedical Research), and a series of 8-week laboratory rotations. Additional available activities include regular seminar and specialized courses. The descriptions for each course are detailed on the following pages. BBSC course offerings are dynamic. New courses are added and older courses are not offered every year. The following listings are provided as a general guide. All graduate course offerings can be found on the main page at "GSBS Course Offerings By Program".

All full-time students are required to take at least 9 credit hours of coursework in each of the three academic terms [I: Fall, II: Spring, III: Summer]. Listed below are the BBSC course offerings. It is not a complete list of all offerings, but reflects courses that are eligible for the first-year requirements. Descriptions for each follow. The second digit in the course number represents credit hours.

Core* and Integrative Elective Courses

Fall Term Courses
- Responsible Conduct in Biomedical Research (BBSC 6129)*
  (longitudinal, spanned across 3 terms)
Principles of Laboratory Safety (BBSC 6217)*
Project Proposal Preparation (BBSC 6221)
Cell Biology (BBSC 6302)*
Biochemistry (BBSC 6401)*
Animal Models of Human Diseases (BBSC 6220)
Laboratory Rotation (BBSC 6043)*

Spring Term Courses
- Laboratory Rotation (BBSC 6043)*
- Neuronal Transmission (BBSC 6126)
- Responsible Conduct in Biomedical Research (BBSC 6129)*(longitudinal course continued)
- Principles of Drug Action, Pharmacokinetics and Biotransformation (BBSC 6208)
- Biostatistics (BBSC 6222)*
- Molecular Biology and Genetics (BBSC 6403)*

Summer Term Courses
- Laboratory Rotation (BBSC 6043)
- Genes, Environment and Disease (BBSC 6118)
- Responsible Conduct in Biomedical Research (BBSC 6129)* (longitudinal course continued)
- Small Sampling of Big Data (BBSC 6130)*
- Fundamentals of Inflammation (BBSC 6210)
- Principles of Laboratory Safety (BBSC 6217)
- Vaccine Development Pathway: From Discovery To Licensure (BBSC 6219)

* denotes mandatory core courses for traditional BBSC students

Additional BBSC Course Offerings that are taken by students in other programs and are not eligible for first-year BBSC curriculum credit:
- Introduction to the Study of Biological Systems (BBSC 6103), Summer
- Critical Reading of Scientific Literature (BBSC 6104), Spring
- Teaching in Molecular Biology and Genetics (BBSC 6127), Spring
- Teaching in Biostatistics (BBSC 6128), Spring
- Frontiers of Science (BBSC 6195), Fall and Spring
Essential Functions Required for Completion of Program

The following description details essential functions (abilities) needed to complete the Basic Biomedical Science degree program.

Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.
Intellectual And Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

Professional and Social Attributes
Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

Application of Legal/ethical Principles and Professional Standards
Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

BBSC Course Offerings
The first-year BBSC offers an extraordinary graduate experience that furnishes a strong foundation and breadth of biomedical concepts and provides a broad and in-depth foundation for advanced work. All full-time students are required to take at least 9 credit hours per week of coursework in
each of the three academic terms [I: Fall (E), II: Spring (A), III: Summer (B)]. Listed below in numerical order are the BBSC course offerings, along with its description. The second digit in the course number represents credit hours.

**BBSC 6043**
**Laboratory Rotation**
This is a required core course in the Basic Biomedical Science Curriculum (BBSC). It is designed to provide students the opportunity to conduct laboratory experiments under the direct supervision of a faculty member. The primary objective of this course is to assist students in choosing a mentor and their area of dissertation specialization. Students in the BBSC are required to take three 8-week rotations in a minimum of two independent laboratories during their first year in the BBSC. The time commitment is at least 6-18 hours/week in the lab. Mentor expectations and grading criteria should be communicated between the mentor and student at the start of the rotation. Students will be required to submit a written report to include description of the research, experiments attempted, interpretations, accomplishments, etc., along with a Student Evaluation Report form completed by the faculty member.

Prerequisites: None
Terms Offered: I, II, III with no more than six credit hours (16 weeks) in one lab
Years Offered: Annually
Hours per week: Laboratory 6-8

**BBSC 6103**
**INTRODUCTION TO THE STUDY OF BIOLOGICAL SYSTEMS**
This eight-week course is designed to introduce graduate students to the study of biological systems, with specific emphasis on fundamental biochemistry principles. The course provides a review of the chemical structures of biomolecules, as well as the noncovalent forces underlying biomolecular structure, function and interaction. Course topics include macromolecule-solvent interactions, pH and dissociation, quantitative descriptions of biochemical equilibria, and laboratory strategies involving protein manipulation and purification. Basic thermodynamic principles are presented, including the concept of the free energy of a reaction as it relates to the synthesis, metabolism, and function of biomolecules. The format of the course includes lectures and problem-solving sessions. Students are expected to lead class discussions following the completion of assigned homework, and grades will be satisfactory (S) or unsatisfactory (U) based on completion of assignments and classroom participation.

Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 1.5

**BBSC 6104**
**CRITICAL READING OF SCIENTIFIC LITERATURE**
This eight-week course is designed to introduce graduate students to critical concepts involved in understanding scientific literature. Emphasis will be placed on analyzing, comprehending, interpreting and evaluating scientific articles from peer-reviewed journals. This class is based on discussion format, and students will be expected to actively participate in classroom discussions, as well as lead one classroom discussion on an article of their choice. Grades will be based on the performance of presentation, attendance, and class participation.

Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 1; Conference/Discussion 2

**BBSC 6118**
**GENES, ENVIRONMENT AND DISEASE**
This eight-week course will address key mechanisms for the development of human disease and, more importantly, the interrelationships between genetic characteristics and exposure to environmental factors or pharmaceuticals in modifying the risks of developing health problems.
The course will be presented as a set of eight sessions which will include lectures as well as discussions of assigned research papers that address the objectives of the course. Students will be assigned papers for presentation in the class. Each two-hour weekly session will discuss two papers if a lecture is not given by the faculty. Background reading will be suggested for each discussion. At the end of the course each student will select a recent published journal article, with approval of the instructor, and will prepare a report that critiques the article and places it in the context of the information gained from the course. The four specific topic areas will be: 1) Mechanisms of DNA damage by endogenous and exogenous agents; 2) DNA damage response including signaling pathways, DNA repair, cell cycle control and apoptosis; 3) The role of genetic variability in modifying responses to exposure to toxic substances and pharmaceuticals, and responses to DNA damage; and 4) The role of epigenetic effects and agents that modify them in determination of changes in gene expression, hormonal effects, and health outcomes. Grades will be calculated based on the performance of leadership in assigned paper discussions, participating in all discussions and report on published paper.

Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2

BBSC 6126

NEURONAL TRANSMISSION

This course provides a general background in cellular neuroscience with an emphasis on neuronal synaptic transmission. The first part of the course covers structure and molecular composition of excitatory and inhibitory synapses. Topics covered include: synaptic structure and dynamics, molecular composition of post-synaptic ligand-gated ion channels, metabotropic receptors, signal transduction pathways, functional analysis of postsynaptic currents, synaptic plasticity and neuronal homeostasis. The second part of the course includes an in-depth reading and discussion of topics related to synaptic receptors mediating neuronal transmission in the central nervous system. This course will prepare students for upper level Neuroscience and Neuropharmacology courses and is also suitable for students interested in basic cellular mechanisms underlying brain function. Grading is based on written midterm and final examinations.

Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

BBSC 6127

TEACHING IN MOLECULAR BIOLOGY AND GENETICS

In this course, trainees will learn and practice how to facilitate small-group learning teams. Trainees will acquire teaching skills through workshops, observing faculty during small group discussions and finally applying these skills to serve as facilitators in BBSC 6403 Molecular Biology and Genetics (MBG) small-group discussions. Facilitator Skills Workshops will be imparted by personnel from the School of Medicine Office of Educational Development. MBG course instructors will meet with the trainees and provide key discussion topics and teaching tactics prior to MBG small-group discussions with enrolled students. The trainees will then serve as lead facilitators for MBG small-group discussions to practice newly learned skills. In addition, trainees will participate in problem set review sessions for MBG students to observe and learn different teaching styles employed in an informal question/answer teaching sessions. Each facilitator will provide formative and summative evaluations of their co-facilitators and those BBSC 6403 students in their respective small groups. Grading will be on a Satisfactory/Unsatisfactory basis. A grade of satisfactory will be dependent on: (a) attendance of the student to all scheduled course sessions and instructor discussions (as detailed above); (b) writing a one-page reflective piece that will serve as self-evaluation; (c) acceptable performance as a facilitator judged by the course instructor with input from students enrolled in the MBG course.

Prerequisites: BBSC 6403 or consent of instructor
BBSC 6128
TEACHING IN BIOSTATISTICS
(1 CREDIT)

In this course, students will learn and practice skills necessary to facilitate students participating in biostatistics labs. Facilitator Skills Workshops will be imparted by personnel from the School of Medicine Office of Educational Development. At the end of the course, students will: (a) Be able to distinguish between actual content (the concept the small group is working on) and process (how the group works on acquiring and developing knowledge on that concept); (b) Understand the various group member roles related to both content and process; (c) Have practiced methods for effective communication; (d) Have learned effective questioning skills; (e) Have practiced effective listening skills and empathy; (f) Be capable of providing effective feedback; (g) Be capable of maintaining engaging group discussions and (h) Be able to provide constructive evaluations. Students will serve as lead facilitators for the lab component of students enrolled in BBSC 6222 (Biostatistics), where they will implement and develop their facilitation skills. Prior to each session with the BBSC 6222 students, small group facilitators will be provided with fully answered laboratory solutions and will have an opportunity to discuss these computer labs with course instructors. Each facilitator will provide formative and summative evaluations of those BBSC 6222 students in their lab sessions. This course is offered on a Satisfactory/Unsatisfactory basis. A grade of satisfactory will be dependent on: (a) attendance of the student to all scheduled course sessions and instructor discussions (as detailed above); (b) writing a one-page reflective piece that will serve as self-evaluation; (c) acceptable performance as facilitator as judged by the course instructor, after consulting with the students being facilitated.

Prerequisites: BBSC 6222 or PHS 633 Biostatistics or PHS 6347 Applied Statistical Methods

Terms Offered: II
Years Offered: Annually
Hours per week: Laboratory 2

BBSC 6129
RESPONSIBLE CONDUCT IN BIOMEDICAL RESEARCH
(1 CREDIT)

This course will cover all topics recommended by NIH for required instruction in responsible conduct of research (RCR), described in NOT-OD-10-019, and will incorporate contemporary ethical and regulatory issues in modern biomedical research. The course will begin in the Fall term and will extend over all 3 terms of the academic year. Students will register for the course in the Fall term and will be automatically enrolled the following Spring and Summer terms. A grade of "G" (longitudinal) will be assigned at the end of the Fall and Spring terms, and a single, 1-hour course grade will be assigned at the end of the Summer term. Specific RCR topics covered in a given term will be temporally aligned with relevant science or research topics being taught in the Basic Biomedical Science Curriculum courses during that term. Small group sessions and case studies will be utilized to discuss and integrate designated RCR topics, and will include various problem-based learning approaches. For each case scenario presented, students (individually or in groups) will be required to: 1) identify the stakeholders; 2) identify the ethical or regulatory issues raised or values at stake; 3) identify possible solutions; and 4) choose and justify the best solution. A grade based on preparation and participation will be assigned for each session. The average grade of all sessions over the three terms will be determined, and an average of 80% or greater is required to achieve a grade of Satisfactory.

Prerequisites: None

Terms Offered: I, II, III Longitudinal
Years Offered: Annually
Hours per week: Lecture 2; Discussion 14

BBSC 6130
SMALL SAMPLING OF BIG DATA
(1 CREDIT)

This seminar series is designed to serve as an introduction to and overview of some aspects of modern data analysis in the biological sciences. As the data available to researchers becomes
increasingly large, increasingly complex, and is generated faster and faster, content consumers, specialist scientists, and statistical data analysts are faced with problems in terms of management, transport, analysis, and interpretation never before seen. This evolution of data has also changed the ways in which the scientific process, scientific discovery and scientific theory are viewed. Essentially this course will be divided into six sections: big data, data sciences, computer science, data analysis, informatics and bioinformatics. Grading will be satisfactory or unsatisfactory based on attendance.

Prerequisites: None
Terms Offered: I, III
Years Offered: Annually
Hours per week: Seminar 1

BBSC 6195
FRONTIERS OF SCIENCE
(1 CREDIT)
This course provides students the opportunity to hear about the latest advancements and techniques in a wide variety of biomedical sciences. Students are required to attend seminars by on- or off-campus speakers during each of the Fall and Spring terms. Students choose twelve seminars to attend on the basis of student interest and/or program recommendations. Grades will be satisfactory (S) or unsatisfactory (U) based on attendance.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Seminar 1

BBSC 6207
NEURONAL EXCITABILITY
(2 CREDITS)
This eight-week course deals with fundamental concepts that underlie electrical excitability, conduction of electrical activity and presynaptic mechanisms. Topics covered include electrochemical potentials, properties of voltage-gated channels, electrotonic spread vs. propagated activity, regulation of exocytosis, quantal analysis of transmitter release and analytical techniques including current and voltage clamp, single channel recording and noise analysis. The class will be presented as lectures with student discussion. Grades will be based on class participation and examinations.

Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3, Conference/Discussion 1

BBSC 6208
PRINCIPLES OF DRUG ACTION, PHARMACOKINETICS AND BIOTRANSFORMATION
(2 CREDITS)
This eight-week course will cover the principles underlying drug and toxin mechanisms of action, as well as their metabolism and clearance. In particular, we will focus on mechanisms underlying the interaction between hormone and neurotransmitter receptors and full, partial, and inverse agonists, as well as analysis of the mechanisms underlying the actions of competitive, partially competitive and non-competitive inhibitors. Additionally, the mechanisms underlying allosteric modulation by drugs and endogenous ligands will be discussed along with how receptor activation engages underlying effector mechanisms. The latter portion of the course will focus on the mechanisms underlying absorption, distribution, elimination and metabolism of both toxins and therapeutic drugs. This will include metabolism by phase I and phase II enzymes, glutathione reductase, as well as drug elimination, duration of action, plateau principle, and continuous and intermittent dosing paradigms. The course will be taught primarily in lecture format with discussion of primary research articles. Grading will be based on class participation, homework problems, two written exams and a 15-minute oral presentation covering the similarities and differences between a pair of drugs that have similar therapeutic goals.

Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor
Terms Offered: II
Years Offered: Annually
BBSC 6210 (2 CREDITS)
FUNDAMENTALS OF INFLAMMATION
This seven-week course deals with fundamental concepts pertaining to inflammation. Inflammation plays a necessary role in wound healing and tissue surveillance, but can also lead to chronic wounds and pathologic states such as inflammatory bowel disease. By moving fluids and white blood cells from the blood into extravascular tissues the host can eliminate abnormal cells, foreign particles, microorganisms, etc. and initiate repair processes. Topics include inflammatory cells, the role that pathogens (bacterial, viral and parasitic) play in inflammation, the mediators (lipids, cytokines, peptides, and other molecules) and cellular events involved in cell recruitment and movement through the vessel wall into tissue spaces. Common inflammatory processes and wound healing will be discussed. Grades will be determined by performance in the discussion of current literature and on one take-home short-essay exam.
Prerequisites: BBSC 6302, BBSC 6401, BBSC 6403 or consent of instructor
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3; Conference/Discussion 1

BBSC 6217 (2 CREDITS)
PRINCIPLES OF LABORATORY SAFETY
This course has been designed to include theoretical and practicum approach to biosafety for all students working in a laboratory. This course will focus on the BSL1-2 program with an introduction to BSL3. Topics will include risk assessment, personal protective equipment, proper use and selection of biological safety cabinets (BSCs) & chemical fume hoods, aerosol producing procedures, chemical safety, biological and chemical exposures, transport of biological materials, disinfection, waste handling and emergency laboratory procedures, regulatory requirements. Emphasis will be on development of competencies in fundamental laboratory techniques and using risk assessment to work safely and aseptically in the laboratory. This class will prepare students for future advancement opportunities into BSL 3 laboratories. The laboratory portion of the course will focus on organizing a biosafety cabinet (BSC) or fume hood, proper techniques in a BSC, preventing aerosols, transportation of biological material, disposing of wastes, and emergency procedures and decontamination. Grades will be based on attendance, participation, oral presentation and laboratory skills. Both classroom and laboratory components must be successfully completed to pass the course.
Prerequisites: None
Terms Offered: I, III
Years Offered: Annually
Hours per week: Laboratory 2; Lecture 1.5

BBSC 6219 (2 CREDITS)
VACCINE DEVELOPMENT PATHWAY: FROM DISCOVERY TO LICENSURE
This eight-week introductory course will be taught in lecture format with a small number of expert lecturers. The course is designed to provide the basic scientist with an understanding of vaccine development from conceptualization through development, testing, and utilization. This multidisciplinary course was designed to introduce students to all of the aspects of vaccine development and utilization to include aspects of vaccines for infectious diseases and chronic non-infectious diseases (e.g., cancer, neurodegenerative diseases, and addiction). Grades will be based on performance of two examinations and class attendance.
Prerequisites: BBSC 6302, BBSC 6401, BBSC 6403, or consent of instructor
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3.5

BBSC 6220 (2 CREDITS)
ANIMAL MODELS OF HUMAN DISEASES
This eight-week course is intended to give an overview of the use of animal models in biomedical
research, help students acquire the skills to write applications and protocols involving research animals, and prepare the students for their qualifying exams. The course will consist of weekly lectures and in depth sessions on animal models of infectious and non-infectious diseases led by experienced faculty. Students will be required to present research paper(s) and evaluate the approach, usefulness, and validity of the models discussed. Also, students will be expected to write and submit an IACUC protocol, which will be critically reviewed by the course directors and randomly assigned members of the class. Grading will be based on presentations, written IACUC protocol, written critique of an IACUC protocol, final in-class exam, and attendance/participation in discussions.

Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 2; Conference/Discussion 1.5

BBSC 6221
PROJECT PROPOSAL PREPARATION
(2 CREDITS)

This course provides skills to develop a dissertation proposal and tools to understand how to best proceed in the preparation of a research proposal or to anticipate reviewer responses. Its goals are to acquire knowledge about basic principles governing proposed topic of dissertation; to become familiar with assessment of current research literature; to acquire practice in process of preparing, giving and critiquing a chalk talk; to acquire some practice in process of preparing, giving and critiquing a research proposal; to learn how to evaluate a grant and respond to such a critique by participating in an NIH style study section. Sample NIH grants and reviews are provided; and to learn how to present such evaluations in a group setting; to prepare a riposte and resubmit a research proposal after review. The course will be taught using some didactic presentations by faculty on what is a chalk talk, desired features of a proposal, the NIH study section approach, how to critique a proposal, and how to respond to a critique with examples. The faculty will also facilitate interactive discussions related to the above. The student will be expected to prepare a chalk talk of their proposed project, to write a proposal and a critique of a fellow student's proposal, to discuss the critiqued proposal, to prepare a riposte and resubmission. Grades will be based on class participation, presentations, and written material.

Prerequisites: Admission to a research group by a mentor

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 1; Discussion 3

BBSC 6222
BIOSTATISTICS
(2 CREDITS)

This is a required core course in the Basic Biomedical Science Curriculum (BBSC) which will provide students in the basic sciences with an introduction to statistical thinking. Specific topics include basic summaries, probability and distributions, inference, experimental design, hypothesis testing, and statistical modeling. Grading will be based on the performance of multiple homework assignments, multiple lab assignments, several in-class quizzes, a final take-home exam, and class participation. Students will learn about the difference between populations and samples. They will learn the proper way to describe experimental results based on descriptive statistics and visualization strategies. They will learn about frequency distributions such as the normal distribution and the basics of probability. They will learn about experimental design and hypothesis testing. Specifically, they will learn when to correctly apply and how to perform the one sample t-test, student's t-test, paired t-test, one-way ANOVA, two-way ANOVA, repeated measures ANOVA, linear regression, correlation tests, nonparametric tests, and chi-square analysis. They will learn the basics of power analyses and sample size calculations. Each concept will be accompanied by a 2hr computer lab where the students will practice with real data examples using the software package R. Additionally, the students will critique basic science articles to learn the best way to present statistical results in manuscript format. This will include discussions about graphs and figures as well as how results are presented and discussed throughout the articles.

Prerequisites: BBSC 6302, BBSC 6401 or Consent of instructor
BBSC 6302

CELL BIOLOGY
This is a required foundation course in the Basic Biomedical Science Curriculum (BBSC). It is a sixteen-week course taught throughout the term to acquaint students with the basic principles of modern cell biology. The topics to be covered include regulation of basic cellular activities including functions of cell organelles, signaling, changes in cell numbers, interactions during development, and cellular organization into tissues. Grades will be based on the performance on in-class examinations and small-group discussion sessions.
Prerequisites: At least one-year college-level biology and chemistry; biochemistry recommended
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

BBSC 6401

BIOCHEMISTRY
This is a required foundation course in the Basic Biomedical Science Curriculum (BBSC). The course deals with the fundamental forces that are the bases for molecular interactions, and the translation of these forces into the structure and function of proteins. Emphasis will be on the principles that give rise to these forces; on applying the principles to biochemical problems; and on the use of the principles in understanding macromolecular structure and function. The course also covers the basics of intermediary metabolism; the application of knowledge as to the fundamental forces that are the basis for molecular interaction; and the integration of these forces into regulation, synthesis and function of different biomolecules as they apply to developing an understanding of metabolism in homeostasis and disease. The course will have three lectures and two hours of small-group discussion and problem-solving sessions per week. Grades will be determined based on performance on written examinations and performance in small-group discussion sessions.
Prerequisites: College chemistry through organic, college physics and biochemistry recommended or consent of instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3; Conference/Discussion 2

BBSC 6403

MOLECULAR BIOLOGY AND GENETICS
This is a required foundation course in the Basic Biomedical Science Curriculum (BBSC). It will consist of three lectures per week and two-hour discussion sessions every other week for a total of sixteen weeks. Topics include nucleic acid structure, DNA replication, genetic recombination, recombinant DNA technology, mutations and their repair, transcription and its regulation, translation, Mendelian inheritance, the human genome, microbial genetics, transgenic animals and models of human genetic disorders, and human evolution. Grades will be determined based on the performance on four examinations, graded problem sets, and participation in small-group discussion sessions.
Prerequisites: BBSC 6302, BBSC 6401, or consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3; Conference/Discussion 2
Biochemistry and Molecular Biology Graduate Program

https://bmb.utmb.edu/graduate_program/

Faculty

Graduate Program Director:
James C. Lee, Ph.D.

Professors
Ahmed, Mahmoud, Ph.D.
Ameredes, Bill T., Ph.D.
Ansari, G.A. Shakeel, Ph.D
Barral, Jose M., M.D., Ph.D.
Brasier, Allan, M.D.
Braun, Werner, Ph.D.
Bujalowski, W.M., Ph.D.
Elferink, Cornelius, Ph.D.
Emmett, Mark, Ph.D.
Fofanov, Yuriy, Ph.D.
Fujise, Kenichi, M.D.
Garcia-Blanco, Mariano, MD.,Ph.D.
Hazra, Tapas K., Ph.D.
Kurosky, Alexander, Ph.D.
Lee, James C., Ph.D.
Oberhauser, Andres F., Ph.D.
Papconstantinou, John, Ph.D.
Pettitt, B. Monte, Ph.D.
Prakash, Louise, Ph.D.
Prakash, Satya, Ph.D.
Rajarathnam, Krishna, Ph.D.
Shi, Pei-Yong, Ph.D.
Singh, Pomila, Ph.D.
Smith, Thomas, Ph.D.
Sowers, Lawrence, Ph.D.
Srivastava, Satish K., Ph.D.
Taglialetela, Giulio, Ph.D.
Watson, Cheryl S., Ph.D.

Associate Professors
Abdel-Rahman, Sherif, Ph.D.
Choi, Kyung H., Ph.D.
Choudhary, Sanjeev, Ph.D.
Iwahara, Junji, Ph.D.
Laezza, Fernanda, Ph.D.
Leiman, Petr, Ph.D.
Midoro-Horiuti, Terumi, M.D., Ph.D.
Morais, Marc, Ph.D.
Rudenko, Gabrielle, Ph.D.
Saadygov, Rovshan, Ph.D.
Toliver-Kinsky, Tracy, Ph.D.
Wagner, Eric, Ph.D.
Watowich, Stanley J., Ph.D.
Yin, Y. Whitney, M.D., Ph.D

Assistant Professors
Bradrick, Shelton, Ph.D.
Kudlicki, Andrzej, Ph.D.
Kuyumcu-Martinez, Muge, Ph.D.
Lee, Yong Sun, Ph.D.
Menon, Ramkumar, Ph.D.
Routh, Andrew, Ph.D.
Rowicka-Kudlicka, Malgorzata, Ph.D.
Wairkar, Yogesh, Ph.D.
Objectives of Graduate Work
The graduate program integrates expertise from biochemistry, cell and molecular biology, structural biology, biophysics, and genetics into the newly emerging and rapidly developing frontiers of contemporary biomedical research. The program encompasses a broad range of research interests at the molecular, organelle, cellular, and clinical levels. It is designed to give pre-doctoral trainees the opportunity to gain an extensive overview of the science, as well as intensive experience in a specific field of research. The program offers students both theoretical and practical means of evaluating developments in modern biochemistry, cell and molecular biology, structural biology, biophysics, and genetics. At the same time, it offers a solid base for further work, developing the ability of students to conduct research that is thorough, carefully planned, and independent. The goal of the program is to train students to become productive scientists, capable of pursuing successful careers and becoming leaders in research, education, industry, and medicine.

Teaching experience is gained by tutoring students from all four schools and by regular presentation of literature and research in a student seminar course designed to develop verbal and organizational skills. Several weekly “journal clubs” are also available to keep students abreast of the current literature and allow practice presenting scientific information in an informal setting. Graduate students also develop critical communication skills by attending regularly scheduled departmental seminars and by interacting informally with visiting scientists.

Research experience is an integral part of the training program. Each student has the opportunity to become familiar with ongoing research in the laboratories of the graduate faculty through informal discussions and by conducting research projects in selected laboratories during the first year. These research laboratories are equipped with some of the most modern instruments available for tissue culture, animal studies, enzymology, protein chemistry, molecular fractionation, protein sequencing, carbohydrate analysis, ultrastructure, X-ray crystallography, ultracentrifugation, and NMR spectroscopy. Diversity of research specialization among the faculty affords each trainee the opportunity to pursue a highly individualized research program. The faculty is composed of 60 members.

Essential Functions Required for Completion of Program
The following description details essential functions (abilities) needed to complete the Biochemistry and Molecular Biology degree program.

Observation (To Include The Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead
transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

Professional and Social Attributes
Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature,
sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

Application of Legal/Ethical Principles and Professional Standards
Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

Programs of Graduate Work

Ph.D. Degree
During the first year, students in the Doctor of Philosophy program are assisted in acquiring a broad knowledge of biochemistry, genetics, cell biology, structural biology, biophysics, and molecular biology through a series of courses in these areas (see BBSC). These include introduction to ethics of science principles and research rotations in which the students pursue research projects under the supervision of faculty of their own choosing. After completion of the BBSC and other courses required by the graduate program in BMB, students are required to pass a comprehensive qualifying examination prior to admission to candidacy. The examination consists of both a written and an oral component and includes presentation and defense of a dissertation research proposal.

Specific course requirements beyond the core curriculum are determined by the student in consultation with his or her faculty advisor and the student’s supervisory committee. Students are encouraged to diversify their programs by taking elective courses in related areas such as physiology, biophysics, pharmacology, anatomy, pathology, and biostatistics. A dissertation describing the results of the student’s original research is required of all candidates. The research work will be conducted under the direct supervision of a faculty mentor and will be monitored by a supervisory committee consisting of at least three faculty from this program, one from another graduate program at UTMB, and one from another institution. The Ph.D. candidate will present the results of his or her findings in a publicly advertised seminar and will defend the work before a graduate committee appointed by the dean of the Graduate School of Biomedical Sciences (GSBS). Completion of the doctoral degree usually requires four to five years, depending on the prior preparation of the student and upon the choice of dissertation projects. GSBS policies require that the defense of the dissertation be completed within five years of admission to candidacy.
M.S. Degree
The program offers a Master of Science degree to a limited number of students. A total of 36 semester credit hours are required, of which 24 must be taken in the program with a minimum of six hours in supporting fields. Master’s degree candidates participate in the core curriculum described for Ph.D. candidates, but their research rotation requirement is reduced. The M.S. student carries out a research project that results in either a master’s thesis or in a paper published in a refereed journal as a first author. Customarily, the degree is completed in two years.

Information About the Curriculum
All first-year students participate in the Basic Biomedical Science Curriculum (BBSC). This integrated curriculum includes three foundation courses: Biochemistry, Cell Biology, and Molecular Biology and Genetics. Students complete three to four 8-week rotations in laboratories of their interest and begin taking required BMB courses.

Students entering the Graduate Program in BMB are required to take six hours of BMB/MBET courses, and an additional 8 credit hours of electives prior to graduation. Elective courses can be taken from any graduate program and are individually tailored for each student to provide the necessary knowledge base for his/her research program. BBSC courses do not count for BMB electives. Students also develop important oral presentation skills through participation in seminar courses.

PhD Curricular requirements for BMB:
— 6 hours/credits of BMB courses (any BMB course, aside from the seminar courses, research or dissertation)
— 8 hours of electives from ANY GSBS graduate program, except BBSC courses
— BMB 6111 – to be taken in fall and spring of years 1-4
— BMB 6195 – to be taken 3 times (spring semesters), with the student presenting their research twice.

Students take the Qualifying Examination in the Spring term of their second year. The written portion of the exam is an NIH-style proposal based on the student’s research project, followed by an oral defense of the proposal.

All BMB/MBET courses will have mandatory evaluations at the end of each term. In order to receive a grade, students must complete these evaluations within the deadline provided. All responses are confidential and anonymous.

BMB Course Offerings

Fall Term Courses
- Teaching Biochemistry (BMB 6102)
- Current Concepts in Biochemistry & Molecular Biology (Faculty Seminar) (BMB 6111)
- Genomics, Proteomics and Bioinformatics (BMB 6208)
- Tutorial in DNA Replication, Repair, and Mutagenesis (BMB 6209)
- The Meaning of Being an Independent Investigator (BMB 6231)
- Probabilistic and Statistical Methods in Bioinformatics (BMB 6326)
- Molecular Biophysics I (BMB 6332)
- Physical Basis of Macromolecular Structure (BMB 6336)
- Biological Electron Microscopy (BMB 6351)
Spring Courses
- Current Concepts in Biochemistry & Molecular Biology (Faculty Seminar) (BMB 6111)
- RNA Biology (BMB 6112)
- Seminar (BMB 6195)
- Practical Algorithms for Bioinformatics and Systems Biology (BMB 6216)
- Molecular, Cellular and Genetic Basis of Aging (BMB 6223) – Odd years only
- Structural Biology and Biophysical Chemistry (BMB 6224)
- Inborn Errors of Metabolism (BMB 6227) – Even years only
- Introduction to Fast Kinetics (BMB 6312) – Even years only
- Pathophysiology of Inflammatory Disorders (BMB 6322)
- Bioinformatics II, Systems Biology & Stochastic Modeling (BMB 6330)
- Molecular Biophysics II (BMB 6334)
- Structural Bioinformatics (BMB 6361)

Summer Courses
- Structure-Based Drug Discovery (BMB 6238)
- Biological Fluorescence (BMB 6239)
- Single Molecular Detection (BMB 6265)
- Protein NMR Spectroscopy (BMB 6266) – Odd years only
- Statistical Thermodynamics (BMB 6341) – Even years only

Physical Facilities
The graduate program is located in the Libbie Moody Thompson Basic Science Building, occupying approximately 15,000 square feet of well-equipped laboratory space. Additional faculty laboratories are located in the Medical Research Building, the Dockside Building, and John Sealy Hospital. Scientific instruments necessary to carry out the most sophisticated experiments are available for students’ use. In addition, there are specialty laboratories available to help students learn and employ the latest research technologies. These include the monoclonal antibody, protein structure, recombinant DNA, ultrastructure (electron microscopy), NMR, and analytical laboratories.

Financial Aid
Financial aid is available to qualified students through the Financial Aid Office. Graduate assistantships are available through the Graduate School on a competitive basis.
BMB Course Descriptions

**BMB 6097**

**RESEARCH**

Work is designed to introduce the student to the techniques and philosophy of scientific research and to guide the development of a research problem in the major area of concentration. Provides laboratory experience prior to entering candidacy. Grade is determined by a written progress report signed by supervisory and program director.

Prerequisites: BBSC Curriculum
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 3-27

**BMB 6098**

**THESIS**

Formal research and writing leading to the preparation and completion of the thesis for the Master of Science degree under the direction of the student’s supervisory committee. Grading will be based upon the student’s level of performance as reported by the chairperson of the student’s supervisory committee and will be assigned as satisfactory or unsatisfactory.

Prerequisites: Admission to candidacy for the Master of Science degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

**BMB 6099**

**DISSERTATION**

Formal research and writing leading to the preparation and completion of the dissertation for the doctor of philosophy degree under the direction of the student’s supervisory committee. Grading will be based upon the student’s level of performance as reported by the chairperson of the student’s supervisory committee and will be assigned as satisfactory or unsatisfactory.

Prerequisites: Admission to candidacy for the Doctor of Philosophy degree
Terms Offered: I, II, II
Years Offered: Annually
Hours per week: Variable

**BMB 6102**

**TEACHING BIOCHEMISTRY**

In this course, students will learn and practice skills necessary to facilitate small group learning teams. Facilitator Skills Workshops will be imparted by personnel from the School of Medicine Office of Educational Development. At the end of the course, students will: (a) Be able to distinguish between actual content (the concept the small group is working on) and process (how the group works on acquiring and developing knowledge on that concept); (b) Understand the various group member roles related to both content and process; (c) Have practiced methods for effective communication; (d) Have learned effective questioning skills; (e) Have practiced effective listening skills and empathy; (f) Be capable of providing effective feedback; (g) Be capable of maintaining engaging group discussions and (h) Be able to providing constructive evaluations.

Prerequisite: BBSC-6401 (Biochemistry) or any of the Molecular Biophysics classes from the MBET Track
Terms Offered: I
Years Offered: Annually
Hours per week: Discussion 2
BMB 6111
CURRENT CONCEPTS IN BIOCHEMISTRY & MOLECULAR BIOLOGY
The objective of this course is to introduce students to current research in the general areas of biochemistry and molecular biology through attendance at faculty seminars. Students will be required to attend departmental seminars in the fall and spring semesters and submit a summary of each seminar attended. Students may choose from Biochemistry and Molecular Biology departmental seminars and Sealy Center for Structural Biology and Molecular Biophysics seminars, and special seminars as communicated by the course director or coordinator. The required number of seminars to be attended will be communicated to the students each semester and will be approximately 75% of the departmental seminars offered that semester (between a minimum of 6 to a maximum of 12 per semester). No textbooks will be required. Grades will be satisfactory (S) or unsatisfactory (U) based on attendance and completion of a seminar summary, to include the objectives/hypothesis of the research presented, methodology significant findings, and implications of research. Students will be required to complete and sign a seminar form containing the summary in order to receive credit. Completed forms will be turned into Dr. Morais for review. Failure to turn in the required number of completed forms per semester will result in a grade of "U", unsatisfactory for the semester.
Prerequisite: None
Terms Offered: I, ii
Years Offered: Annually
Hours per week: Seminar 1

BMB 6112
RNA BIOLOGY
This course will cover the cutting-edge trend of RNA research as well as classic knowledge on RNA. The main objectives will be: 1) to understand the role and mechanism of small regulatory ncRNAs as well as intermediate and long ncRNAs, 2) recognize diverse roles and properties of RNA, and 3) to understand the metabolism of diverse RNAs including mRNAs and ncRNAs. The lecture will consist of three modules (see "course schedule" below). Each module will last two weeks: one week for lecture and the other week for journal reading and discussion.
Prerequisite: Recommended (but not mandatory) BBSC6401 Biochemistry
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Discussion 1

BMB 6195
SEMINAR
The course provides practical training in seminar presentation skills, critical thinking, and peer evaluation. Students must register for the Seminar course (BMB 6195) in years 2, 3 and 4 (three consecutive years after they enter into the BMB graduate program). Each student will attend student seminars regularly and, in addition, each student will present one seminar per year in their third and fourth years.
Prerequisite: None
Terms Offered: II
Years Offered: Annually
Hours per week: Discussion 2; Seminar 1

BMB 6208
GENOMICS, PROTEOMICS AND BIOINFORMATICS
Lecturers will select seminal recent papers on principles and novel techniques used in the interpretation of DNA micro arrays, protein arrays and data mining of structural and functional databases. Each student is requested to read all papers, and present one paper with additional background information in a 45-minute lecture. The faculty will provide additional advice on the context of this paper in the literature, might
complement the student presentation with comments from his expertise on particular techniques, and will stimulate the discussion on the content of paper.

Prerequisite: Consent of instructor and/or First Year BBSC curriculum

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 1; Conference/Discussion 2

**BMB 6209**

**TUTORIAL IN DNA REPLICATION, REPAIR, AND MUTAGENESIS**

This course will address various aspects of DNA replication, repair, and mutagenesis. A particular focus point will be the interrelationships among repair processes and other important cellular functions. The aim is to develop students' fundamental knowledge of the research area, and their abilities to comprehend, evaluate and present scientific material. Grading bases on written critiques of papers, on participation in the discussions, and qualify of the presentation.

Prerequisite: Consent of instructor or first Year BBSC Curriculum

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 1; Conference/Discussion 2

**BMB 6216**

**PRACTICAL ALGORITHMS FOR BIOINFORMATICS AND SYSTEMS BIOLOGY**

This course is designed to prepare the student to design, write, and modify such software applications. We will cover the data structures and algorithms most useful in modern systems biology. The presented concepts will be illustrated by real-life examples and exercises in analyzing genomic sequences, expression profiles, regulation networks and interaction. We will learn how to generate simulated / randomized data with given statistical properties and use them for Monte-Carlo analysis. Practical techniques will be presented for parsing the output of web-based servers, as well as for creating our own on-line resources. We will also cover the basics of relational databases and visualization of multidimensional scientific data. In most examples of data processing will be using PERL, a versatile high-level programming language that is very popular in bioinformatics and world-wide-web applications, as well as R, a software environment for statistical computing.

Prerequisite: None

Terms Offered: II

Years Offered: Annually

Hours per week: Lecture 2

**BMB 6223**

**MOLECULAR, CELLULAR AND GENETIC BASIS OF AGING - Odd Years Only**

This course encompasses the principles and novel techniques used in understanding the molecular, cellular (physiological) and genetic factors that regulates the rate of aging and longevity. The mechanisms of aging will be clarified by integrating genetic data with molecular, cellular and physiological outcomes and environmental factors. The course discusses how organisms develop the molecular and biochemical characteristics of aging. A major consideration is how environmental factors interact with genetic factors to influence aging processes.

Prerequisite: Consent of instructor or First Year BBSC curriculum

Terms Offered: II

Years Offered: Bi-Annually

Hours per week: Lecture 1; Conference/Discussion 2

**BMB 6224**

**STRUCTURAL BIOLOGY AND BIOPHYSICAL CHEMISTRY**

This course deals with the role of biophysical methods, including structural biology, solution biophysical and computational approaches, in the study of proteins in the
proteomic era. The focus is on conformational changes and macromolecular assembly, the utility of dynamic and static structural data, and the necessity to combine experimental approaches to obtain a full functional description.
Prerequisite: Consent of instructor or BBSC core
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

**BMB 6227**
**INBORN ERRORS OF METABOLISM**
This course will cover the inherited diseases whose basic metabolic disturbances have been described. Emphasis will be placed on mechanisms contributing to enzymatic blocks. The primary aim is to give an understanding of the basic defects and their effects on metabolism.
Prerequisites: Consent of instructor
Terms Offered: II
Years Offered: Biennially-Even Years
Hours per week: Lecture 2

**BMB 6231**
**THE MEANING OF BEING AN INDEPENDENT INVESTIGATOR**
This course provides the framework for graduate training. Thus, the course will teach students to:
1. Identify a project of significance through critical analysis of the literature;
2. Identify needed information to fill the gap;
3. Identify the best approaches to acquire the needed information;
4. Assimilate data;
5. Present data in writing or verbally.
Base of grading is class participation and critical analysis of data.
Prerequisite: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 1; Discussion 2

**BMB 6238**
**STRUCTURE-BASED DRUG DISCOVERY**
The drug discovery process requires a combination of different disciplines with the ultimate goal of bringing to the marketplace a drug that can treat health problems. However, the current experimental strategy of drug discovery and development is expensive, inefficient, and lengthy. Structure-aided drug discovery constitutes an advantageous strategy to improve the drug discovery process with less investment of money and time. Using didactic lectures and computer-based interactive projects, this course will provide an in-depth introduction to the theoretical and practical aspects of structure-aided drug discovery. At the completion of this course, participants will have become skilled in applying the software, databases, and concepts necessary to independently initiate a computer-based drug discovery project.
Prerequisite: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 6

**BMB 6239**
**BIOLOGICAL FLUORESCENCE**
Course description and objectives: The course addresses major theoretical and practical aspects of fluorescence spectroscopy as encountered in biological research of macromolecular interactions in solution. The subjects include discussions of fluorescence intensity measurements, emission and excitation spectra, inner filter
effect, magic angle, fluorescence lifetime, quantum yield determination, dynamic and collisional quenching problems, and Fluorescence resonance energy transfer (FRET) theory. Practical aspects of the course will focus on the experimental design, approaches and applications of measurement of fluorescence, including steady state and time dependent fluorescence anisotropy as applied to macromolecular structure analyses, and quantitative fluorescence titration methodologies in examining energetics of macromolecular interactions.

Prerequisite: Undergraduate background in Biochemistry, Biology, Chemistry
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 4

**BMB 6265**
(2 CREDITS)
**SINGLE MOLECULAR DETECTION**

Single molecule methods are an important new set of tools that are currently used in many areas of biology. The goal of this course is to provide conceptual framework on single molecule experimental techniques. We will describe novel methods of single molecule manipulation and analysis. Some of the techniques that will be covered are Atomic Force Microscopy, Optical tweezers and single molecule fluorescence. We will discuss the use of these techniques to study polymer elasticity, protein mechanics, motor proteins, protein folding, RNA folding, receptor-ligand interactions, imaging of single molecule and cell mechanics. In each lecture we will discuss two or more key papers.

Prerequisite: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2

**BMB 6266**
(2 CREDITS)
**PROTEIN NMR SPECTROSCOPY**

In this course, students will learn advanced NMR methods for biophysical research of proteins and their molecular interactions. Theoretical aspects of protein NMR spectroscopy will be taught using the Mathematica program. Practical issues will be taught using actual NMR data together with the NMR-Pipe and NMR-View programs.

Prerequisite: Students must have taken Molecular Biophysics II (BMB 6334)
Terms Offered: III
Years Offered: Biennially-Odd Years
Hours per week: Lecture 2

**BMB 6312**
(3 CREDITS)
**INTRODUCTION TO FAST KINETICS**

This course is for advanced graduate students provides an introduction to the theoretical and experimental aspects of transient chemical kinetics analysis of biochemical reaction mechanisms. Emphasis will be placed on application of time-dependent and fast kinetic methods of study of the dynamics of biomolecular interactions.

Prerequisite: BBSC Curriculum
Terms Offered: II
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

**BMB 6322**
(3 CREDITS)
**PATHOPHYSIOLOGY OF INFLAMMATORY DISORDERS**

This will be a 3 hours course in which various Signaling Pathways that contribute to inflammatory disorders such as various forms of cancers including metastasis, diabetes, asthma, COPD, macular degeneration and other visual complications, arthritis, bacterial
infections and sepsis will be discussed. A two hour lecture will be presented on
tuesdays and one hour discussion on thursdays. The class time will be decided based
upon the convenience of the students.
prerequisite: none
terms offered: ii
years offered: annually
hours per week: lecture 3

BMB 6326 (3 CREDITS)
PROBABILISTIC AND STATISTICAL METHODS IN BIOINFORMATICS
This course is an introduction to the ideas and tools of probability calculus, statistical
methods and machine learning techniques for bioinformatics processing of large scale
biological datasets. It consists of four parts: basic probability calculus, statistical
models, machine learning and applications in proteomics and genomics. We will also provide
the necessary introduction into linear algebra, R programming and algorithmic design
techniques. The course build concepts for machine learning and statistical models from
probabilistic and linear algebraic bases. Sample spaces, conditioning, Bayes’ Rule,
random variables, distributions, expectations, and Markov chains will be covered in the
1st part of the course. Interesting examples such as the Matching problem, variations of
Birthday Problem, Gambler's Ruin, Simpson's paradox, St. Petersburg Paradox, and
Markov Chain examples are discussed in the context of probability modeling. Linear
algebraic (matrix based) view of modeling for linear least squares, support vector
machines and other statistical tools will be provided. The discussed topics in probability
calculus, statistics and machine learning are later applied in the example of
bioinformatics data processing. Specific examples of applications are in the mass
spectrometry based proteomics, genomic sequencing and sequence alignments.
Future opportunities & current limitations will be critically addressed. In addition to the
regular lecture sessions, supplementary sections may be scheduled to address issues
related to R.
prerequisite: none
terms offered: i
years offered: annually
hours per week: lecture 2; conference/discussion 1

BMB 6330 (3 CREDITS)
BIOINFORMATICS II, SYSTEMS BIOLOGY & STOCHASTIC MODELING
Biomedical research is rapidly becoming data-intensive and researchers generate and
use increasingly large, complex, multidimensional, and diverse datasets. The data sets
are often structured, but with a non-trivial structure inconsistent with classical
experimental designs. The ability to access, process, analyze, understand, extract
value from and disseminate data is becoming critical. Multiple skills are required for
these purposes. In this course, we will concentrate on some of the key probabilistic,
statistical concepts and computational modeling techniques actively used in modern
biomedical data analysis. Examples of data processing will be provided from
proteomics experiments and standard databases available in R. The goal is to
comprehensively understand development, physiology, metabolic and gene regulatory
networks, by looking at many genes, RNA's proteins and metabolites in an organism
simultaneously.
prerequisite: BBSC Curriculum
terms offered: ii
years offered: annually
hours per week: lecture 3

BMB 6332 (3 CREDITS)
MOLECULAR BIOPHYSICS I
In this course, students learn thermodynamics and kinetics for biological molecules.
Both theoretical and experimental aspects are covered. Students also learn the
MATLAB software so that they can use it as a tool for their own research.
Prerequisite: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

**BMB 6334**
**MOLECULAR BIOPHYSICS II**
In this course, students learn thermodynamics and kinetics for biological molecules. Both theoretical and experimental aspects are covered. Students also learn the MATLAB software so that they can use it as a tool for their own research.
Prerequisite: Molecular Biophysics I
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

**BMB 6336**
**MACROMOLECULAR STRUCTURE**
Introduction to proteins and nucleic acids, with emphasis on physical underpinnings. Topics include primary, secondary, and tertiary structure, sequence analysis, energetics and predictive methods. The method of evaluation will be based on two exams and problem sets.
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

**BMB 6341**
**STATISTICAL THERMODYNAMICS**
This is an advanced elective course in fundamental biophysics. We will explore topics concerning the connection between the microscopic properties of atoms determined by quantum mechanics with the macroscopic properties determined by thermodynamics. We wish to understand the connection between atomic or molecular properties and bulk behavior as happens in solutions or cells. The central objective of the course is how to get from $10^{23}$ variables (like position, velocity, species) to a small number of thermodynamic observables. The tools of statistics and probability theory will be employed to understand the behavior of large numbers of atomic/molecular systems via their mechanical laws and properties to describe solids, liquids and biopolymers. Lectures, online course materials, and homework problems will be used for each class period.
Prerequisite: No graduate course prerequisites. Undergraduate thermodynamics, differential equations, and some quantum mechanics are recommended.
Terms Offered: III
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

**BMB 6351**
**BIOLOGICAL ELECTRON MICROSCOPY**
The purpose of this course is for the student to develop an understanding of the principles of electron microscopy as applied to the study of biological macromolecules and tissues. Knowledge of these principles will form a foundation for gaining practical experience and training in biological electron microscopy. At the completion of this course, participants will have become skilled in applying some of the techniques and concepts necessary to independently initiate projects on quantitative protein unfolding/folding, protein-ligand binding, protein size distribution, protein secondary and tertiary structure, or any number of other quantitative biophysics applications.
Prerequisite: BMB 6334-Molecular Biophysics II or permission from instructor.
Terms Offered: I  
Years Offered: Annually  
Hours per week: Lecture 3

**BMB 6361**  
**STRUCTURAL BIOINFORMATICS**

Structural Bioinformatics is driven by the emergence of large amounts of data on gene sequences, three-dimensional (3D) macromolecular structures of genes and proteins and their functional properties. Those data are derived from high-throughput DNA sequencing, as results from the Protein Structure Initiative to generate a comprehensive overview of all 3D protein folds, and mass spectroscopic/proteomics methods to characterize structural modifications of proteins in a living cell environment. The objective of the course is to make students familiar with the basic concepts and practical state-of-the-art computational tools to search, retrieve and analyze those high-resolution structural data and be able to generate hypotheses on the biological mechanisms of those systems. The course will focus on probability concepts and statistical models of data representations and analysis, algorithms for sampling data, software tools for protein structure prediction, and computational methods for analyzing the energetics, kinetics and dynamics of bio-macromolecules and their interactions by structural simulations.

Prerequisite: Previous attendance of the course BBSC 6223 Bioinformatics is highly recommended.

Terms Offered: II  
Years Offered: Annually  
Hours per week: Lecture 3
Cell Biology Graduate Program

http://cellbio.utmb.edu/

Faculty

Graduate Program Director
Pomila Singh, Ph.D.

Professors
Abate, Nicola, Ph.D.
Ameredes, Bill T., Ph.D.
Barral, Jose M., M.D., Ph.D.
Bhat, Krishna, Ph.D.
Chopra, Ashok, Ph.D.
Chung, Jin Mo, Ph.D.
Cong, Yingzi, Ph.D.
Denner, Larry, Ph.D.
Dewitt, Douglas S., Ph.D.
Elferink, Cornelis, Ph.D.
Elferink, Lisa A., Ph.D.
Emmett, Mark, Ph.D.
Enkhbaatar, Perenlei, M.D., Ph.D.
Hankins, Gary D., M.D.
Hawkins, Hal, M.D., Ph.D.
Herndon, David N., M.D.
Hellmich, Mark Richard, Ph.D.
McBride, Gere, Ph.D.
Navarro, Javier, Ph.D.
Papconstantinou, John, Ph.D.
Prough, Donald S., M.D.
Rasmussen, Blake B., Ph.D.
Resto, Vincente A., M.D., Ph.D.
Saade, George A., M.D.
Singh, Pomila, Ph.D.
Sowers, Lawrence, Ph.D.
Tagliatela, Giulio, Ph.D.
Sheffield-Moore, Melinda, M.D., Ph.D.
Torres, Alfredo, Ph.D.
Urban, Randall, M.D.
Volpi, Elena, M.D., Ph.D.
Vargas, Gracie, Ph.D.
Watson, Cheryl, Ph.D.
Wu, Ping, M.D., Ph.D.

Kayed, Rakez, Ph.D.
Finnerty, Celeste Campbell, Ph.D.
Pinchuk, Iryna, Ph.D.
Tang, Shao-Jun, Ph.D.
Zhang, Wenbo, Ph.D.

Assistant Professors
Chen, Yan, Ph.D.
Durham, William Joseph, Ph.D.
Hommel, Jonathan, Ph.D.
Kim, Yu Shin, Ph.D.
Kumar, Satish, D.M.V., Ph.D.
Martinez, Neslihan, Ph.D.
Menon, Ramkumar, Ph.D.
Sarkar, Partha, Ph.D.
Zhang, Kangling, Ph.D.

Associate Professors
Abdel-Rahman, Sherif, Ph.D.
Belalcazar, Ligia M., M.D.
Cai, Jiyang, Ph.D.
Hellmich, Helen, Ph.D.
Objectives of the Program

The objectives of the Cell Biology program are threefold:
1. to expose students to the basic science underlying the molecular and cellular mechanisms of how normal and diseased cells, tissues, and organs function;
2. to provide laboratory experiences that will allow students to do independent research and contribute to our knowledge base; and
3. to provide students with an opportunity to learn how to communicate with others about their research and its underlying science. Graduates of this program should be able to function as researchers and/or teachers in academic institutions, government laboratories, or industry.

Essential Functions Required for Completion of Program

Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor's/mentor's physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical
instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

**Intellectual and Cognitive Abilities**

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

**Professional and Social Attributes**

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

**Application of Legal/Ethical Principles and Professional Standards**

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the
other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

**Scope of the Program**

The graduate program in cell biology is designed for students seeking a Ph.D. degree and coordinates with the M.D.-Ph.D. Combined Degree Program for students seeking joint degrees. Courses within the program provide students the opportunity to gain a basic knowledge of several sub-disciplines of cell biology including histology, neuroanatomy, ultrastructure, development, and molecular biology. Required BBSC courses and electives in other areas of biomedical science are available to provide a broad foundation upon which students can build a research career. Laboratory techniques utilized by cell biology faculty are diverse and state-of-the-art. They include transmission and scanning electron microscopy; computer reconstructions and stereology; image analysis; retrograde and anterograde tracing of neural pathways; thymidine autoradiography; *in situ* hybridization; immunocytochemistry; monoclonal antibody production and characterization; immunoblotting; protein purification, characterization and identification of unknown proteins, RNAseq analysis and Big Data analysis; recombinant DNA methods; RNA and DNA analysis; anti-sense and gene editing technology; generation of mutant mice; cell and tissue culture; advanced imaging techniques; electrophysiology, and several other emerging techniques used in the fields of neurosciences, Epigenetics, DNA repair, Cancer research and development Biology. Students rotate through at least two-four laboratories before selecting an advisor and research project.

Course work and laboratory rotations are normally completed during the first one and one-half years. Students then take the written and oral qualifying examination as part of the requirements for admission to candidacy. The dissertation proposal, written in the format of an NIH RO1 proposal, with extended background section, demonstrating adequate knowledge of literature in the field, is submitted as the written exam. The examination committee reviews the written exam and grades the proposal. Students are expected to revise the written proposal as per the comments and suggestions and describe the changes in the one page introduction of the revised proposal, which is reviewed by the program director and/or the exam committee. Once the student passes the written exam, the student forms a supervisory committee and gives a seminar to the faculty and students of the program as part of the oral exam, and answers all the questions of the supervisory committee in a closed session. The supervisory committee consists of at least five faculty members (one of whom is a graduate faculty member from another institution, other than UTMB, and at least one is from another graduate program at UTMB). This committee typically serves as the supervisory committee for the student’s research. The program is complete when a dissertation is presented to the supervisory committee and successfully defended in an oral examination. See the Cell Biology web page for more information, http://cellbio.utmb.edu/.

**Curriculum**

The curriculum emphasizes the development of research, teaching, and communication skills. It provides:

1. a strong background in cell and molecular biology, with an opportunity to pursue specific interests in greater depth;
2. exposure to current research topics and techniques;
3. an opportunity to learn how to teach and how to present seminars; and
4. an opportunity to learn how to write and defend research proposals.

**Cell Course offerings**

**Fall Term Courses**
• Laboratory Rotations (CELL 6008)
• Research (CELL 6097)
• Thesis (CELL 6098)
• Dissertation (CELL 6099)
• Seminar (CELL 6195)
• Imaging in Biology (CELL 6207)
• Advanced Academic Success Skills Part I (CELL 6217)
• Advanced Academic Success Skills Part II (CELL 6218)
• Teaching Gross Anatomy (CELL 6324)
• Gross Anatomy (CELL 6701)

Spring Term Courses
• Laboratory Rotations (CELL 6008)
• Research (CELL 6097)
• Thesis (CELL 6098)
• Dissertation (CELL 6099)
• Seminar (CELL 6195)
• Advanced Academic Success Skills Part I (CELL 6217)
• Advanced Academic Success Skills Part II (CELL 6218)

Summer Term Courses
• Laboratory Rotations (CELL 6008)
• Research (CELL 6097)
• Thesis (CELL 6098)
• Dissertation (CELL 6099)
• Seminar (CELL 6195)
• Maternal and Fetal Biology (CELL 6222)
  • Cellular & Molecular Mechanisms in Health & Disease (CELL 6401)
• Laboratory Rotations (CELL 6008)
• Research (CELL 6097)
• Thesis (CELL 6098)
• Dissertation (CELL 6099)
• Seminar (CELL 6195)
• Imaging in Biology (CELL 6207) - Elective
• Advanced Academic Success Skills Part I (CELL 6217)
• Advanced Academic Success Skills Part II (CELL 6218)
• Teaching Gross Anatomy (CELL 6324) - Elective
• Gross Anatomy (CELL 6701) - Elective

Spring Term Courses
• Laboratory Rotations (CELL 6008)
• Research (CELL 6097)
• Thesis (CELL 6098)
• Dissertation (CELL 6099)
• Seminar (CELL 6195)
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Summer Term Courses
- Laboratory Rotations (CELL 6008)
- Research (CELL 6097)
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- Seminar (CELL 6195)
- Maternal and Fetal Biology (CELL 6222) - Elective
- Cellular & Molecular Mechanisms in Health & Disease (CELL 6401)

Physical Facilities
The Cell Biology Graduate Program is based in the Department of Neuroscience and Cell Biology, but many program faculty have appointments in other departments of the University. Each faculty member has a research laboratory containing the equipment required for his or her specific research objectives. A variety of shared research facilities are also available on campus including a Protein Chemistry Core Facility, a Biomolecular Synthesis Facility, a Molecular Genetics Center, animal care facilities, a well-developed computer network, and library.

CELL Course Descriptions

CELL 6008
LABORATORY ROTATION (1-9 CREDITS)
The majority of students will have completed their lab rotations in year I while enrolled in the required BBSC 6301 laboratory rotation course. The students are expected to have chosen their mentor before starting year II. With the approval of the Program Director, any student who has not chosen a mentor and lab in which to conduct their dissertation research can register for Cell Laboratory Rotation. The objectives of this course are to acquaint students with the research activities of individual faculty members and to assist students in selecting their areas of specialization. Upon mutual agreement with faculty, the students will rotate through 1-2 laboratories during each term in year II and spend approximately seven weeks in each laboratory. During this time the student will observe and participate in specific research projects. It is expected that the student will spend a minimum of 12 hours in the laboratory per week. Grading will be based on a written report describing the project worked on in each laboratory. Course may be repeated for credit.
Prerequisite: Permission of instructor and the Program Director
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: 12 - 36 Laboratory

CELL 6097
RESEARCH (3-9 CREDITS)
Formal research directed toward Master of Science or Doctor of Philosophy degree programs. Grading will be based upon the student's level of performance as reported by the student's research supervisor and will be assigned as satisfactory or unsatisfactory.
Prerequisite: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: 3 - 27 Laboratory

CELL 6098
THESIS (3-9 CREDITS)
The Cell Graduate Program does not recruit students for the Master of Science degree. However, in certain special circumstances, students who are unable to continue with their Doctorate of Philosophy degree research program may be allowed to obtain a Master of Science...
degree. Formal research and writing, leading to the preparation and completion of the thesis for the Master of Science degree, is expected under the direction of the student’s supervisory committee. Grading will be based upon the student’s level of performance as reported by the chairperson of the student’s supervisory committee and will be assigned as Satisfactory, or Unsatisfactory. Students that elect to transition to MS degree, due to special circumstances as described above, are expected to register for a total of 9 credit hours.
Prerequisite: Admission to candidacy for the Master of Science degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference or Discussion 1; Research 3 – 7

CELL 6099
DISSERTATION
(3-9 CREDITS)
Formal research and writing, leading to the preparation and completion of the dissertation for the Doctor of Philosophy degree, is expected under the direction of the student’s supervisory committee. Grading will be based upon the student’s level of performance as reported by the chairperson of the student’s supervisory committee and will be assigned as Satisfactory or Unsatisfactory. Students in Dissertation are expected to register for a total of 9 credit hours.
Prerequisite: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

CELL 6195
SEMINAR
(1 CREDIT)
The objectives of this course are to expose students to a wide range of current research topics in cell biology, and to allow students to organize and present seminars in their own fields of interest. All Cell Biology Graduate Program students must register for seminar course every term irrespective of status in the program. Generally, the class will be graded S/U. However, in the semester the student presents a seminar, the student will receive a letter grade from an assigned faculty member.

Specific expectations for achieving a grade S are as follows:

All students are expected to attend seminars presented by local and invited speakers on a regular basis. All students (pre-candidacy and in candidacy) are required to attend all Cell student seminars, including oral qualifying exam presentations and oral defense presentations, and faculty candidate seminars. A sign-up sheet will be available to each student at the start of each semester. The sign-up sheet must be completed by the student and turned in to the coordinators office one week before the end of the semester. Excuses will only be granted with pre-approval of the Course Director. Failure to attend a required seminar (as described above) without an excuse will result in an unsatisfactory (U) grade. Students are also required to attend seminars of invited speakers if the speaker has been invited by the Cell Program.

Students in pre-candidacy are required to attend 12 seminars per term. These can include seminars presented by Cell students, faculty candidates and Cell invited speakers. The students will be responsible for maintaining their sign-up sheet for the semester and will turn it in to the program coordinator at the end of the semester. Pre-candidacy students are required to give a seminar once a year which describes the research project they have worked on either during a lab rotation or after the student has chosen a laboratory to work in on their dissertation proposal. The student will receive a letter grade (A-C) from the assigned faculty/examination committee members in the semester in which the student gives a seminar.

Students in candidacy are not required to document 12 seminars per semester though seminar attendance is still an essential part of training as a doctoral student. Students in candidacy are, however, required to record attendance of all Cell student seminars and faculty candidate
seminars on the sign-up sheet provided by the program coordinator in order to receive a satisfactory (S) or letter grade. Students in candidacy are expected to present their research once per year, and will receive a letter grade in the semester they present the seminar. This can include the seminar given at the time of oral exam/oral defense. The annual seminars may be coordinated with a committee meeting. In the semester the student presents their research seminar, the student will receive a letter grade. The student must have recorded attendance at all Cell student and faculty candidate seminars on the sign-up sheet provided until and unless they have received pre-approval by the program director to be excused.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Seminar 1

CELL 6207  
**IMAGING IN BIOLOGY**

This is a 16 week course consisting of 3 modules that will encompass the basic principles of imaging. This course is taught from a syllabus that will be available on the first day of the class. A letter grade (A-F) will be given. The final grade in this course will be determined from class participation, student presentations and written exam.

The first module is comprised of the principles of imaging, which will cover:
- The basic properties of electromagnetic waves
- Laser/non-laser radiation
- Interaction of light with molecules, cells and tissues
- Fundamentals of spectroscopy and imaging
- Laboratory demonstrations and paper discussions

The second module will cover fluorescence microscopy from both the theoretical and practical points of view. There will be a series of lectures as well as practical applications including:
- Image processing
- Confocal and multiphoton laser scanning microscopy.

The last module of this course will cover single molecule detection and manipulation, including atomic force microscopy. In addition to lectures, this segment will also consist of demonstrations and group discussions.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 1.5; Laboratory 1.5

**CELL 6217**

**ADVANCED ACADEMIC SUCCESS SKILLS - PART I**

Academic Success is heavily dependent on scientific communication and writing skills. Successful scientists can spend anywhere from 50-80% of their time reading, writing and presenting their data. For this course, the lecturer works with each student and facilitates the students to develop their specific dissertation proposal in the NIH RO1 format. In Part I of the course, the students learn how to improve their presentation skills as an oral seminar, and learn how to present their dissertation proposal as an oral seminar in allocated time. In Part II of the course, the students learn how to develop their dissertation proposal in the NIH RO1 format. The schedule for Part I and Part II of the course is flexible and developed with the students who are taking the course. All the work in this course will be graded on an A-F scale. Class participation and home assignments (which must be e-mailed/submitted 1 day before the indicated class date), accounts for ~25% of the final grade for both Parts I and II. 75% of the final grade is based on the quality of the oral presentation of the dissertation proposal (Part I), and written research proposal (Part II). The grade for the oral and written proposals is given by an assigned examiner. Prerequisites: Must have chosen the primary mentor and an area of research in which the student will work for their dissertation research. Preferably the student will have developed the specific focus of their research in the mentor's laboratory, and generated some preliminary data towards their goals/hypothesis.
CELL 6218
ADVANCED ACADEMIC SUCCESS SKILLS - PART II
Academic Success is heavily dependent on scientific communication and writing skills. Successful scientists can spend anywhere from 50-80% of their time reading, writing and presenting their data. For this course, the lecturer works with each student and facilitates the students to develop their specific dissertation proposal in the NIH RO1 format. In Part I of the course, the students learn how to improve their presentation skills as an oral seminar, and learn how to present their dissertation proposal as an oral seminar in allocated time. In Part II of the course, the students learn how to develop their dissertation proposal in the NIH RO1 format. The schedule for Part I and Part II of the course is flexible and developed with the students who are taking the course. All the work in this course will be graded on an A-F scale. Class participation and home assignments (which must be e-mailed/submitted 1 day before the indicated class date), accounts for ~25% of the final grade for both Parts I and II. 75% of the final grade is based on the quality of the oral presentation of the dissertation proposal (Part I), and written research proposal (Part II). The grade for the oral and written proposals is given by an assigned examiner. Prerequisites: Must have chosen the primary mentor and an area of research in which the student will work for their dissertation research, Preferably the student will have developed the specific focus of their research in the mentor’s laboratory, and generated some preliminary data towards their goals/hypothesis.
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2; Discussion 1-2

CELL 6222
MATERNAL AND FETAL BIOLOGY
The course will advance the interest and knowledge in the area of maternal and fetal medicine. The students should achieve a broad perspective of reproductive systems and process, and become familiar with modern experimental approaches, both in vitro and in vivo. It is designed to enable the students to understand: 1) the development and function of reproductive system; 2) normal changes associated with pregnancy; 3) physiological processes that affect maternal and fetal well-being; 4) the mechanisms by which pregnancy affects fetal outcome. Experience is gained by working with the faculty and the other students in an active class discussion. Emphasis is also placed on the role of developmental programming of chronic diseases such as diabetes and cardiovascular diseases. Grading: The student will get a letter grade (standard A to F) based on class participation (50%), assigned paper (25%) and oral presentation that the students will be required to prepare on a topic of chosen interest (25%).
Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2

CELL 6324
TEACHING GROSS ANATOMY
This course provides additional training in gross anatomy for graduate students anticipating future teaching responsibilities in this discipline. Enrollment is only open to those students who have had significant previous training in human gross anatomy, including extensive dissection experience. This course requires performance as a teaching assistant in the gross anatomy lab on a daily basis and may include gross anatomical prosection dissections and formal presentations of the dissected regions to the SOM freshman medical class, senior medical students, and/or PA/PT students in the School of Health Professions. Participation in a clinical anatomy journal club is also required. Grading (S/U) will be determined by the Course Director based on observation of performance in the laboratory, knowledge of and skill in demonstrating anatomical structure, student evaluations, and presentations in small group setting. Students will
receive periodic written feedback during the course regarding their performance. Although traditionally offered in the fall semester, actual dates and times of the course will be determined by the anatomy teaching staff. Enrollment requires prior consultation with and approval of Course Director. Depending on various circumstances, the course may not be offered every calendar year.
Prerequisites: Cell 6701 - Gross Anatomy (Must have received a grade B or higher and have approval by dissertation mentor.)
Terms Offered: I
Years Offered: Annually
Hours per week: Laboratory 8; Conference/Discussion 1

CELL 6401
CELLULAR AND MOLECULAR MECHANISMS IN HEALTH AND DISEASE
The course is designed to teach latest advances in Cell Biology, with emphasis on molecular mechanisms and signaling pathways. Topics will be taught by faculty who have the expertise and conduct research in the subject matter. A total of 14-15 topics will be taught. Prior to the start of the course, students will receive suggested reading for each topic to be covered in the course. Suggested reading material will help the students gain basic and current understanding of the topic to be covered, and students will read the suggested literature before the week in which the topic is taught. On Day 1(Monday) of the week, faculty will present an overview of the topic and query the students for knowledge they are expected to have gained by reading the suggested literature. Faculty will then assign students specific topics that they will need to present and discuss on Wednesday. On Day 2 (Wednesday), students (in pairs or singly) will be requested to lead the discussion on the assigned topics. Each week, 2-3 topics within an area, will be covered. Students will lead the discussion and faculty will facilitate the discussions, to ensure that all students contribute to the discussion. On Day 3 (Friday), faculty will have a wrap-up session and challenge the students with specific questions on the topic, to judge critical thinking skills. Grades will be based on student knowledge (day 1), participation and written/oral presentations (day 2), and answers to critical thinking Qs (such as problem solving exercises) ( day 3 ). Faculty will provide a score for each day, on a scale of 10, for each student. A grid for each day will be sent to the faculty for providing written scores. Grades on all three days from all weeks will be combined and calculated as a percent. Final grade will be formulated as a letter grade, wherein: 70-79%=C; 80-89%=B; 90-100%=A. A grade of less than 70%=Fail.
Prerequisites: All Graduate Students, other than MD-PhD students, should have passed required BBSC courses 6401, 6302, 6403, 6222, or have authorization to enroll from the course director.
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 4

CELL 6701
GROSS ANATOMY
Lectures, conferences and laboratory work cover the gross anatomical structure and function of the human body. Additional bi-weekly conferences focus on such topics as the history of anatomy, anatomical terminology, developmental anatomy, and anatomical topics in current medical and scientific literature. Exposure to Problem-Based-Learning is also likely. Laboratory sessions involve the complete dissection of a human cadaver (4-5 students/cadaver). Laboratory study is aided by anatomical models, permanent glass-mounted dissections, roentgenograms, computer-based cross-sectional anatomy exercises and gross pathology demonstrations. Grading will be based on midterm and final examinations which will include written and laboratory practical formats. These examinations will determine the majority of the course grade with PBL and small group discussion contributing the remainder. Examination scores will be based on an adjusted percentage correct with 70% level as passing as used in examinations for School of Medicine students taking the course. Although traditionally offered in the fall semester, actual dates and times of the course will be determined by the anatomy teaching staff. Enrollment requires prior consultation with and approval of Course Director. Depending on various circumstances, the course may not be offered every calendar year.
Prerequisite: None
Terms Offered: I  
Years Offered: Annually  
Hours per week: Laboratory 8; Lecture 6; Conference/Discussion 2
Facility

Graduate Program Director:
Jere McBride, Ph.D.

Professors
Ansari, G.A. Shakeel, Ph.D.
Aronson, Judith F., M.D.
Barrett, Alan D., D.T., Ph.D.
Boor, Paul J., M.D.
Bourne, Nigel, Ph.D.
Bukreyev, Alexander, Ph.D.
Campbell, Gerald A., M.D., Ph.D.
Cong, Yingzi, Ph.D.
Dong, Jianli, M.D., Ph.D.
Garg, Nisha Jain, Ph.D.
Gelman, Benjamin B., M.D., Ph.D. Hawkins, Hal K., M.D., Ph.D.
Kaphalia, Bhopendra S., Ph.D.
Khan, M. Firoze, Ph.D.
Kramer, George C., Ph.D.
Ksiazek, Thomas, DVM, Ph.D.
Makino, Shinji, Ph.D.
McBride, Jere, Ph.D.
Milligan, Gregg, Ph.D.
Motin, Vladimir L., Ph.D.
Okorodudu, Anthony O., Ph.D.
Olano, Juan, M.D.
Paessler, Slobodan, D.V.M., Ph.D.
Peterson, Johnny W., Ph.D.
Popov, Vsevolod, Ph.D.
Pyles, Richard, Ph.D.
Soong, Lynn, M.D., Ph.D.
Sun, Jiaren, M.D., Ph.D.
Tesh, Robert B., M.D.
Torres, Alfredo G., MSc, Ph.D.
Vaidya, Smita, Ph.D.
Walker, David H., M.D.
Wang, Tian (Tina), Ph.D.
Weaver, Scott C., Ph.D.

Associate Professors
Aguilar, Patricia, Ph.D.
Beasley, David W. C., Ph.D.
Bouyer, Donald H., Ph.D.
Brocard, Anne-Sophie, Ph.D. RBP
Endsley, Janice J., Ph.D
Forrester, Naomi L., Ph.D.
Freiberg, Alexander, Ph.D.
Furguson, Monique, R., Ph.D.
Gong, Bin, M.D., Ph.D., HTL
Ikegami, Tetsuro, D.V.M., Ph.D.
Sahni, Sanjeev, Ph.D.
Thangamani, Saravanan, MSc., Ph.D.
Valbuena, Gustavo, M.D., Ph.D.
Vasilakis, Nikos, Ph.D.
Williams-Bouyer, Natalie, Ph.D.

Assistant Professors
Hughes, Grant, Ph.D.
Stevenson-Lerner, Heather, M.D., Ph.D.
Hu, Haitao, Ph.D.
Objectives of Graduate Work

Experimental Pathology is a biomedical discipline concerned with the nature of human disease. This discipline examines mechanisms by which molecular, structural, and functional aberrations cause disease or are caused by disease. There are five specific objectives of the program.

1. Educate students in the basic biomedical sciences of cell morphology, biochemistry, molecular biology, and physiology, and their pathologic counterparts in disease processes. Additionally, students are trained in the study of human pathogens and their vectors.

2. Provide interactions between students and clinical scientists to facilitate student development of an appreciation for the problems, issues, and technology of diagnosis, management, and treatment of human disease.

3. Educate students in research methodology and in data analysis while providing exposure to the multiple approaches to research about mechanisms of disease.

4. Provide students with the guidance, training and support needed to complete an original research project in a specialized area of experimental pathology.

5. Prepare students for the diverse careers available to Ph.D.’s in the Biomedical Sciences.

Essential Functions Required for Completion of the Program
The following description details essential functions (abilities) needed to complete the Experimental Pathology degree program.

Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.
Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations.
Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

Professional and Social Attributes
Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.
Application of Legal/Ethical Principles and Professional Standards

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

Programs of Graduate work

Courses required and the precise program to be followed are determined by the goals of the individual student. The flexibility in course requirements depends to a large extent on the student's background in biomedical sciences. Among the many possible areas of experimental pathology for specialized training and research are chemical injury to the heart, kidney, liver and lung; pathobiology; toxicology; emerging infectious diseases; vector biology; biodefense; tropical diseases; virology; and the mechanism of transmission and disease pathogenesis due to infectious agents including AIDS. Training is carried out through lectures, seminars, small-group discussions, and research experiences. Regular contact with clinical scientists is provided through scheduled seminars and conferences. Research experiences offered to students may involve techniques in ultrastructure, enzymology, chromatographic separation and spectral detection, virology, molecular biology, proteomics, genomics, phylogeny, pathogenic microbiology, phylogenetics, vector biology, pharmacokinetics, in vivo or isolated organ function, and tissue culture, among others. Teaching experiences are offered by participation in graduate and medical school courses and by regular presentation of literature and research in seminars. A program of study leading to a doctoral degree in experimental pathology is offered.

Physical Facilities

The Department of Pathology is located primarily in the Keiller Building with additional facilities in the McCullough Building, Clinical Sciences Building, John Sealy Hospital, Jennie Sealy Hospital, the Galveston National Laboratory and Old Microbiology Building. Research areas include fully equipped laboratories for electron microscopy, immunohistology, molecular biology, virology, pathogenic microbiology, vector biology, biochemical and environmental toxicology, cell culture, and pathophysiology and exposures to toxic substances and infectious agents. Facilities include a suite of biosafety level 3 containment laboratories and biosafety level 3 animal care quarters for biohazard and toxicology studies, and the only full-sized biosafety level 4 laboratory at a U.S. university. Insectaries for the study of arthropod vectors of infectious diseases including BSL3 containment are also available. UTMB is one of eight institutions nationwide receiving grants to establish a Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research (RCE). The National Institute of Allergy and Infectious Diseases (NIAID) selected UTMB as the site for a $167 million national bioccontainment laboratory (the Galveston National Laboratory currently under construction). When completed in 2008, this facility will be one of only two large-scale national research facilities focusing on new and emerging disease threats. UTMB is the only institution in the to be awarded both the RCE and national bioccontainment laboratory grants from NIH.

The Department of Pathology is also home to the UTMB Center for Biodefense and Emerging Infectious Diseases and a World Health Organization Collaborating Center for Tropical Diseases that studies the pathogenesis, host response, and control and prevention of tropical infectious disease. The WHO Center includes the World Arbovirus Reference Center and faculty who are internationally renowned in the areas of
arbovirology, medical entomology, and vector biology.

Each year clinical components of the Pathology Department evaluate approximately 21,500 surgical and 35,000 cytopathologic specimens; perform more than 400 autopsies; and make more than 3.9 million chemical, immunological, or microbiological determinations. This wealth of clinical material provides many opportunities for graduate students to participate in research studies on human diseases. Several research projects on tropical diseases also provide opportunities for student training in epidemiological and ecological methodology, especially in Latin America and Africa.

**COURSE OF STUDY FOR THE EXPERIMENTAL PATHOLOGY GRADUATE PROGRAM**

The program has three components: courses, seminars, and research training. Course surveys are mandatory as stated in the GSBS Student Handbook, and failure to complete the survey will result in a grade of “I.” The program coordinator will send course surveys at the end of each term.

**COURSE OF STUDY FOR THE EXPATH GRADUATE PROGRAM**

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<tr>
<th>BBSC Core Courses-Year 1</th>
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<th>Course Number</th>
<th>Term/Year</th>
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</thead>
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<td>Biochemistry</td>
<td>Lee/Morais</td>
<td>BBSC 6401</td>
<td>I A</td>
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<tr>
<td>Small Sampling of Big Data</td>
<td>Jupiter</td>
<td>BBSC 6130</td>
<td>III A</td>
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<tr>
<td>Cell Biology</td>
<td>Choudhary/Oberhauser</td>
<td>BBSC 6302</td>
<td>I A</td>
</tr>
<tr>
<td>Biostatistics</td>
<td>Spratt</td>
<td>BBSC 6222</td>
<td>II A</td>
</tr>
<tr>
<td>Molecular Biology &amp; Genetics</td>
<td>Barral/Bouyer/Martinez</td>
<td>BBSC 6403</td>
<td>II A</td>
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<tr>
<td>Responsible Conduct in Biomedical Research</td>
<td>McKinney</td>
<td>BBSC 6129</td>
<td>I,II,III A</td>
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<tr>
<td>Laboratory Rotations</td>
<td>Toliver-Kinsky</td>
<td>BBSC 6043</td>
<td>I,II,III A</td>
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<tr>
<th>ExPath Program-Year 1</th>
<th>Course Director</th>
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<th>Term/Year</th>
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<tbody>
<tr>
<td>Principles of Laboratory Biosafety</td>
<td>Brocard</td>
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<td>I or III A</td>
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<tr>
<td>Frontiers of Infectious Diseases</td>
<td>McBride</td>
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<td>I,II A</td>
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<tr>
<td>Basic Human Pathobiology-Tox or ID</td>
<td>Boor/Khan</td>
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<td>Olano</td>
<td>PATH 6386</td>
<td>III A</td>
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<tr>
<td>Functional Histology and Pathobiology</td>
<td>Hawkins/Olano</td>
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<td>II A</td>
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<tr>
<td>Program Electives (3 cr)</td>
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<th>ExPath Program-Year 2</th>
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<td>Vasilakis</td>
<td>PATH 6279</td>
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<td>ExPath Trainee Work in Progress</td>
<td>McBride</td>
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<td>I,II A</td>
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<tr>
<td>Research in Pathology</td>
<td>McBride</td>
<td>PATH 6097</td>
<td>I,II,III A</td>
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<tr>
<td>Frontiers of Infectious Diseases</td>
<td>McBride</td>
<td>PATH 6145</td>
<td>I or II A</td>
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<td>Program Electives (3 cr)</td>
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**Program Electives**

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<td>Milligan/Bourne</td>
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<td>Aguilar/Sahni</td>
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<td>Peters</td>
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<td>Nichols</td>
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<td>Murphy</td>
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<td>Boor</td>
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<td>Melby/Travi</td>
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75 | P a g e
Advanced Immunology  Sun/Wang  MICR 6408  I  A
Teaching Skills & Course Devel.  Aronson  PATH 6101/6102  II, III  B
Biology of Arthropod Dis Vectors  Thangamani  PATH 6112  III  A
Fundamentals of Inflammation  Hawkins/Reyes/ Midori-Horiuti  BBSC 6210  III  A
Vaccine Development Pathway  Bourne/Milligan  BBSC 6219  III  A
Cellular & Molecular Mechanisms  Singh/Vargas  CELL 6401  III  A
Pathogenic Bacteriology  Torres/Motin  MICR 6315  III  A
Clinical Microbiology Practicum  Williams-Bouyer/ Loeffelholz  PATH 6123  I,II,III  A
Research Rotations  McBride  PATH 6012  I,II,III  A
Thesis  McBride  PATH 6098  I,II,III  A
Dissertation  McBride  PATH 6099  I,II,III  A
Seminar in Pathology  McBride  PATH 6195  I,II,III  A
Special Topics  McBride  PATH 6000  I,II,III  A

Key:  I = Fall, II = Spring, III = Summer, A = Annual, B = Biennial

Students are expected to take at least six hours of electives. Electives need to include an advanced course in the student’s area of specialization and can include courses offered by other graduate programs at UTMB as deemed appropriate by the student in consultation with his/her advisor and/or the Program Director.

Grades for required core courses

Pathobiology of Human Diseases Parts I & II, Experimental Design and Grant Writing, and Teaching in Pathology

1. Students must obtain a B grade or better in all required courses.
2. Accumulation of two C grades in graduate school constitutes grounds for dismissal from graduate school at UTMB. In addition, a grade of C in the core courses of this program will be deemed a deficiency, which will have to be corrected. This will involve repeating all or parts of courses where a grade C or lower was obtained and require a grade B or better when the parts of the course are repeated. Decisions on which parts of courses require repeating will involve discussions of the respective course director with the Student Evaluation and Advisory Committee.
3. A grade of F will require the entire course to be retaken and a grade of B or better obtained on repeating the course.

Academic Progress

1. Students must maintain a GPA of 3.0 or better. This includes all courses and rotations.
2. A student will be put on probation if the average GPA falls below 3.0 in any one semester. Students whose average in the subsequent semester does not achieve 3.0 or better are subject to dismissal from graduate school.

M.D./Ph.D. Curriculum in Experimental Pathology

Experimental Pathology will require a minimum of 9 hours of classes. Coursework must include PATH6266 entitled Basic Human Pathobiology, and Basic Human Pathobiology – Toxicology (PATH 6276) or Basic Human Pathobiology – Infectious Disease (PATH 6286) and an elective course appropriate for the student’s area of specialization within the Experimental Pathology program. The academic record of each M.D./Ph.D. student will be evaluated by the Program Director and, if deficiencies are noted, additional coursework...
Students may be exempted from experimental pathology and BBSC required core courses based on their prior academic record in graduate courses taken previously. Exemption from BBSC courses can also be determined by examinations. Other exemptions may be made depending on the background or qualifications of the student at the discretion of the student evaluation and advisory committee (seac), the program director and the director of the BBSC.

List of Conferences and Seminars at UTMB

Attending seminars is a critical part of the training program. Since Pathology is uniquely positioned at the interface between basic sciences and clinical medicine, Experimental Pathology graduate students have an exceptional opportunity to interact with clinicians regarding observations and unknowns in human disease. Departmental seminars provide formats for such interactions on a regular basis.

UTMB offers numerous seminars and conferences sponsored by various departments, programs, centers and interest groups. Information about these seminars is disseminated through a variety of mechanisms including UTMB Daily Announcements, Departmental Weekly Announcements, IHII Weekly Calendar, the UTMB web site, posted announcements, and in targeted emails. The number and diversity of seminar opportunities precludes a detailed listing of them. Listed below are several conferences/seminars that directly relate to many of the students in Experimental Pathology.

Experimental Pathology Trainee Work in Progress (PATH 6115) (weekly, fall/spring terms) – Thursday, 12 Noon, GNL 1.100. Trainees in Pathology, including graduate students and post-doctoral fellows engaged in research, present their current findings to their peers, faculty and staff. Graduate students in their first year in the program present 30-minute talks, while more senior students and post-doctoral fellows present 45-minute talks. This seminar series serves several purposes: 1) to provide trainees the opportunity to develop their verbal presentation skills; 2) to provide a forum for trainees to receive input into their research; and 3) to help develop a cohesive identity among trainees interested in the diverse research topics within the Department of Pathology. Participation in the annual Pathology Department Trainee Research Day, which usually occurs the first part of May each year, is a requirement of this course. Graduate students are expected to attend these seminars and attendance is considered for final grades. Written evaluations are prepared by faculty and students. The results of these evaluations are provided to the speaker and the speaker’s mentor.

Interdepartmental Infectious Disease Work in Progress (weekly, year round) – Tuesday, 8:30 a.m., Marvin Graves Bldg., Room 4.208. Laboratories engaged in infectious disease research at UTMB present their current research in this relatively informal seminar setting designed to provide an interactive exchange of ideas. This series encourages the dissemination of research interest information encouraging the development of collaborative research efforts.

Immunology Research in Progress (once per month, year round) – Wednesday, 12 Noon, Levin Hall 3.320. Laboratories engaged in immunology and infectious diseases research at UTMB present their current research in this relatively informal seminar setting designed to provide an interactive exchange of ideas. This series encourages the dissemination of research interests and reagents and the development of collaborative research efforts.

Immunology Journal Club (three times per month, year round) – Wednesday, 12 Noon, MRB 4.145. Faculty, postdoctoral fellows, and graduate students present recently published papers in high-impact journals. These informal discussion sections allow fellows to strengthen their presentation skills and broaden immunological concepts and research tools.
Environmental Health and Medicine Seminar - The seminar series brings outstanding toxicologists to UTMB for lectures and informal interactions with faculty and trainees. This is typically held in Levin Hall room 3.320 at noon on Mondays in the Fall and Spring semesters.

Grand Rounds (PATH 6195) – (Weekly, Fall and Spring terms) - Monday, 12 Noon, GNL 1.100. This seminar series emphasizes topics of interest to those involved in the clinical activities of the Pathology Department. Faculty and invited guests from other UTMB departments and other educational institutions present current clinical research or other relevant clinical topics of interest.

Colloquium of Frontiers of Infectious Disease and Tropical Medicine (PATH 6145) (weekly, Fall and Spring terms) - Tuesday 12:00 p.m. 2.212 BSB. National and international renowned researchers are invited to present their most recent research in the fields of infectious disease, emerging infectious diseases, biodefense and tropical medicine.

The Biodefense and Emerging Infectious Disease Journal Club (occurs on the second and fourth Wednesdays of every month at 4:00pm in GNL 1.100) provides a forum for PhD students, postdoctoral fellows, faculty, and other interested staff to meet and discuss scientific papers of interest to the field. On a rotating basis, members of the club select papers for discussion and distribute them to the group in advance of the meeting. The topics are wide ranging and have included discussion of the secondary structure of HIV, the discovery of extant viral sequences in human and mammalian DNA, and the immunology of acute vs chronic viral infections. A discussion of the paper is led by the club member who selected the paper, with emphasis on critical evaluations of the experimental approach, methods, results, and interpretation of the data. Higher level discussions of the impact of the work described in the paper, its context vis-a-vis trends in infectious disease research and funding, and how similar approaches could be taken at UTMB are also encouraged.

path Course offerings

Fall Term Courses
- Research Rotations (PATH 6012)
- Research in Pathology (PATH 6097)
- Thesis (PATH 6098)
- Dissertation (PATH 6099)
- Experimental Pathology Trainee Work in Progress (PATH 6115)
- Clinical Microbiology Practicum (PATH 6123)
- Colloquium of Frontiers of Infectious Diseases and Tropical Medicine (PATH 6145)
- Introduction to Vaccinology (PATH 6161)
- Seminar in Pathology (PATH 6195)
- Workshop in Phylogenetics (PATH 6211)
- Introduction to Competitive Grant Writing (PATH 6279)
- Cellular Microbiology & Disease (PATH 6289)
- Principles of Biodefense (PATH 6310)

Spring Term Courses
- Research Rotations (PATH 6012)
- Research in Pathology (PATH 6097)
- Thesis (PATH 6098)
- Dissertation (PATH 6099)
- Experimental Pathology Trainee Work in Progress (PATH 6115)
- Clinical Microbiology Practicum (PATH 6123)
- Foundations of Virology (PATH 6140)
- Colloquium of Frontiers of Infectious Diseases and Tropical Medicine (PATH 6145)
Seminar in Pathology (PATH 6195)
Cardiovascular Toxicology (PATH 6242)
Basic Human Pathobiology-Toxicology (PATH 6276)
Tropical Diseases (PATH 6318)
Functional Histology and Pathobiology (PATH 6436)

Summer Term Courses
- Research Rotations (PATH 6012)
- Research in Pathology (PATH 6097)
- Thesis (PATH 6098)
- Dissertation (PATH 6099)
- Biology of Arthropod Disease Vectors (PATH 6112)
- Clinical Microbiology Practicum (PATH 6123)
- Seminar in Pathology (PATH 6195)
- Fundamentals of Pathology (PATH 6203)
- Basic Human Pathobiology-ID (PATH 6386)

PATH COURSE DESCRIPTIONS

PATH 6012  
**RESEARCH ROTATIONS**
It is the goal of research rotations to provide exposure to the breadth of research opportunities in Experimental Pathology and to ensure that students receive diverse training. Rotation policies are flexible and responsive to students' background and interest. The number and types of rotations are determined by the SEAC, which will take the student's experience and interests into consideration. Three rotations in combination of BBSC and Pathology Rotations are recommended for most students. Rotations within an area of interest should be representative of the different types of research within that area and ensure that students are exposed to diversity in approaches, thought and techniques. Students can request a waiver from the required rotations in writing to the SEAC, and the request must include justification for that waiver. The SEAC can grant such waivers based upon the justification and records submitted in support of such a waiver request supplied by the student. The purpose of this course is to provide introductory laboratory experiences that will help students choose their areas of specialization and assist in the selection of a supervisory professor for their subsequent dissertation research. A student works on an individual basis with a member of the faculty for all or part of a term (8 or 16 weeks), either independently performing a short project designed by the faculty member, or jointly working on some facet of ongoing research.
Prerequisites: Consent of instructor
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference 1; Laboratory 120

PATH 6097  
**RESEARCH IN PATHOLOGY**
This course varies in credit according to the work performed. The student concentrates on a problem of his or her own choosing with faculty advisor. Grading is S/U (satisfactory/unsatisfactory);
Prerequisite: None
Terms Offered: I, II, III
Years Offered: Annually

PATH 6098  
**THESIS**
Formal research and writing leading to the preparation and completion of the thesis for the Master of Science degree under the direction of the student's supervisory committee. Grading is based on the student's level of performance as reported by the chairperson of the student's supervisory
committee and is assigned as satisfactory, needs improvement, or unsatisfactory.
Prerequisite: Admission to candidacy for the master's degree
Terms Offered: I, II, III
Years Offered: Annually

PATH 6099
DISSERTATION
Formal research and writing leading to the preparation and completion of the dissertation for the
Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading
is based on the student's level of performance as reported by the chairperson of the student's
supervisory committee and is assigned as satisfactory, needs improvement, or unsatisfactory.
Prerequisite: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually

PATH 6101
TEACHING SKILLS AND COURSE DEVELOPMENT I
Participation in Teaching Workshops: During these interactive sessions, students will learn
about basic principles of course design, teaching strategies (especially small group teaching to
foster active student learning and application), public speaking, and types of assessments
(evaluations of student performance). In these workshop settings with their peers and the
instructors, students will have an opportunity to explore their own ideas and attitudes about
teachers and learners, discuss learning style preferences, investigate evidence-based best
teaching practices, practice public speaking skills, and learn about selected computer-based
educational technologies. Small group teaching in Integrated Medical Curriculum: Student
teachers will apply principles of small group teaching in small group sessions for first year
medical students in the Integrated Medical Curriculum. Each student will co-teach 4 laboratory
exercises with a faculty instructor, on topics that include histopathology and pathobiology of
inflammation, immunity, clinical and basic microbiology, neoplasia, and developmental/pediatric
diseases. Students will receive feedback on their teaching effectiveness from the faculty
instructor with whom they are paired. Students will have an opportunity to evaluate and critique
lab exercises in terms of their effectiveness in fostering Significant Learning in students.
Grading is Standard (A-F) and will be based on participation in and preparation for teaching
workshop sessions, oral presentation, and written assignments, and faculty evaluations of
small group teaching in IMC labs.
Prerequisites: PATH 6266, consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Conference/Discussion 2

PATH 6102
TEACHING SKILLS AND COURSE DEVELOPMENT II
Participation in Teaching Workshops: Students will receive focused, hands-on instruction in
writing course objectives and multiple choice test items. Teaching a module in the Clinical
Laboratory Sciences Program: Students will develop a module in a “Case-Studies” course for
Clinical Laboratory Sciences Students in the School of Health Professions. Under the
guidance of CLS instructors, student teachers will identify a topic or theme for consideration,
develop objectives for the module, create lecture and case study material accordingly, and
write MCQ style exam questions assessing CLS student acquisition/application of concepts
addressed. This component will require that student teachers learn about clinical/diagnostic
applications of basic science and demonstrate the ability to foster CLS student integration of
laboratory data, basic science information, and clinical information. Student teachers will
receive feedback about the effectiveness of their teaching from CLS students at the end of the
module. Student teaching sessions will be video-recorded and reviewed by student and faculty
mentor. Grading is Standard (A-F) and will be based on attendance and participation in
teaching workshops, student and faculty evaluations of teaching effectiveness, and module
development in CLS course [contribution to module planning; timeliness and appropriateness
of objectives, lecture material, and test questions; and performance of test items].
Prerequisites: PATH 6101
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 1; Conference/Discussion 1

PATH 6112
BIOLOGY OF ARTHROPOD DISEASE VECTORS
The goal of this course is to introduce students to arthropods that are vectors for a wide variety of infectious agents that cause human diseases. The unique biology of hematophagous arthropods that has evolved to facilitate the coexistence between the vectors, pathogens, and the vertebrate host will be illustrated in both lectures and practical sessions. The curriculum will build upon a general introduction to arthropods. Then, using specific examples, the processes of infection, development, and transmission of pathogens will be discussed. This will include vector behaviors involved in location of the host, physiological adaptations to facilitate blood feeding and digestion, and factors that influence the vector-pathogen relationship. Options for controlling vector-borne diseases will be discussed from a historical perspective, with a consideration of how modern molecular approaches might be used in the future. Required reading: The Biology of Disease Vectors (Marquardt, W.C., Kondratieff, B., Moore. C.G., Freier, J., Hagedorn, H.H., Black, W. III., James, A.A., Hemingway, J. & Higgs, S. editors). Elsevier Academic Press. 2004. Evaluations are based on full-term examination (80%) and laboratory practical (20%). Final examination: Students will be evaluated based on multiple-choice questionnaires, short essays and the demonstration of practical knowledge. Grading is Standard (A-F).
Prerequisites: Consent of instructor
Terms Offered: III
Years Offered: Annually
Hours per week: Laboratory 1; Lecture 2

PATH 6115
EXPERIMENTAL PATHOLOGY TRAINEE WORK IN PROGRESS
This course provides a forum for graduate student research in progress updates and is required for all graduate students in Experimental Pathology. The objective of this course is to enable students to gain experience by orally presenting their current research and future studies, and responding to questions from the audience. Attendance is required at the weekly Experimental Pathology seminars. Participation in the annual Pathology Department Trainee Research Day, which usually occurs the first part of May each year, is a requirement of this course. Attendance at weekly Pathology Grand Rounds, other weekly clinical conferences, interdepartmental infectious disease conferences, and immunology or toxicology seminar offerings is voluntary, but strongly encouraged. Grading is Standard (A-F) and grades will be determined based on submission of written evaluations (2nd year), attendance, and completion of one annual research presentation. (The written evaluations must be turned in to the Program Coordinator within 1 week of the seminar. Evaluations submitted after 1 week will automatically be reduced by one grade and those submitted 2 weeks late will not be accepted or receive a grade of F.) Attendance at 90% of seminars is required for year 2 trainees and 80% for trainees in years 3-5.
Prerequisites: Consent of program director
Terms Offered: I, II
Years Offered: Annually
Hours per week: Conference 1

PATH 6123
CLINICAL MICROBIOLOGY PRACTICUM
This course is designed to provide graduate students with an opportunity to gain both understanding and practical, hands-on experience in the policies, procedures and regulatory/safety standards of the clinical microbiology laboratory, and its role in infectious disease diagnostics. It serves as an introduction to the field of clinical microbiology, for those students interested in pursuing this area as a career choice. The student will rotate through different sections of the clinical microbiology laboratory. Bench-level rotations will expose the student to laboratory subspecialties including bacteriology, virology, serology, mycology,
mycobacteriology and parasitology. The student will be given simulated specimens on which to perform bacterial identification and susceptibility testing under the guidance of microbiology technologists. Throughout the rotation, students will participate in weekly Microbiology Plate Rounds and are encouraged to attend the weekly Adult and Pediatric Infectious Disease Case Conferences. Grading is based on a written and oral assignment. Final grade will be assigned as either Satisfactory/Unsatisfactory (S/U).

Prerequisites: Consent of instructor
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 30; Conference/Discussion 2; Seminar 1

PATH 6140
FOUNDATIONS OF VIROLOGY
Discoveries and discoverers, inventors and inventions, developers and technologies -- the historic bases for the state of virology research today and the larger context in which laboratory, field, and public health virology contribute to the prevention and control of viral diseases. I will use the tabular material and the 800 slide Powerpoint slide sets http://www.utmb.edu/ihii/virusimages/index.shtml to provide an overview of the history of medical virology, emphasizing as stated, “the discoverers and discoveries, the inventors and inventions, the developers and their technologies.” In producing these materials I have accumulated quite a bit of information, enough to provide in lecture / discussion format a sense of the context of the discoveries, and in key instances lots of detail that everyone is sure to find exciting. 16 lectures will each cover an “era,” starting with key events forming the base for the rise of microbiology in the 19th century, continuing with the discovery of the first viruses and the rise of the science in France, Germany and the United States in the early years of the 20th century, continuing with the discovery of most of the important human pathogens throughout the 20th century (and continuing today), and setting the stage for the molecular virology revolution that also continues. Grading is S/U (satisfactory/unsatisfactory). Pass/fail will be determined by attendance and participation in class discussions.
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

PATH 6145
COLLOQUIUM OF FRONTIERS OF INFECTIOUS DISEASES AND TROPICAL MEDICINE
Frontiers of Infectious Diseases & Tropical Medicine is an Experimental Pathology course that uses the Colloquium of Infectious Diseases and Immunity for its didactics. The colloquium is organized and sponsored by the Center for Biodefense and Emerging Infectious Diseases (CBEID), the Center for Tropical Diseases (CTD), and the Departments of Microbiology & Immunology (M&I) and Pathology at UTMB. This colloquium was created to offer faculty, staff, and trainees the opportunity to hear about the latest research of recognized experts in the fields of infectious diseases, microbiology, and immunity. Invited speakers are almost always from academic institutions throughout the United States and occasionally from international institutions. The Colloquium offers a wide range of topics within the fields of infectious diseases, microbiology, and immunity, including epidemiology, vaccine development, pathogenesis, pathophysiology, molecular biology, cellular microbiology, etc. Students registered for this course will have the opportunity to meet the speaker in a separate small-group session called “meet the professor”. This is a great opportunity to learn not only about the details of the speaker’s research, but also about their motivations in science, their life experiences, and their advice as it relates to professional and academic advancement. Grading is S/U (satisfactory or unsatisfactory) and depends on attendance. Specific requirements are the following: First year students will register for this course for the fall and spring semesters, and they must attend more than 80% of the seminars offered during those semesters; second through fifth year students will register for this course for either the fall or the spring semester, and they must attend more than 80% of the seminars offered during the selected semester; registered students must attend more than one third of the “meet the professor” post-seminar meetings. Grades in this course are based on attendance.
PATH 6161  (1 CREDIT)
INTRODUCTION TO VACCINOLOGY
Introduction to Vaccinology: Vaccines for the 21st Century is a six-week, one-credit hour introductory course taught in lecture format with a small number of expert lecturers. The course is designed to provide the basic scientist with an understanding of vaccine development from conceptualization through development, testing, and utilization. The course objectives are to learn:

1. Essential information regarding the pathogens and diseases for which vaccines are needed.
2. The pathophysiologic approach to developing vaccine strategies.
3. The principles of the development, availability, and use of vaccines.
4. The application of traditional and new technologies to vaccine development.

There will be assigned reading in preparation for each class session. Reading materials will be provided prior to each class. Each session will be 1 hour (total 15 contact hours). Course performance will be determined by take home midterm & final examinations (50% each).

Prerequisite: Consent of Instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

PATH 6195  (1 CREDIT)
SEMINAR IN PATHOLOGY
This course requires attendance at, and participation in, weekly Pathology Grand Rounds, where the staff and guests from other departments and other educational institutions present current research or relevant topics of interest. Grading is S/U (satisfactory/unsatisfactory).

Prerequisites: None
Terms Offered: I,II,III
Years Offered: Annually
Hours per week: Seminar 1

PATH 6211  (2 CREDITS)
WORKSHOP IN PHYLOGENETICS
Phylogenetic methods are becoming increasingly popular for studies of microbial systematics, molecular epidemiology and evolution, pathogen emergence, predicting host and vector relationships, inferring biochemical and drug sensitivity similarities, etc. Although user-friendly algorithms are now widely available, proper analyses require a theoretical understanding of the assumptions underlying the algorithms used, and the statistical methods for determining the stability of phylogenetic trees generated. This course is designed to provide students with a basic practical and theoretical knowledge of phylogenetic methods for analyzing nucleotide and amino acid sequences. Upon completion of the course, the student will be able to make sound decisions on the best methods for analyzing their own sequences, run a variety of algorithms on a UNIX workstation and Macintosh personal computer, and interpret results to reach valid, statistically-supported conclusions. The course will meet for one session of two hours each week. The first hour will be devoted to theoretical discussions of methods, and demonstrations using a laptop computer and projection system. The second hour will be a computer laboratory session where students will be given hands-on training with phylogenetic algorithms. Grading is S/U (satisfactory/unsatisfactory) and based on a class project involving phylogenetic analysis of the students' sequences (either their own sequences from a research project or GenBank sequences of interest) as well as completion of a mock research paper suitable for submission to a journal. The results of class projects will also be presented to the class in typical scientific meeting format. Requirements for a passing grade include both publication quality data and writing, and a presentation of quality suitable for a national meeting. The final grade will be based 75% on the written class project (mock research paper) and 25% on the oral class.
presentation.
Prerequisites: Consent of Instructor
Terms Offered: I
Years Offered: Biennially-Even Years
Hours per week: Lecture 2

PATH 6276
BASIC HUMAN PATHOBIOLOGY-TOXICOLOGY
(2 CREDITS)
The objective of this course is to introduce the principles of toxicology. This is achieved by presenting specific clinically-relevant examples of toxic injury and exploring the biochemical, cellular and pathogenetic mechanisms that underlie these examples. Mechanisms of toxin-induced cellular injury discussed could include injury by reactive oxygen and nitrogen species, xenobiotic adduction and metabolism, and receptor/signal disruption. Grading is based on contributions to class discussion (40%) and a final examination (60%). Grading is Standard (A-F).
Prerequisites: BBSC 6276 or consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3; Conference 2

PATH 6279
INTRODUCTION TO COMPETITIVE GRANT WRITING
(2 CREDITS)
This course will provide an introductory and interactive experience to competitive grant writing. Topics to be covered include understanding the review process, and planning, organizing, writing a successful hypothesis driven application. Students will be required to write a two year grant application, provide written critiques, and participate in a final mock study section review. Grading is Standard (A-F) and will be based on class participation (30%), written assignments (40%), and quality of the final application (40%).
Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 2

PATH 6289
CELLULAR MICROBIOLOGY & DISEASE
(2 CREDITS)
This advanced course provides an in-depth examination of the molecular mechanisms of host-pathogen interactions (bacteria/viruses) to understand the strategies for successful infection of the host cell and evading host defense mechanisms. All topics are conceptual overviews of the principal mechanisms of bacterial/viral pathogenesis. Topics include molecular mechanisms of pathogen adherence/entry to host cells and pathogen signaling host cells through adhesion molecules, subversion of endocytic pathways, manipulation of the host cell cytoskeleton, bacterial secretion systems, immune evasion mechanisms and persistent infection. Emphasis is given to diseases with prototypic pathogenic mechanisms. Instruction involves lectures, class discussions and readings in contemporary or classic literature. Grading is based on attendance (20%), class discussions and participation (30%), and one final examination (50%). The format of final exam will be for students to choose 5-6 out of 10-12 questions. Grading is standard (A-F).
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Conference 2

PATH 6318
TROPICAL DISEASES
(3 CREDITS)
This course is designed to provide graduate students with an overview of tropical diseases and related current research. The course is not designed to be comprehensive, but will sample representatives of major infectious tropical diseases. Emphasis is placed on the ecology, epidemiology and control of tropical diseases. The class meets two (2) times a week for 90 minutes; each session includes a 45 minute lecture by a faculty member, followed by the presentation of a pertinent paper and discussion questions. Students are expected to submit their selected reference and at least 5 discussion
questions to the lecturer one week in advance. Grading is Standard (A-F);
Prerequisites: Consent of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 1.5; Conference/Discussion 1.5

PATH 6386 (3 CREDITS)
The objective of this course is to introduce basic principles of infectious disease pathogenesis. This is achieved by introducing selected and representative pathogens and exploration of their virulence mechanisms from the biochemical, molecular and pathogenetic point of view. Presentation of clinically-relevant cases will illustrate these principles. This course is centered on the interaction of infectious organisms and their host rather than an “infectious agent”-centered course. Two general lectures on infectious disease pathogenesis and molecular diagnostics are followed by topics related to viral diseases, obligate intracellular bacteria, mycobacteria, gram positive and gram negative pathogens. The course is generously complemented by journal club sessions related to the topics presented at lectures. Grading is based on contributions to journal club discussion (30%) and a final examination (70%). Grading is Standard (A-F).
Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 4; Discussion 2

PATH 6436 (4 CREDITS)
FUNCTIONAL HISTOLOGY AND PATHOBIOLOGY
This 16-week course will provide a fundamental background for students who are interested in pursuing experimental pathology. This course will include, but is not limited to, general pathobiology, basic functional histology, and organ development of humans. Pathobiology topics will include cell injury/death, acute inflammation, immunopathology, neoplasia, coagulation, and genetic diseases. Functional histology will include the following organ systems: cardiovascular, respiratory, nervous, hematopoietic, gastrointestinal/hepatic, and urinary. For each system, normal functional histology and the main categories of diseases will be discussed (infectious, neoplastic, environmental, hemodynamic, etc.). Supplemental lectures on experimental techniques used in pathology research will also be included: histology/immunohistochemistry, electron microscopy, flow cytometry, and laser capture microdissection. Topics will be discussed as didactic lectures and use of glass slides/virtual imaging for demonstration of histology slides. Seven journal club sessions will take place during the course and will be related to the topics discussed during the course. Grading is Standard (A-F) and will be based on two mid-term exams and one final exam. Participation during journal clubs will also be graded. (Examinations: 20% + 20% + 20%; Journal Club: 20%; Attendance: 20%)
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3; Conference/Discussion 1
Human Pathophysiology and Translational Medicine
Graduate Program
https://its.utmb.edu/learning/degree_programs/degreePrograms.html

Faculty

Graduate Program Director
Mark R. Hellmich, Ph.D.

Professors
Abate, Nicola, M.D.
Ansari, G.A. Shakeel, Ph.D.
Aronson, Judy, M.D.
Barrett, Alan Ph.D.
Boehning, Darren, Ph.D.
Bourne Nigel, Ph.D.
Carlton, Susan, Ph.D.
Cheng, Xiaodong, Ph.D.
Chopra, Ashok, Ph.D.
Cunningham, Kathryn, M.D.
Denner, Larry, Ph.D.
Dewitt, Douglas, Ph.D.
Dong, Jianli, M.D., Ph.D.
Elferink, Cornelis, Ph.D.
Garg, Nisha, Ph.D.
Geisbert, Thomas W., Ph.D.
Gelman, Benjamin, MD, Ph.D.
Hellmich, Mark R., Ph.D.
Khan, M. Fironze, Ph.D.
Kramer, George C., Ph.D.
McBride, Jere, Ph.D.
Melby, Peter, M.D.
Milligan, Greg Nelson, Ph.D.
Motamed, Massoud, Ph.D.
Nichols, Joan E., Ph.D.
Paessler, Slobodan, DVM, Ph.D.
Pyles, Richard B., Ph.D.
Ramana, Kota, Ph.D.
Rasmussen, Blake B., Ph.D.
Rastellini, Christina, M.D.
Reyes, Victor E., Ph.D.
Sarna, Sushil K., Ph.D.
Srivastava, Satish K., Ph.D.
Suzuki, Fujio, Ph.D.
Torres, Alfredo G., Ph.D.
Variyam, Easwaram, M.D.
Volpi, Elena, M.D., Ph.D.
Walker, David H., M.D.
Weaver, Scott C., Ph.D.
White, Jr. Arthur C., M.D.
Wu, Ping, M.D., Ph.D.
Zhou, Jia, Ph.D.

Associate Professors
Abdel-Rahman, Sharif, Ph.D.
Bente, Dennis, Ph.D.
Chao, Celia, Ph.D.
Endsley, Janice, Ph.D.
Falzon, Miriam, Ph.D.
Ferguson, Monique, Ph.D.
Finnerty, Celeste C., Ph.D.
Hellmich, Helen, Ph.D.
Ikegami, Tetsuro, BVSc, Ph.D.
Kayed, Rakez, Ph.D.
Kelly, Brent C., Ph.D.
Nanovskaya, Tatiana, Ph.D., DDs
Shi, Xuan-Zheng, Ph.D.
Spratt, Heidi, Ph.D.
Valbuena, Gustavo, M.D., Ph.D.
Vargas, Gracie, Ph.D.

Assistant Professors
Anastasio, Noelle, Ph.D.
Figueiredo, Marxa, Ph.D.
Green, Thomas A., Ph.D.
Rockx, Barry, Ph.D.
Objectives of Graduate Work

The Human Pathophysiology and Translational Medicine (HPTM) PhD program is designed to provide an integrated understanding of the human body as a multicomponent system through the rigorous training of students in the mechanistic pathophysiology of human diseases, while simultaneously developing the methodological skills necessary to translate basic scientific knowledge into improvements in clinical medicine. HPTM is housed administratively in the UTMB Institute for Translational Science, which underlines the commitment for innovative science at the interface of basic and clinical sciences. These objectives will be achieved by engaging HPTM students in an innovative educational curriculum driven by experiences and situations that resemble the professional practice of translational scientists, while promoting the development of skills necessary for autonomous learning. Students in the program are mentored by Multidisciplinary Translational Teams (MTTs) composed of both basic science and clinical faculty. Through a combination of core and elective course, we anticipate that graduates of the HPTM program will exhibit the following competencies: a) possess a broad understanding of the normal structure and function of the human body; b) demonstrate a broad understanding of alterations in structure and function of the body and its major organ systems that correlate to specific human disease and/or injury; c) be knowledgeable in molecular biochemical and cellular mechanisms important in maintaining physiological homeostasis of organisms; d) identify and develop meaningful pre-clinical models of human disease; e) appreciate limitations of current standards of care for human disease; f) identify current gaps in the detection, diagnosis and treatment of a specific human disease, and g) collaborate effectively with clinicians, scientists of different disciplines and other healthcare-related professionals to conduct effective and efficient translational research.

Program of Study

The HPTM Program requires that all full-time students take at least 9 semester credit hours (hrs/wk) of course work in each of the three academic terms per year. All students in the program will take the same set of required courses prior to entering candidacy. By virtue of the unique, interprofessional nature of the curriculum for this program, HPTM students are not required to take BBSC core courses. The curriculum is based on stepwise acquisition of competencies that are guided by authentic performance of translational scientists. General competency categories include biomedical content knowledge, communication, research skills, management, teaching, professionalism, external services. In year 1 of the program, HPTM students will participate in problem-based learning and small group laboratory sessions with medical students in the Basic Science Core Courses of the School of Medicine (SOM) Integrated Medical Curriculum (IMC). Additionally, HTMP students will take the foundational HPTM-specific courses Practice of Translational Science modules 1-4, (POTS1-4)]. During the summer term of the first year, HPTM and select medical students in the Translational Research Track of the IMC will take an interprofessional research design course (Readers are referred to the Bulletin of the UTMB School of Medicine for a general outline of the PBL curriculum and the Integrated Medical Curriculum.) Students will begin their research laboratory rotations during the second term of the first year. Elective courses relevant to each individual student’s specific area of research will be taken during the second year prior to taking the qualifying exam and applying for candidacy. Following advancement to candidacy, students will register for the dissertation course for the remainder of their graduate studies. Continued participation in the Translational Research Seminar Series will be the only non-research based course requirement after candidacy.
Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor's/mentor's physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient's gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend...
three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

Professional and Social Attributes
Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

Application of Legal/Ethical Principles and Professional Standards
Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

HPTM COURSE OFFERINGS

Fall Term Courses
- Research Hours (HPTM 6097)
- Dissertation (HPTM 6099)
- Translational Research Seminar Series (HPTM 6109)

1st Block
- Practice of Translational Science I (HPTM 6291)
- Gross Anatomy and Radiology (HPTM 6405) Integrated Medical Curriculum

2nd Block
- Practice of Translational Science II (HPTM 6292)
- Molecules, Cells, and Tissues (HPTM 6332) Integrated Medical Curriculum

Spring Term Courses
Research Hours (HPTM 6097)
Dissertation (HPTM 6099)
Translational Research Seminar Series (HPTM 6109)

1st Block
Practice of Translational Science III (HPTM 6293)
Pathobiology and Host Defense (HPTM 6406) Integrated Medical Curriculum

2nd Block
Practice of Translational Science IV (HPTM 6294)
Lab Rotation and Clinical Encounters (HPTM 6306)

Summer Term Courses
Research Hours (HPTM 6097)
Dissertation (HPTM 6099)

1st Block
IP Translational Research Design Course (HPTM 6295)
Lab Rotation and Clinical Encounters (HPTM 6306)

2nd Block
Lab Rotation and Clinical Encounters (HPTM 6306)

HPTM COURSE DESCRIPTIONS

HPTM 6097 (3-9 CREDITS)
RESEARCH
Formal research directed toward the Doctor of Philosophy degree programs. Grading will be based upon the student's level of performance as reported by the student's research supervisor and will be assigned as satisfactory or unsatisfactory in a Mentor Report. Work is designed to introduce students to the techniques and philosophy of scientific research and to guide them in the development of a research problem in their major area of concentration. At the end of the registered term, students are required to write a one-page description of their research work. This course is taken after a student has passed the qualifying exam. Each student may enroll in this course for a maximum of three terms before becoming a candidate.
Prerequisites: Approval of Program Advisor
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

HPTM 6099 (3-9 CREDITS)
DISSERTATION
Formal research and writing leading to the preparation and completion of the dissertation is required for the Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory, needs improvement or unsatisfactory.
The HPTM Program will continue the theme of inter-professional collaborations in the conduct of translational dissertation research by utilizing co-mentoring teams composed of a basic scientist and physician from the Institute for Translational Sciences (ITS) Multidisciplinary Teams (MTTs) to guide each student's dissertation project. Both mentors will be involved in guiding the development, implementation and completion of the student's dissertation research project. The rationale for co-mentored research projects is that this mechanism will continue the student's exposure to both the scientific and clinical perspectives of a disease or injury state, and facilitate the further development of their inter-professional communication skills.
Grading will be based upon the student's level of performance as reported by the chairs of the
student's supervisory committee and will be assigned as satisfactory, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

HPTM 6109
1 CREDIT
TRANSLATIONAL RESEARCH SEMINAR SERIES FOR HPTM GRADUATE STUDENTS
This seminar series provides opportunities for Human Pathophysiology and Translational Medicine (HPTM) graduate and Translational Research Track (TRT) medical students to present their research to their peers and interested faculty in a scholastic setting, maintain contact with TRT students and gain an understanding of the translational insights of the medical students doing their clinical rotations, and interface with experienced clinicians and scientific competencies. Grading will be based on: seminar and post-seminar discussion attendance (70%), professionalism (5%), career building (10%) and the annual presentation of a student research update seminar (15%). Final grades will be calculated based on the standard A-F scale.

Prerequisites: Student must be entering second year in the HPTM program to enroll
Terms Offered: I, II
Years Offered: Annually
Hours per week: Discussion 1; Seminar 1

HPTM 6211
(2 CREDITS)
BIOVENTURE
A hands-on immersion into life science entrepreneurship through practical lessons that are applied to students’ group projects in the course. Students will graduate from this course with practical understanding and experience in how to evaluate a life science technology as a basis for starting a new business. The student/fellow directed course is intended to be an 8 week intensive undertaking, where 4-5 student teams begin with nascent intellectual property, conduct market/IP diligence, identify commercially viable products, create developmental/commercialization/financing plans, culminating into a detailed investor presentation. Each team would be guided by one or two experienced domain-specific entrepreneur(s) for the duration of the course. The goal is to provide students with practical experience in conceptualizing commercial applications for their research, and also provide important skills of how to lead and function within a team, reducing complex biological concepts to simple value propositions.

Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 3

HPTM 6291
(2 CREDITS)
PRACTICE OF TRANSLATIONAL SCIENCE MODULE I
Students in this course will participate in active, student-directed cooperative learning exercises in small groups to explore foundational concepts that address basic competencies of translational scientists. Students will be concurrently enrolled with medical students in Gross Anatomy and Radiology course (HPTM 6405). Topics explored during the POTS 1 courses will include scientific knowledge of human physiology and pathology as well as traditional basic sciences such as cell biology, molecular biology, genetics, etc. Concepts will be linked to Problem Based Learning cases studies in the GAR course (HTPM 6405). Students will also spend significant time in groups exploring and applying concepts related to other core competencies of translational scientists, such as teaching, professionalism, communication, and management. Grades will be based on weekly quizzes (20%), final written exam (20%), small group participation and problem-solving (20%), and other (oral presentation, reflective writing, peer assessment, learning portfolio) (40%).

Prerequisites: Students must be enrolled in the HPTM program. HPTM 6405 must be taken concurrently.
HPTM 6292
PRACTICE OF TRANSLATIONAL SCIENCE MODULE II
Students in this course will participate in active, student-directed cooperative learning exercises in small groups to explore foundational concepts that address basic competencies of translational scientists. This course will emphasize core principles in physiology incorporating biochemistry, molecular biology, genetics, etc. Grades will be based on weekly quizzes (20%), final written exam (20%), participation in small group activities (20%), and other (oral presentation, reflective writing, peer assessment, learning portfolio) (40%).
Prerequisites: Students must be enrolled in the HPTM program. HPTM 6291 and HPTM 6405. HPTM 6332 must be taken concurrently.
Terms Offered: I
Years Offered: Annually
Hours per week: Conference/Discussion 4

HPTM 6293
PRACTICE OF TRANSLATIONAL SCIENCE MODULE 3
Students in this course will participate in active, student-directed cooperative learning exercises in small groups to explore foundational concepts that address basic competencies of translational scientists. This course will emphasize core principles in physiology and pathology incorporating cell injury and adaptation, inflammation, immunologic diseases, microbiology, environmental and genetic diseases. Grades will be based on weekly quizzes (20%), final written exam (20%), participation in small group activities (20%), and other (oral presentation, reflective writing, peer assessment, learning portfolio) (40%).
Prerequisites: Students must be enrolled in the HPTM program. HPTM 6405, HPTM 6291, HPTM 6332, HPTM 6292
Terms Offered: II
Years Offered: Annually
Hours per week: Conference/Discussion 4

HPTM 6294
PRACTICE OF TRANSLATIONAL SCIENCE MODULE 4
Students in this course will participate in active, student-directed cooperative learning exercises in small groups to explore foundational concepts that address basic competencies of translational scientists. This course will emphasize core principles in physiology and pathology, as well as research skills such as grant writing, research techniques, presentation skills, animal use and human subjects. Grades will be based on: scientific content assessment (40% of total grade) includes quizzes, exams, and post-class assignments. Competency assessment is the remaining 60% of the grade. Competency assessment includes reflective writing, peer assessment, group work exercises, proposal papers, group projects and oral presentations.
Prerequisites: Students must be enrolled in the HPTM program. HPTM 6405, HPTM 6291, HPTM 6332, HPTM 6292, POTS3 and Pathobiology and Hose Defenses for HPTM students.
Terms Offered: II
Years Offered: Annually
Hours per week: Conference/Discussion 4

HPTM 6295
INTERPROFESSIONAL TRANSLATIONAL RESEARCH DESIGN
The Interprofessional Translational Research Design (IPTRD) course will team HPTM students with UTMB Medical Students in the Translational Research Track in identifying a translational problem and designing translational research projects. The course will focus development of key research design and collaborative competencies. Major emphasis will be on biostatistics and research design, team building, professional identify development, inter-professional communication and oral presentation skills. The course will meet for three, two hour sessions
weekly. Teaching methodology will use active learning modalities such as guided inquiry, moderated discussion, workshop sessions and seminar presentations. Course grades will be based on small group discussions participation, written critiques of research articles, and research proposal developed as an interprofessional pair.

Prerequisites: Currently enrolled in the HPTM program having satisfied the requirements of HPTM 6291, 6292, HPTM 6293 and HPTM 6294 or a UTMB Medical School Student enrolled in the Translational Research Track

Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 6

HPTM 6306
LABORATORY ROTATION AND CLINICAL ENCOUNTERS
This course will consist of two components: 1) a laboratory rotation with HPTM research faculty, and 2) clinical encounter sessions with HPTM clinical faculty. During the laboratory rotation, students will gain hands-on experience and mentorship in conducting T1 translational research projects in their specific area of scientific and clinical interest. The goal of the clinical encounter sessions are to continue the development of interprofessional communication skills between scientist (students) and physicians (clinical mentor), have the student gain a focused knowledge of current standards of diagnosis and treatment of a specific disease or injury, discuss the limitation of current methods of clinical care, and explore or identify potential areas for future translational research projects for the improvement of current standards of care. Clinical encounter sessions activities will include: physician “shadowing” to observe patients afflicted with the diseases or injury of interest and attending interdisciplinary clinical conference that discuss disease processes and/or patient care.

Prerequisites: Student must be enrolled in the HPTM program
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 12

HPTM 6332
MOLECULES, CELLS AND TISSUES
In this course, graduate students in the HPTM curriculum will participate in problem based learning, histology lab, and lectures together with selected medical students in the Integrated Medical curriculum course of the same name. This interprofessional learning opportunity will allow medical students and graduate students to learn with, from and about each other with the goal of instilling collaborative competencies for translational research. Major basic science topics include biochemistry, cell biology, pharmacology, histology, genetics, molecular biology. This course will be complemented by the HPTM-specific course Practice of Translational Science Module II (HPTM 6292). Grades will be based on midterm and final written examinations (48%), Laboratory examination (12%), and participation in problem based learning groups (40%).

Prerequisites: Enrollment in HPTM
Terms Offered: I
Year Offered: Annually
Hours per week: Laboratory 1; Lecture 4; Conference/Discussion 6

HPTM 6405
GROSS ANATOMY AND RADIOLOGY
In this course, graduate students in the HPTM curriculum will participate in problem based learning, anatomy lab, and lectures together with selected medical students in the Integrated Medical course of the same name. This inter-professional learning opportunity will allow medical and graduate students to learn with, from and about each other with the goal of instilling collaborative competencies for translational research. Grades will be based on participation in small group problem based learning sessions (45%), midterm and final written exams (25%), midterm and final laboratory practical exams (22%), and self study cross sectional anatomy tutorial (8%).
Prerequisites: Enrollment in HPTM
Terms Offered: I
Years Offered: Annually
Hours per week: Laboratory 6-8; Lecture 4; Conference/Discussion 3

HPTM 6406 (4 CREDITS)
PATHOBIOLOGY AND HOST DEFENSE FOR HPTM STUDENTS
In this course, graduate students in the HPTM curriculum will participate in problem-based learning (PBL) sessions, pathology lab session and lectures together with selected medical students in the integrated Medical Curriculum course of the same name. PBL and lab sessions involve case-based studies of various diseases. Major basic science topics include general pathology, histopathology, basic immunology and microbiology. The inter-professional learning opportunity will allow medical students and graduate students to learn with, from and about each other with the goal of instilling collaborative competencies for translational research. The course will be complemented by the HPTM course Practice of Translational Science Module 3. Grades will be based on mid-term exam, final exam, lab exam, PBL evaluation, PBL graded quizzes and graded weekly quizzes. Assessment modalities for HPTM students are tailored specific for the program-specific objectives, hence the use of essay examinations in addition to course development multiple choice assessments.
Prerequisites: HPTM 6405, HPTM 6291, HPTM 6332, HPTM 6292. Students must be enrolled in the HPTM program
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 5; Discussion 6; Laboratory 2
Master of Medical Science Degree

https://gsbs.utmb.edu/mms/

Faculty

Graduate Program Director:
Celia Chao, M.D.

Professors
Ahmed, Mahmoud S., Ph.D.
Berenson, Abbey, MD., Ph.D.
Celia Chao, M.D.
Goodgame, Richard, W., M.D.
Hellmich, Mark Richard, Ph.D.
McBride, Jere W., Ph.D.
Petersen, Johnny W., Ph.D.

Associate Professors
Finnerty, Celeste, Ph.D.
Pinchuk, Iryna V, Ph.D.
Purpose

The Master of Medical Science (M.M.S.) program is specifically designed to provide research training to residents, fellows, and faculty of UTMB clinical departments.

Prior to admission, applicants must submit a document describing their research plan. This must include a statement of the purpose of the investigation, the hypotheses to be tested, and a description of the experimental approach. The document will be evaluated by the program’s steering committee. It is strongly advised that the applicant consult with the Program Director prior to submission of the document, well in advance of the beginning of the next period for registration.

Essential Functions Required for Completion of Program

The following description details essential functions (abilities) needed to complete the Master of Medical Science Program.

Observation (to Include the Various Sensory Modalities)

Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication

Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills

Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical
instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

**Intellectual and Cognitive Abilities**

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

**Professional and Social Attributes**

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

**Application of Legal/Ethical Principles and Professional Standards**

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.
Duration of Enrollment in the M.M.S. Program

After acceptance into the M.M.S. program, the student, with his or her supervisory professor, must prepare for the following milestones:

1. Selection of a supervisory committee. Within one month of acceptance into the program, the student must name a supervisory committee to oversee the proposed research. The supervisory committee is composed of five members, one of whom is the supervisory professor and who will chair the committee. At least two members of the committee must be from basic science departments and two from clinical departments. No more than two members may be from the student’s own department. The supervisory professor and supervisory committee must be approved by vote of the M.M.S. steering committee before the student may proceed to the next phase of training.

2. Conduct of research. During the research component of the work toward the M.M.S. degree, the student must be enrolled in the M.M.S. research course (MMSC 6097) offered each term by the Graduate School. As part of the requirements of this course, the student must forward to the dean of the Graduate School a progress report for the term, signed by the supervisory professor. A copy of this report must also be forwarded to the M.M.S. program director for circulation to the steering committee.

3. Admission to candidacy. When the student and supervisory committee feel that the student is ready to begin writing a description of the research for publication in a refereed journal or as a thesis, the student must apply to be admitted to candidacy for the M.M.S. degree. Before admission to candidacy, the student must pass an oral preliminary examination on the research; this examination is administered by the M.M.S. steering committee and is open to all M.M.S. faculty. The student’s admission to candidacy will be decided by a vote of the M.M.S. program steering committee whose decision will be communicated to the supervisory professor and to the dean of the Graduate School. After admission to candidacy, the student must enroll in the M.M.S. thesis course (MMSC 6098) and register for it each subsequent term until graduation.

4. Writing a scholarly report. After admission to candidacy for the M.M.S. degree, the student has one year to prepare a journal article. The following criteria apply:
   - The student must write the article and be first author.
   - The student must submit the article with all tables and figures to the program director one month before the article is submitted to the journal.
   - The supervisory professor will provide the M.M.S. steering committee with two letters that must accompany the manuscript. The first letter, which must bear the signature of each member of the supervisory committee, must certify that each has read the manuscript; the second letter must certify that the journal to which the manuscript is to be submitted is a respected refereed journal in the appropriate area of specialty.

5. Completion of requirements. A letter from the student with a copy of the journal’s acceptance letter completes the formal requirements for the M.M.S. degree.

- Thesis (MMSC 6098)
MMSC COURSE OFFERINGS

Spring Term Courses
- Research (MMSC 6097)
- Thesis (MMSC 6098)

Summer Term Courses
- Research (MMSC 6097)
- Thesis (MMSC 6098)

MMSC COURSE DESCRIPTIONS

MMSC 6097 (3-10 CREDITS)
RESEARCH
This course initiates the formal research training directed toward a Masters of Medical Science degree. During this course, the student will select a supervisory committee, submit full written proposal for approval, orally defend the approved written proposal, and request admission to candidacy. Grading is based on the student's level of performance as as satisfactory, needs improvement, or unsatisfactory.
Terms Offered: I, II, III
Years Offered: Annually

MMSC 6098 (3-10 CREDITS)
THESIS
Once admitted to candidacy, the student will pursue the proposed research and present a progress report to the supervisory committee for approval and recommendations. In the last semester, the student will finish research activities related to the approved project, prepare an oral defense of his or her thesis, and write and submit his or her research findings as a manuscript to a PubMed-indexed peer-reviewed journal. Grading is based upon the student's level of performance as reported by the chairperson of the student's supervisory committee.
Prerequisite: Admission to candidacy for the master's degree
Terms Offered: I, II, III
Years Offered: Annually
Medical Humanities Graduate Program

http://imh.utmb.edu/education/graduate-program

**Faculty**
Graduate Program Director:
Anne Hudson Jones, Ph.D.

**Professors**
Carter, Michele A., Ph.D.
Jones, Anne Hudson, Ph.D.
Winslade, William J., Ph.D., J.D.

**Assistant Professors**
Crowder, Jerome, Ph.D.
Farroni, Jeffrey, J.D., Ph.D.
Macdonald, Arlene, Ph.D.
McKinney, Evelyn Bernadette, J.D., Ph.D.

**Adjunct Faculty**
Vaiani, Cheryl J. Ellis, Ph.D.
Wooten, Heather, Ph.D.
Program Rationale

In 1988, the Medical Humanities (MEHU) Graduate Program of the Institute for the Medical Humanities (IMH) at the University of Texas Medical Branch at Galveston (UTMB) was authorized to offer the nation's first Ph.D. degree in the medical humanities. Twenty-nine years later, we are still one of the very few programs in the United States to offer advanced degrees (M.A. and Ph.D.) in the Medical Humanities.

We have enjoyed the freedom and creativity inherent in developing this innovative, interdisciplinary MEHU Graduate Program. And we continue to struggle with the difficulty of stating precisely what a medical humanities degree signifies, how medical humanists are trained, and what they do after completing their education. What does it mean to become a medical humanist by studying at the IMH? This question cannot be adequately answered abstractly or in advance of the experience itself, but some useful things can be said. Becoming a medical humanist is not simply a matter of taking an array of interdisciplinary courses in the medical humanities or of acquiring the knowledge and skills of a clinical ethicist. Becoming a medical humanist includes more than curricular and professional development. Formal humanities knowledge and clinical competence must be personally integrated so that they become humanistic—a word with so many meanings and (often negative) connotations that it is rarely used today in scholarly discourse.

By humanistic, we refer to knowledge (not necessarily in the humanities), clinical competence, or practice that is informed by the ancient ideal of humanitas. The original meaning of the Latin word humanitas was human feeling; the word gradually became associated with an educational ideal that blended knowledge, humane feeling, and compassionate action. It is this wonderful and elusive mixture of knowledge, feeling, and action—the “humanist educational ideal” in Lionel Trilling’s terms—that we are trying to recapture and refigure in a contemporary health-care setting. Humanistic knowledge is more difficult to achieve than cognitive knowledge alone, because it demands heightened awareness that all knowledge resides in particular individuals who are embodied, embedded in social relationships, and limited. Humanistic knowledge requires attention to the context of knowledge making and to the practical needs and problems of any given situation. It requires a depth of self-understanding that allows both detached discernment and personal engagement, depending on the human needs of any given situation and the scholarly, clinical, or pedagogical aims of the knower.

The personal integration essential to humanistic knowledge is a fluid, holistic ideal that can occasionally be achieved and exemplified but cannot be taught directly or didactically. It is an ongoing personal and interpersonal process. The MEHU graduate program faculty therefore conceives the development of a medical humanities graduate student as a kind of “moral career” in itself—one that involves collaborative cultivation of a responsible engaged self who seeks his or her own unique blend of knowledge, feeling, and action.

By and large, humanities scholars in contemporary academic life are cut off from this strenuous holistic ideal and from its ancient and Renaissance humanist origins. Especially since the late nineteenth century, academic humanists have been encouraged to take up permanent residence within the boundaries of a particular humanities discipline and to pursue specialized research and teaching. Without devaluing the necessity of specialized research and teaching, the MEHU graduate program faculty believes that becoming a medical humanist—and striving for humanistic knowledge and competence—requires a strong historical and conceptual grounding in the humanist educational ideal in the West. This effort to connect graduate education in the medical humanities with the humanist tradition is what makes our program unique.

Objectives and Program of Graduate Work

The MEHU Graduate Program offers graduate work for students pursuing an M.A. or a
Ph.D. in the medical humanities. The MEHU Graduate Program also coordinates programs of study leading to M.D.-Ph.D. degrees (as part of UTMB’s M.D.-Ph.D. Combined Degree Program), M.D.-M.A. degrees, and J.D.-M.A. and J.D.-Ph.D. degrees (in collaboration with the University of Houston Law Center). Course work is available for UTMB graduate students in other programs. Ph.D. students in the medical humanities are expected to 1) acquire a general knowledge of the humanist tradition; 2) become acquainted with the methods and literature of the humanities as these relate to medicine; 3) develop competence in one or more humanities disciplines and apply this competence to the investigation of a particular problem; 4) transform this investigation into a dissertation that represents significant and original research; and 5) demonstrate an ability to teach and work with a variety of persons in the humanities and the health sciences and professions.

ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

The following list describes essential functions (abilities) needed to complete the MEHU Graduate Program.

1. MEHU graduate students must be able to produce scholarly research papers based on seminars, research, and/ or qualifying examinations, and theses or dissertations within a reasonable time frame.
2. MEHU graduate students must be able to physically attend MEHU courses in our classrooms and at other locations on campus.
3. MEHU graduate students must be able to meet in person with professors and to attend scheduled Brown Bags and Colloquia.
4. MEHU graduate students must be capable of effectively reading, comprehending, visualizing, and interpreting texts and visual materials—printed, archival, and electronic.
5. MEHU graduate students must be able to effectively understand, interpret, and respond to lecturers, case conferences, and other forms of oral instruction.
6. MEHU graduate students must be able to effectively read or interpret, and carry out verbal and written instructions with reasonable proficiency in the English language.
7. MEHU graduate students must be able to provide and receive constructive criticism to and from students and faculty in the classroom and in public settings.
8. MEHU graduate students must be able to effectively present bioethics and humanities information to colleagues, employees, and patients in various settings of an academic health-science center.

Admission Requirements

Applicants to the MEHU Graduate Program are expected to satisfy all the basic requirements for admission to a degree program in UTMB’s Graduate School of Biomedical Sciences (GSBS):

- A bachelor’s degree from a regionally accredited institution or an advanced degree and training from an acceptable foreign institution of higher education.
- A recommended undergraduate grade point average of at least 3.0 (on a 4.0 scale). Grades received in graduate courses, which are computed separately, are also considered in evaluation of the application.
- Official GRE scores for verbal, quantitative, and writing sections must be provided.
- The Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) is required if English is not the native language. The minimum requirement on TOEFL is 550 or greater on the paper-based test, or 213 or greater on the computer-based test or 6.5 for the IELTS Academic Test.

Preference will be given to applicants with an advanced degree in bioethics, history,
law, literature, philosophy, or religious studies; a closely allied program in the humanities or social sciences; or one of the health sciences or professions. Students entering with a B.A. degree alone will be evaluated after one year to determine whether they may continue beyond the master’s degree. Personal interviews with members of the MEHU Graduate Program faculty are encouraged. Completed applications must be received by November 1st, March 1st, and June 1st. Applications are considered for admission for the subsequent term.

Financial Support Policy

The MEHU Graduate Program faculty will make annual awards of available financial support (graduate assistantships and scholarships) on the basis of demonstrated academic merit in combination with justifiable financial need. All applications will receive equal review. The faculty will make its decision each spring after considering grades, letters of recommendation, and other relevant aspects of each previous academic or professional career and after reviewing petitions of need. MEHU-graduate students receiving support should understand that 1) funding decisions are made one year at a time; 2) funding is contingent on their progress in the program and on available resources; and 3) the duration of funding will never exceed four years. The faculty will review all students’ progress annually. The Graduate Program Director will review and discuss each student’s record with his or her advisor at the time of the review of student progress before recommending that the student continue to receive aid. If they decide a student’s progress is not sufficient to merit funding, they will bring the matter to the faculty for discussion and decision.

Should financial support become available in the middle of an academic year, the faculty will select another recipient using the same criteria as for new students. Under the rules of the State of Texas, a nonresident for tuition purposes who is appointed to a Research Assistantship that is at least half-time and that relates to the student’s degree program is eligible to pay in-state resident tuition and fees. This benefit extends to a student’s spouse and children if they enroll in any state institution of higher education. This waiver of nonresident fees is a statute in the Texas Education Code, Section 54.063. Other exemptions and waivers can be reviewed at http://www.collegeforalltexans.com/index.cfm?ObjectID=6D1466D9-AEA5-DE00-C12F3F75E7367718.

Physical Facilities

The IMH is well integrated into educational, clinical, and research activities at UTMB. Our linkages to the Schools of Medicine, Nursing, and Health Professions provide many opportunities for learning, collaborating, and teaching in clinical care and research. Within the IMH, a study space is set aside for student use.

The MEHU Graduate Program is well served by UTMB’s Moody Medical Library, a major resource library for the Southwest. In recent years, the Moody Medical Library has undertaken a major effort to supplement its collection by acquiring monographs, books, and journals required by the MEHU graduate program faculty for their respective disciplinary work. It now contains adequate reading material for basic courses in history, law, literature, philosophy, and religious studies, as these relate to medicine. You can view a complete list of services here: http://guides.utmb.edu/services

COURSE REQUIREMENTS

Ph.D. students are required to take the four core courses plus thirty-nine hours of MEHU elective courses, pass written and oral qualifying examinations, and write and defend a doctoral dissertation.

M.A. students are required to take the four core courses plus fifteen hours of MEHU elective courses and write a master’s thesis. Though the GSBS allows students to use a published article as an alternative to a thesis, the Medical Humanities Graduate Program does not allow this substitution.
All students in the MEHU Graduate Program are required to take and demonstrate proficiency in the following four core courses:

- MEHU 6375-Humanism and the Humanities
- MEHU 6378- Humanism and the Medical Humanities
- MEHU 6382-Integrated Clinical Ethics Consultation
- MEHU 6101- Ethics of Scientific Research

All students in the MEHU Graduate Program are required to take and demonstrate proficiency in fifteen to thirty-nine hours of the following elective courses:

- MEHU 6152- Life History, Autobiography, and Autoethnography
- MEHU 6153- Visual Ethics and the Medical Humanities
- MEHU 6306-Foundations of Bioethics
- MEHU 6311- Bioethics and Leadership
- MEHU 6315-Clinical Ethics
- MEHU 6317-Advanced Practicum in Health-Care Ethics
- MEHU 6320-Narratives of Medical Catastrophes
- MEHU 6343-Social Justice in International Research
- MEHU 6344-Law, Science, and Society
- MEHU6345-Bioethics and Case Law
- MEHU 6351-Qualitative Methods in Social Medicine
- MEHU 6352 -Foundations of Social Medicine
- MEHU 6353-The Meaning and Making of ‘Human’: An Interdisciplinary Introduction to Contemporary Social Theory
- MEHU 6354-Global Health in Social Medicine
- MEHU 6355-Visual Ethnography and the Digital Humanities
- MEHU 6361-Trauma, Narrative, and Resilience
- MEHU 6363-Narratives of Illness
- MEHU 6367-Introduction to Literature and Medicine
- MEHU 6370-Philosophical Ethics
- MEHU 6379-Death & Dying Law & Ethics
- MEHU 6381-Ritual Bodies, Social Rites: Material Engagements with Health and Healing
- MEHU 6384- Religion and the Politics of Health
- MEHU 6386-Psychoanalysis, Consciousness, and Neuroethics

GSBS guidelines require that the Graduate Program Director serve as advisor for all first-year students in the program. After their first year in the program, students may choose a new advisor as their interests or needs evolve. Each student and his or her advisor in consultation with the Graduate Program Director will determine the sequence of courses.

Ordinarily, four to five years of full-time study are required for the Ph.D. degree. The M.A. degree usually requires two years of full-time study. Students pursuing both an M.D. and a Ph.D. in the medical humanities may apply to the M.D.-Ph.D. Combined Degree Program. Completing the M.D.-Ph.D. Combined Degree Program takes seven to eight years of full-time study.

Every student is required to submit an annual progress report due on January 15. This report must be signed by both the student and his or her advisor. If the report has not been submitted by January 31, the student will receive a reminder notice. If the report has not been submitted by February 15, the Graduate Program Director will request a meeting with the student and advisor to determine what needs to be done to get this requirement fulfilled. If the report is then not completed within a week, the student will be referred to the GSBS deans for further action. The goal of the report is to encourage the student to assess his or her development over the course of the year and to allow the advisor to give feedback, suggestions, encouragement, and constructive criticism. The report will be used in the
graduate program faculty’s annual review of students and placed in each student’s file.

After the first year, Ph.D. students will ordinarily begin focusing their course work on areas of specialization to prepare for the qualifying examination and dissertation proposal. Subjects not treated in regular courses may be pursued under Special Topics courses, when available. Students may elect major and minor areas of specialization, which are administered by area coordinators in collaboration with the faculty advisors. In the event that the available faculty cannot support current areas of specialization, students may be required to pursue their degree without a formal declaration of areas of specialization.

Areas and coordinators are as follows:
- Health Care Ethics (Michele A. Carter, Ph.D.)
- Health Law and Policy (Bernadette McKinney, J.D., Ph.D.)
- Literature and Narrative Studies in Health Care (Anne Hudson Jones, Ph.D.)
- Social Medicine (TBD)

Major areas of specialization require fifteen elective hours (usually five three-semester-credit-hour courses); minor areas require nine elective hours (usually three three-semester-credit-hour courses). Because many elective courses qualify for more than one area of specialization, the actual course content of areas of specialization may vary from student to student. Required courses cannot count towards a major or minor. Only elective courses can be used. Each student’s particular array of courses will be determined in collaboration with the area coordinator, advisor, and Graduate Program Director.

**Note:** the degree offered through the program is a Ph.D. or M.A. in Medical Humanities. Students are not required to declare major or minor areas, but, in collaboration with their advisors, may design their own focus of study (within the parameters of the overall program requirements).

**M.A. THESIS SUBMISSIONS**

Once students complete the master’s thesis, they must submit an electronic copy (in Word) to the Graduate Program Director, who will ensure that the thesis is checked, through the currently adopted GSBS software for any problems with appropriate citation of research sources. This procedure is in accordance with GSBS policy adopted in 2011. Medical humanities master's theses generally run between seventy-five and a hundred pages. Though the GSBS allows students to use a published article as an alternative to a thesis, the MEHU Graduate Program does not allow this substitution.

**Ph.D. Qualifying Examinations**

After completion of course work, Ph.D. students will ordinarily take no more than one semester to prepare for written and oral qualifying examinations. Qualifying examinations will cover three areas: 1) humanism, the humanities, and medical humanities; 2) a major area of specialization; and 3) a minor area of specialization. Students not declaring major and minor areas formally will still be tested in these areas. The latter two test areas will address the principal focus of the student’s scholarly interests and, respectively, the secondary focus of interest. The specifics of these test areas will be determined by the student’s qualifying examination committee. Preparation for the examinations will involve constructing, (with supervision of the advisor, area of specialization coordinators, and MEHU graduate program faculty) and mastering bibliographies of relevant readings. The written examination will consist of five questions to be answered in five days: two questions from course work and reading in the major area of specialization; one question from course work and reading in the minor area; one question covering humanism, the humanities, and the medical humanities; and one question covering a specific area of interest, practice, or
research, possibly related to the student’s dissertation topic.

Within three weeks of a student’s completing his or her written examination, the examination committee will review it and determine whether the answers are satisfactory. If so, the advisor will then schedule the oral qualifying examination. The oral examination, which will be announced and open to all members of the MEHU graduate program faculty, will test the student’s skills in dealing with concrete practical issues in medical humanities, research and education. It will also probe the student’s perceived areas of strength and weakness, while engaging issues of major interest to the student.

After the oral examination, the student will receive one of four possible grades: Pass with Distinction, Pass, Conditional Pass, Fail. A conditional pass means that the answer to one question is not yet adequate; at the discretion of the faculty member who asked it, in consultation with the entire committee, the student may be required to rewrite the answer to that question or to undertake specific remedial work. Unsatisfactory performance on two questions constitutes a failure of the qualifying examinations. A student who has failed the examinations does not have the option of rewriting either of the answers.

Beginning in July 2008, each committee member must submit a completed evaluation form for the written qualifying examination and also for the oral qualifying examination. These completed forms should be turned in to the Graduate Program Coordinator immediately after the oral examination. They are a requirement of the SACS accreditation review of UTMB in 2008.

**Completing the Dissertation**

Within one semester of the qualifying oral examination, students should submit a written dissertation proposal to the dissertation advisor. (See http://www.gsbs.utmb.edu/current/candidacy.html for GSBS guidelines and required format. Students who are not admitted to candidacy within one year of the date they pass their qualifying examinations are dismissed from the GSBS unless the Dean grants a waiver.) Upon entering candidacy, students and their mentor must read the “Compact between Medical Humanities Graduate Students and Their Research Advisors.” Both the student and his or her advisor must sign the page at the end of this compact and submit to the Graduate Program Coordinator, who will in turn submit the form to the GSBS. The advisor, supervisory committee, and student will then meet to discuss the proposal and suggest revisions before the proposal is submitted to the Graduate Program Director, who must review and approve the proposal before it goes to the Dean of the GSBS. When the proposal is ready to submit, the chair of the student’s dissertation committee must complete a Dissertation Proposal Review Assessment form and turn it in to the graduate program coordinator. This form is a requirement of the SACS accreditation review of UTMB in 2008.

Once students have completed their qualifying examinations and receive approval from the Dean for their dissertation proposal, they are admitted to candidacy, beginning in the term following the approval of their dissertation proposal.

Students and mentors should note that there is a deadline date, each term, by which students must apply to the Dean for candidacy. This date is specified in the GSBS Academic Calendar. Failure to apply by this date sets back a student’s admittance to candidacy by an entire term.

Students will also present a ninety-minute dissertation colloquium based on the proposed dissertation research. A maximum of five years may elapse between the Dean’s official acceptance of the proposal and completion of the dissertation.

Graduate students may take unlimited research hours before being admitted to candidacy.
GSBS policy states, however, that “after successful completion of the written portion of the qualifying examination . . . students will be allowed to register for Research (6097) a maximum of three (3) terms. Failure to be admitted to candidacy by the end of the third term after successfully completing the qualifying examination is grounds for dismissal from the Graduate School.”

When mentor and student agree that a dissertation is ready to be reviewed by the committee, the student should plan a tentative dissertation defense date. Six weeks before that date, the student should submit a complete draft of the dissertation. An electronic copy of the dissertation, in Word, shall be submitted at this time to the Graduate Program Director, who will ensure that the dissertation is checked, through the currently adopted GSBS software, for any problems with appropriate citation of research sources. This procedure is in accordance with GSBS policy adopted in 2011. Four weeks before the tentative defense date, the supervising committee, having read the entire draft, should meet with the mentor and student to develop a consensus on what work remains before the dissertation is ready to defend. After the dissertation has been accepted by the supervisory committee, an oral defense, announced and open to all members of the UTMB community, will be held.

Beginning in July 2008, each committee member must submit a completed evaluation form for the dissertation defense. These completed forms should be turned in to the Graduate Program Coordinator immediately after the defense. This form is a requirement of the SACS accreditation review of UTMB in 2008.

**MEHU COURSE OFFERINGS**

**O= ODD YEARS ONLY**
**E= EVEN YEARS ONLY**

**Fall Term Courses**
- Research (MEHU 6097)
- Thesis (MEHU 6098)
- Dissertation (MEHU 6099)
- Ethics of Scientific Research (MEHU 6101)
- Foundations of Bioethics (MEHU 6306)- E
- Advanced Practicum in Healthcare Ethics (MEHU 6317)
- Bioethics and Case Law (MEHU 6345)- E
- Qualitative Methods in Social Medicine (MEHU 6351)-O
- Foundations of Social Medicine (MEHU 6352)- E
- Narratives of Illness (MEHU 6363)- E
- Humanism and the Humanities: History and Theory (MEHU 6375)- O
- Death & Dying Law & Ethics (MEHU 6379)-O
- Ritual Bodies Social Rites (MEHU 6381)-O
- Integrated Clinical Ethics Consultation (MEHU 6382)

**Spring Term Courses**
- Research (MEHU 6097)
- Thesis (MEHU 6098)
- Dissertation (MEHU 6099)
- Clinical Ethics (MEHU 6315)
- Advanced Practicum in Healthcare Ethics (MEHU 6317)
- Narratives of Medical Catastrophes (MEHU 6320)- O
- Law, Science, and Society (MEHU 6344)-O
• The Meaning and Making of ‘Human’: An Interdisciplinary Introduction to Contemporary Social Theory (MEHU 6353)- E
• Global Health in Social Medicine (MEHU 6354)- O
• Visual Ethnography and the Digital Humanities (MEHU 6355)- E
• Introduction to Literature and Medicine (MEHU 6367)- E
• Philosophical Ethics (MEHU 6370)- E
• Humanism and the Medical Humanities (MEHU 6378)- E
• Integrated Clinical Ethics Consultation (MEHU 6382)
• Psychoanalysis, Consciousness, and Neuroethics (MEHU 6386)- O

**Summer Term Courses**

• Research (MEHU 6097)
• Thesis (MEHU 6098)
• Dissertation (MEHU 6099)
• Ethics of Scientific Research (MEHU 6101)
• Life History, Autobiography, Autoethnography (MEHU 6152)- E
• Visual Ethics and the Medical Humanities (MEHU 6153)- O
• Bioethics and Leadership (MEHU 6311)- E
• Advanced Practicum in Healthcare Ethics (MEHU 6317)
• Social Justice in International Research (MEHU 6343)- O
• Trauma, Narrative, and Resilience (MEHU 6361)- O
•Integrated Clinical Ethics Consultation (MEHU 6382)
• Religion and the Politics of Health Care (MEHU 6384)- O

**MEHU COURSE DESCRIPTIONS**

**MEHU 6097**
(3-9 CREDITS)

**RESEARCH**
This course is designed to afford the student the opportunity to develop a thesis or dissertation proposal under faculty guidance. The proposal development may involve a literature search, conceptual analysis, primary research, or a pilot field study. The research would be preliminary but relevant to the thesis or dissertation. Credit and hours to be arranged. Teaching technique is tutorial in nature. At the end of the term, the student must turn in a one-page report of the research completed during the semester, and the student's advisor must turn in a completed Ongoing Research Assessment form to the graduate program coordinator. This form is a requirement of the SACS accreditation review of UTMB in 2008.
Prerequisite: Consent of advisor and Graduate Program Director
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Research 3-9

**MEHU 6098**
(3-9 CREDITS)

**THESIS**
Formal preparation and completion of the thesis for the Master of Arts degree under the direction of the student's supervisory committee. At the end of each term, the student must turn in an end-of-semester progress summary, and the student’s advisor must turn in a completed Ongoing Thesis/Dissertation Progress Assessment form to the graduate program coordinator. This form is a requirement of the SACS accreditation review of UTMB in 2008.
Prerequisite: Admission to candidacy for the Master's degree and consent of advisor and Graduate Program Director
Terms Offered: I, II, III
Years Offered: Annually
MEHU 6099  DDISSERTATION
Formal preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student's supervisory committee. To satisfy the requirements for graduation students must register for 9 total hours minimum. At the end of each term, each student must turn in an end-of-semester progress summary, and the student’s advisor must turn in a completed Ongoing Thesis/Dissertation Progress Assessment form to the Graduate Program Coordinator. This form is a requirement of the SACS accreditation review of UTMB in 2008.
Prerequisite: Admission to candidacy for the Ph.D. degree and consent of advisor and Graduate Program Director.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Dissertation 3-9

MEHU 6101  ETHICS OF SCIENTIFIC RESEARCH
This course will employ small-group discussion to explore ethical issues in the conduct of scientific research. Students will meet with co-instructors from the IMH and the GSBS to discuss readings and cases dealing with the philosophy of science, the ordinary practice of scientific research, conflicts of interest, and the value conflicts that arise between scientists and society at large. Course grades (S/U) will be determined by attendance, which is required at all sessions (60%), and adequate class participation based on an understanding of the basic concepts of the course (40%). (15 contact hours in 2 days).
Prerequisite: None
Terms Offered: I, III
Years Offered: Annually
Hours per week: Lecture and small groups, 1 (15 contact hours in 2 days)

MEHU 6152  LIFE HISTORY, AUTOBIOGRAPHY, AUTOETHNOGRAPHY
This course addresses advanced qualitative research methods that include techniques for collecting and analyzing life histories, oral histories, autobiographies, and autoethnography. These methods are increasingly popular research techniques and provide an alternative to empirical methods for identifying and documenting health and behavioral patterns of individuals and groups. Life history and oral history allow the researcher to explore individual experiences within a particular historical and temporal framework. Autobiography and autoethnography methods involve self-observation and reflexive investigation using ethnographic field work and writing. Methodologies, data analysis, and the validity/challenges of each of these research methods will be discussed for use in historical research and as reflections of our own biographies. Grading criteria: Participation, Attendance, & Blog (20%); Field Project (25%); Final Presentation (20%); Final Paper (35%).
Prerequisite: MEHU 6351 Qualitative Methods in Social Sciences
Terms Offered: III
Years Offered: Biennially-Even Years

MEHU 6153  VISUAL ETHICS AND THE MEDICAL HUMANITIES
Visual images are powerful rhetorical tools. They are used as evidence and illustration; they guide therapeutic and social interventions; and they do work that is both critical and aesthetic. Visual images cross disciplines and media and are often acknowledged for their immediacy and their persuasiveness. This creates a need to look critically at the ethical underpinnings of visual perception, production and communication. This course establishes a foundation for understanding the role of visuals in social science and humanistic research and explores the ethical issues that arise in their use in medicine and the medical humanities. A looking -intensive
experience compliments and explores the reading-intensiveness that characterize medical humanities graduate courses, with the aim of developing a comprehensive list of textual, visual and online resources for later use. To that end, the plan for each week is divided into required readings in preparation for discussion; one or more image resources for exploration; and then some additional readings that bear on the week's topic. Additional suggestions that reflect each participant’s particular interests in this topic are highly encouraged. Each week’s iteration of the syllabus should be considered an open working document, so that the course will develop in a way that is responsive to the class's interests. All readings will be made available on Blackboard. Grading will be based on course participation, journals/blogging, and a final project and presentation.

Prerequisite: None
Terms Offered: Summer
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6306
(3 CREDITS)
FOUNDATIONS OF BIOETHICS
Bioethics emerged in recent decades as a field of inquiry that explores and clarifies moral dimensions in medical practice. Weekly seminars will explore ethical aspects of various bioethical problem areas. Topics will include the role of ethical theories, principles and cases, ethical reasoning, and ethical decision making. Leading texts such as The Principles of Biomedical Ethics will be carefully and critically studied. Students are evaluated on the basis of their participation in class discussion (25%) and on the basis of written work including research papers and conceptual analysis of textual materials (75%).

Prerequisite: None
Terms Offered: I
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6311
(3 CREDITS)
BIOETHICS AND LEADERSHIP
Medicine and biomedical research are moral endeavors that require the cooperation and collaboration of others to be successful. The physician must demonstrate leadership by exercising the authority of position, encouraging others to change behaviors, providing an example for colleagues and trainees to follow, making decisions in crises, demonstrating skills that inspire confidence, and doing the right thing under pressure. Similarly, the biomedical researcher must be able to persuade others to work with him or her by demonstrating integrity, communicating clearly, working with others toward a common goal, acting appropriately with skill, and creating a working environment that encourages others to do their best work. Demonstrating these traits, skills, behaviors, and attitudes is not automatic. People in positions of leadership can abuse their power and suffer failures of the moral imagination. This course examines theories and approaches to leadership development and how the medical humanist/bioethicists can become leaders and play a role in helping physicians and biomedical scientists to become ethical leaders needed in this rapidly changing environment. Objectives: 1. Discuss various theories and examples of leadership and compare and contrast them with styles of medical practice and research; 2. Explore ethical theories as they relate to leadership in the biomedical realm; 3. Apply ethical leadership concepts to new scenarios and defend their analyses. Grading criteria: Class participation; Formal presentations (2) assessed on basis of content, delivery, quality of slides; Research papers (2) assessed on incorporation of guidance from presentations, quality of research, grammar, organization, logic, citation form, and content.

Prerequisite: None
Terms Offered: III
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6315
(3 CREDITS)
CLINICAL ETHICS
This seminar is a comprehensive examination of the dominant methods, themes, cases and contemporary issues associated with the field of clinical ethics. The course examines ethical, legal, historical and cultural aspects of bioethical issues in the health care arena, with particular emphasis on modes of reasoning in clinical ethics consultation. Grading Criteria: There are three graded assignments: a critical essay (30%), an argument/case analysis (30%) and a formal presentation (20%). Specific details will be provided. All students are expected to complete all reading assignments before each class and participate in discussions.

Prerequisites: Consent of instructor

Terms Offered: II

Years Offered: Biennially-Odd Years

Hours per week: Lecture 3

MEHU 6317
ADVANCED PRACTICUM IN HEALTHCARE ETHICS
This course is designed to offer an in-depth exploration of ethical issues in health care with specific attention to the development of practical skills in bioethics problem solving, case analysis, policy development, clinical teaching, and/or interdisciplinary field work. Students work independently under the supervision of a designated mentor who will assist the instructor in providing access to a variety of teaching-learning venues in health-care ethics. Students will spend 3 hours a week in clinical settings and 2 hours a week in discussion of readings and clinical experiences. In most cases the Advanced Practicum is an opportunity for concentrated study of a theme, problem, or issue to be further developed at the thesis or dissertation stage. Grading will be based on practicum performance, project presentations, and a written essay. Prerequisite: MEHU 6382 and consent of the instructor.

Terms Offered: I, II, III

Years Offered: Annually

Hours per week: Practicum 5

MEHU 6320
NARRATIVES OF MEDICAL CATASTROPHES
This course will examine historical, autobiographical, fictional, and video narratives of past, present, and potential medical catastrophes—defined as devastating circumstances that result in the total collapse of medical institutions and infrastructure for a prolonged period of time. The first part of the course will take a panoramic overview of historical narratives of medical catastrophes from the plagues in ancient Greece, Renaissance Italy, the seventeenth-century England; the 1918 influenza pandemic, especially in the United States; to the dropping of the atomic bomb on Japan in 1945. The middle section of the course will zoom in for a close and extended examination of narratives from the aftermath of Hurricane Katrina in New Orleans in 2005, with special attention to the events at Memorial Medical Center. The focus of the final part of the course will expand to consider narratives of contemporary and potential medical catastrophes, from the 2010 earthquake in Haiti and the 2011 earthquake, tsunami, and nuclear accident in Japan to the current outbreak of Ebola and potential pandemics of avian influenza. Ethical issues emerging from these various narratives will be a continuing theme throughout the course. Students’ grades will be determined by the quality of their participation in class discussion (20%); two short essays (20% each); and a final course paper (40%).

Prerequisites: MEHU 6363 Narratives of Illness or permission of the instructor.

Terms Offered: II

Years Offered: Biennially-Odd years

Hours per week: Lecture 3

MEHU 6343
SOCIAL JUSTICE IN INTERNATIONAL RESEARCH
This seminar explores the relationships between the social and structural determinants of health, ideas of global justice and the ethical conduct of research in developing countries. It addresses both theoretical and practical aspects of the concept of social justice and related notions of human rights, national identities, poverty, moral agency, power, standards of care, access to care in research contexts, and the role of community in research partnerships. Course instructors will use a multidisciplinary approach that incorporates perspectives from philosophy,
history, political theory, literature, law and policy, film studies, and cultural anthropology. Students will learn to interpret films, cases, and text-based narratives, think systematically about the issues that these narratives raise, and identify appropriate responses to ethical dilemmas in international research settings. Students will be evaluated on the basis of weekly journals, one midterm essay, student-led discussion presentation, a mock IRB presentation and paper, and a final comprehensive exam.

Prerequisite: Consent of instructor for non-IMH students

Terms Offered: III
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6344 (3 CREDITS)

LAW, SCIENCE, AND SOCIETY

Scientific discoveries generate tremendous excitement, but they can also generate controversies and conflicts. The challenges of protecting the interests of scientists, research institutions, funding agencies, governments, research participants, and ordinary citizens require critical thinking and careful weighing of benefits and burdens. This course explores current controversies and disputes surrounding biomedical research and the thought processes necessary to arrive at well-reasoned policy responses. Invited experts will join the class to share their insights and perspectives. The course is designed to address elements of 12 of the 15 Core Competencies in Clinical and Translational Research. It provides guidance in gathering and evaluating evidence from various disciplinary perspectives and designing ways to address research problems. In addition, the course.

1. Examines the roles of bioinformatics and electronic health records in addressing research questions,
2. Provides insights into and applications of ethics and compliance in clinical and translation research,
3. Requires clear communication aimed at broad audiences,
4. Raises awareness of cultural needs and differences,
5. Provides opportunities to obtain understanding of multiple disciplines,
6. Fosters leadership through innovation and creativity in problem-solving,
7. Applies adult-learning and competency-based instruction, and
8. Addresses controversies currently affecting biomedical science and society’s health and well-being and the roles of various interests in creating community.

Grading will be based on 25% Participation, 25% Paper 1, 25% Paper 2, 25% Presentation.

Prerequisite: None

Terms Offered: II
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6345 (3 CREDITS)

BIOETHICS AND CASE LAW

Some of the most riveting cases in legal history involve disputes about health care. These court cases have brought to light several important ethical issues, and published legal opinions have given shape the way we view rights over the body, reproduction, life, death, and other health matters. This course explores the interactions between law and bioethics and how key cases have contributed to our understanding of the boundaries of medicine and biomedical research and the legal and moral rights and duties of physicians, researchers, and patients. Grading criteria: Seminar Participation=25%; Paper #1=25%; Paper #2=25%; Paper #3=25%.

Prerequisite: None

Terms Offered: I

Years Offered: Biennially-Even Years

Hours per week: Lecture 3

MEHU 6351 (3 CREDITS)

QUALITATIVE METHODS IN SOCIAL MEDICINE
Through engaged community interaction and in-class discussion, this course will explore a variety of qualitative methods for conducting research in topics related to social medicine. Topics to be discussed will include, but are not limited to, the social determinants of health, health and individual responsibility, health disparities, immigration and health, the U.S. health care system and health policy. As a result of this course, students will be familiar with all of the phases of a qualitative research project including completing forms for the IRB, developing a research design, conducting ethnographic research, writing and analyzing field notes, and theorizing research findings. Ethical, political, and social issues related to qualitative research will be discussed. Blackboard will be used. Grading will be based on in-class participation, research design, field notes (due in class every two weeks), and a final paper.

Prerequisite: None
Terms Offered: I
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6352 (3 CREDITS)
FOUNDATIONS OF SOCIAL MEDICINE
The Foundations of Social Medicine course offers a critical inquiry into the socio-cultural, technological and political-economic dimensions of health, medical knowledge and practices. Informed by the social sciences and the humanities, this course emphasizes theoretical, historical and cross-cultural approaches to the study of what has broadly been defined as the social determinants of health. Within the context of this course, social determinants are understood as the conditions in which people are born, grow, live, work and age, including the health system, as well as the ideas, discourses and institutional practices of public health and medicine. This course provides the foundation for the social medicine area of concentration and, consequently, functions as a survey course. It is meant to introduce students to themes that will be explored in greater depth in other courses offered in the area of concentration. Readings for the term will be drawn primarily from sociology, science and technology studies, and anthropology. Topics to be covered include the history and definition of social medicine, social and structural determinants of health, the political economy of health, biomedicalization, and the social production of scientific knowledge. Grading criteria: In-class participation-20%, mid-term paper-30%, Final paper-35%, and in-class presentations-15%.
Prerequisite: None
Terms Offered: I
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6353 (3 CREDITS)
THE MEANING AND MAKING OF ‘HUMAN’: AN INTERDISCIPLINARY INTRODUCTION TO CONTEMPORARY SOCIAL THEORY
This course will address the question of what it means to be human through an interdisciplinary exploration of contemporary theories. The course is designed to provide students interested in "social medicine" a foundation in notions of power, society, identity, space, politics, aesthetics, language, and the market as these have been conceptualized in dialogue and dispute between political, cultural and social thinkers of the 19th, 20th, centuries. While the course is not comprehensive in nature, its objective is to stimulate thinking about how conceptions of what it means to be human vary according to the perspective with and context within which this question is asked and answered. Grading criteria: Participation, 20%; 2 Response Papers, 30%; Seminar Facilitation (1-week), 10%; Final Paper Outline, 10%, and Final Paper, 30%.
Prerequisite: None
Terms Offered: II
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6354 (3 CREDITS)
GLOBAL HEALTH IN SOCIAL MEDICINE
This course offers a cross-cultural exploration of medical systems, healers, and healing
approaches through a critical ethnographic lens. Since every culture and society around the world has had to deal with injury and illness, each has a well-developed concept about the healing process, healers, diagnosis, medical treatment, medical knowledge and health practices. We must also consider what “global” means, not simply international, but how all health systems around the globe are interconnected, including our state, city and island. We will consider these and other topics with a commitment to understanding the broader structural issues at play.

Grading: Students will be required to lead at least two seminars throughout the semester. Students will be required to journal each week on their reactions to the readings and can later update their journals following class to discuss how their ideas changed or give impressions of other material presented in class (e.g. film). All journals will be kept on Blackboard. Each entry should be between 500 and 750 words. Journal entries are due before class begins. Based upon weekly reactions, students will formulate a brief (5 page) analytic reflection paper that considers themes in comparison to their experience and expectations of medicine (ethno/bio) and culture. These will be submitted every five (5) weeks. The final paper will be accompanied by a multimedia in-class presentation which will demonstrate the culmination of the student’s thinking about one specific theme or comparative themes. Students need not have any previous multimedia experience to produce a successful final presentation.

Prerequisite: None
Terms Offered: II
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6355
VISUAL ETHNOGRAPHY AND THE DIGITAL HUMANITIES
This class explores the role of all things visual in regard to ethnography—the description of people—and how that endeavor has evolved along with the technology employed. From the inception of fieldwork, through the collection of material and the production of the work, we delve into how ethnographers (and all social researchers) use images (and other senses) as data (analog or digital). We are interested in engaging with the visual beyond it as a means for recording data or illustrating text, but as a medium through which we create new ways of thinking and use multiple media simultaneously (intermediality). To do this we stress collaboration at a number of levels, from the most basic researcher/informant relationship, to a more abstract visual/textual/sensual relationship between producers of words, images, and things. Through these we will discuss, explore and critique the potentials of photography, video, the Internet (and other types of media) in research and representation of what it means to be human. Through a combination of theory and praxis, of methods and experience, of the analog and digital, of visual and textual we must always recognize our own cultural biases and assumptions, reflecting upon where our ideas about culture originate and how we use technology to portray others. In the classroom we will read, watch, listen and share our ideas about the visual (and other senses) in human subject research. Outside the classroom students will have the opportunity to implement and practice these ideas in order to understand their role in the work. Grading criteria: Seminar participation (20%), Writing components (40%), Production components (40%).
Prerequisites: None
Terms Offered: II
Years Offered: Biennially-Even years
Hours per week: Lecture 3

MEHU 6361
TRAUMA, NARRATIVE, AND RESILIENCE
What does it mean to serve as a devoted audience to the sufferers of trauma, enter empathically in the fragmentation of sufferers’ lives, and offer a companionship that encourages the construction of life stories through which hope for a future may be kindled? Addressing such a question becomes imperative as conditions of globalization, war, genocide, and violence associated with population shifts and urban expansion prompt drastic increases in the incidence of trauma and in the devastating repercussions that flow from traumatic experience. In this course we will indeed begin to address the question. We will consider a range of clinical and theoretical accounts ranging from Freud’s and Janet’s to those of recent writers who seek to
integrate biological, clinical, and cultural perspectives to understand the phenomenon of trauma. But we will also consider numerous works of fiction that depict and speak from the borderland of trauma’s vacuity, and inquire as to the value of such works in promoting an improved understanding of trauma and in suggesting responses to it that have considerable clinical and therapeutic implications. The course will be divided into three parts: I. Trauma, Narrative, and History; II. War and the Undoing of Character; III. Narrative and Resilience. Two short papers (20% of grade, each), one scholarly essay (40%), and seminar participation (20%) will be required.

Prerequisite: Permission of the instructor
Terms Offered: III
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6363 (3 CREDITS)
NARRATIVES OF ILLNESS
A study of the changing nature and importance of narratives of illness. Focus will be on the historical development of patients' autobiographical narratives of illness (pathographies); the historical development of physicians' narratives of patients' illnesses (expanded case histories); and representative contemporary patients' narratives of illness that exemplify different forms and styles. Special attention will be given to theoretical background works about pathographies (Anne Hunsaker Hawkins) and the first-person narrative of illness (Arthur Frank). Course grades will be determined by the quality of participation in class discussion of assigned readings (20%), two assigned essays about course readings (20% each), and a final course paper (40%).

Prerequisite: None
Terms Offered: I
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6367 (3 CREDITS)
INTRODUCTION TO LITERATURE AND MEDICINE
An introduction to the history, theory, and practice of literature and medicine. The first two parts of the course focus on two important traditional approaches to literature and medicine: 1) the historical development of literary images of healers; and 2) illness as metaphor or theme in classic medical novels, as well as in selected contemporary literary works. The third section of the course surveys and samples the dominant theories and methods of using literature in medical education. Particular attention is given to the aesthetic and ethical models. Students have the opportunity to practice these various approaches by reading and discussing selected works of literature. Course grades will be determined by the quality of participation in class discussion of assigned readings (20%), two assigned essays about course readings (20% each), and a final course paper (40%).

Prerequisite: None
Terms Offered: II
Years Offered: Biennially-Even Years
Hours per week: Lecture 3

MEHU 6370 (3 CREDITS)
PHILOSOPHICAL ETHICS
This seminar is conducted as a modern Socrates Café. The course emphasizes the most important philosophical thinkers in the Western tradition on the question of the “good” or the “good life.” Students will read and critically examine major works in Virtue Theory, Utilitarianism, Kantianism, Moral Sense Theory, and other normative theories of ethics. The course aims to develop critical skills in the philosophical analysis of human action, character, duty, ethical reasoning, and moral judgment. Students are expected to be active participants in the exchange of ideas that is at the heart of all forms of Socratic inquiry. Grading is based on class participation, two written essays and two argument summaries.

Prerequisite: Permission of the instructor. This course will function as a recommended precursor but not a required prerequisite to MEHU 6378-Humanism and the Medical Humanities.
MEHU 6375  
HUMANISM AND THE HUMANITIES: HISTORY AND THEORY  
(3 CREDITS)  
This course will provide an historical and conceptual overview of Western humanism and its evolution into university-based humanities disciplines. It will begin with the contemporary debate over the canon and core curriculum in academic circles. This debate about whether American society possesses any shared values on which to build a unified community will frame our historical exploration of humanism and our approach to the medical humanities. Readings will include a textbook on the history of Western humanism; primary sources from antiquity, the Renaissance, the Scientific Revolution, the Enlightenment, the emergence of the modern university and of modern professionalism, and contemporary analyses by advocates of postmodernism and critics of the Western tradition. Course grading will be based on class participation (25%) and three essays about course readings (25% each).  
Prerequisite: None  
Terms Offered: I  
Years Offered: Biennially-Even Years  
Hours per week: Lecture 3

MEHU 6378  
HUMANISM AND THE MEDICAL HUMANITIES  
(3 CREDITS)  
This course introduces students to central themes in humanistic thought since 1800. Drawing on both European and American authors of cultural criticism, medicine, and social theory, it will follow relations between varieties of humanism and medicine. Topics include the flourishing of liberal humanism in the nineteenth century; the professionalization of the humanities in the new research universities; the evolution of intellectuals as a social class; the modern split between scientific medicine and humanistic thought; the attack on humanism and the end of modernity; the growth of the medical humanities; and the rise of multiculturalism.  
Grading criteria: Grading will be based on class participation (25%), and three short papers (25% each) that address questions from the required readings. Readings will include works by Marx, Nietzsche, Freud, Hughes, Lasch, Trilling, Habermas, Taylor, Lyotard, Rothman, Pellegrino, Clouser, Ramsey, Engelhardt, Carson, and Kass.  
Prerequisite: None  
Terms Offered: II  
Years Offered: Biennially-Even Years  
Hours per week: Lecture 3

MEHU 6379  
DEATH & DYING LAW & ETHICS  
(3 CREDITS)  
Impressive feats of medicine and technology are often the sources of disagreements, misunderstandings, ethical dilemmas, and legal battles, especially at the end of life. Legislation and court cases help to some extent to reduce the ambiguity and confusion about the rights and obligations of patients, family members, health-care providers, and others toward the dying and the dead. However, value clashes, blurring of concepts, and political machinations keep end-of-life and post-mortem issues from repose. This course examines such issues as the right to die, hospice, physician-assisted suicide, advance directives, definitions of death, disposal of the deceased’s body, and more from the perspectives of law and bioethics. By the end of the course students should be able to: (1) Discuss the evolving legal and ethical landscapes in the U.S. concerning dying and death. (2) Explore the ethical and social issues that have created the need for the laws. (3) Apply legal and ethical concepts to new scenarios and defend their chosen responses using ethical and legal concepts. Components of the final grade: Participation (20%), Presentation #1 (15%), Presentation #2 (15%), Paper #1 (20%), and Paper #2 (30%).  
Prerequisites: None  
Terms Offered: I  
Years Offered: Biennially-Odd Years
MEHU 6381 (3 CREDITS)
RITUAL BODIES, SOCIAL RITES: MATERIAL ENGAGEMENTS WITH HEALTH AND HEALING
In this course we will consider the significance of ritual and ritual theory for our understanding of individual and collective engagements with health and healing. We will consider rituals across the life course, in varied cultural contexts, and in conversation with select social theories. Our questions will encompass media and memory, power and performance, the sacred and the secular. Drawing from religious studies, cultural history, sociology & anthropology, the course is an opportunity to examine claims about what ritual is, consider theories about what it does, and explore the multiple ways that rituals impact the construction, delivery, and pursuit of health and healing. Grading criteria: Class participation (20%), Three Review Papers (30%), Ritual Design Exercise (10%), Outline for Final Research Paper (15%), and, Final Research Paper (35%).
Prerequisites: None
Terms Offered: I
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

MEHU 6382 (3 CREDITS)
INTEGRATED CLINICAL ETHICS CONSULTATION
This course is designed to provide an opportunity for graduate students in the IMH to learn about the role of the ethicist in clinical medicine by engaging them in health care encounters and relationships that typify medical practice. Students will be introduced to basic concepts and the practice of clinical ethics through observations of a clinical ethicist and participation, as appropriate, in clinical encounters. The student, with the guidance of a clinical ethicist, will observe and interact with the care team, on a weekly basis, for three hours. Further objectives of the course may include understanding of medical terminology and the vocabulary of medicine, readings in a particular area of clinical ethics or ethics consultation, and observation of ethics consultations, clinical ethics teaching, and ethics committee meetings. Students will complete a project (paper, presentation or case analysis). Grading will be determined from: participation in clinical experiences, discussions of readings and the project.
Prerequisite: Permission from the instructor required. Students must contact the instructor at least 30 days before the term begins. This course is not being made available to new students in their first term of course work. Students need to have a beginning understanding of medical humanities before they can comprehend how the role of a clinical ethicist who is grounded in medical humanities is different from an ethicist who may have a different academic background.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 2; Clinical 3

MEHU 6384 (3 CREDITS)
RELIGION AND THE POLITICS OF HEALTH CARE
How do religions factor into the cultural meanings of health and illness, the power dynamics through which these meanings are constructed, and related injustices in bodily experiences? How are religious spaces, religious rituals, religious bodies and religious beliefs impacted by their participation in the normalizing discourses, economic circuits, and biotechnical practices of modern medicine? Attending to critical perspectives on health and illness, with a particular focus on Foucault, this course explores the ceaseless work of the religious imagination with respect to healing in an age dominated by medicine. We will consider the embodiment of religion, the sociological debates about contemporary religion, the claims that religion is increasingly more viscous and visible, the legal frameworks for religious freedom, the place of religious majorities and minorities in America’s diverse religious landscape- and the ways that each of these elements engages with the production of health. Grading criteria: Seminar Participation, 20%; Short paper on Theorizing Religion and the Politics of Health, 20%; Seminar Facilitation (one-class), 20%; Final Paper Outline, 10%, and Final Paper, 30%.
Prerequisites: None
MEHU 6386
PSYCHOANALYSIS, CONSCIOUSNESS, AND NEUROETHICS
(3 CREDITS)
Psychoanalysis will be critically examined through Freud's clinical cases, the interpretation of dreams, and selected theoretical essays. Recent developments in neuroscience and imaging techniques will provide a framework of relationships between the brain and consciousness including minimal consciousness and persistent vegetative states. The ethical implications of psychoanalysis and brain mind studies will be applied through topics such as moral and legal responsibilities. Grading criteria: (1) a book review of a relevant book on brain policy, 5-7 pages (20%); a seminar paper of at least twenty pages, exclusive of end notes (60%); class presentation and discussion of the seminar paper and class participation (20%).
Prerequisite: None

M.D.-M.A. DUAL DEGREE IN MEDICAL HUMANITIES
The M.D.-M.A. dual degree in Medical Humanities has been designed to allow medical students who have special interests in medical humanities and bioethics to pursue the M.A. degree along with their M.D. and to complete both degrees in five years. This option complements our successful M.D.-Ph.D. program in Medical Humanities by making an advanced degree available to those medical students who plan to go into clinical practice rather than research.

The M.A. in Medical Humanities requires a full year of course work, which must be initiated in the Fall Term of odd years. A minimum of thirty-one semester hours is required for the M.A.: twenty-five hours of MEHU course work (ten hours in four required MEHU courses and fifteen hours of MEHU electives) plus at least three hours of Research to prepare and submit a master's thesis proposal and at least three hours of Thesis. Everything can be completed in four academic terms.

Medical students must apply for admission to the GSBS. The GSBS has agreed to waive the requirement for the Graduate Record Examination (GRE) if students' MCAT scores are available. New letters of recommendation will be required, but students' previous application materials (including academic transcripts) should still be on file in Enrollment Services, thus making the application process easier and faster.

Concurrent J.D.-Ph.D. in Medical Humanities
UTMB's IMH and the Health Law and Policy Institute at the University of Houston Law Center have agreed to offer selected students the opportunity to complete concurrently both the J.D. and the Ph.D degrees. The concurrent degree plan will provide an opportunity to obtain a J.D. and Ph.D. in approximately six years of study. It aims to serve a small number of highly qualified students with an academic interest in law (such as bioethics, legal history, medical jurisprudence, or health policy) and the humanities.

To be eligible for the concurrent degree track, a student must meet the admission requirements of both institutions. Certain courses taken in the medical humanities would count toward a law degree—up to twelve semester hours of approved lecture and seminar courses. Similarly, certain health law courses would count toward elective credit for the medical humanities degree—up to three courses or nine semester hours.

This unique collaboration between the IMH and the Health Law and Policy Institute will
allow serious and well-qualified scholars at an early stage in their careers to obtain both professional training and interdisciplinary academic education. In particular, the concurrent degree plan will enhance students’ ability to obtain a rich understanding of how the values, theories, and ideas of the humanities are tied to law and health care.

We expect that this concurrent degree plan will accept two or three students during the next five years. In the future, we will seek additional fellowship support for outstanding candidates.

Health Law Courses
Among the many courses available at the Health Law and Policy Institute, University of Houston Law Center, Houston, Texas, through the concurrent J.D.-Ph.D. dual degree track:

Elder Law
Explores financial and end-of-life planning for the elderly, including the use of trusts, wills, advance directives, and powers of attorney; examines the role of the guardian and attorney ad litem; analyzes the role of Medicare and Medicaid; and considers the legal aspects of home health, assisted living, and nursing home alternatives for senior citizen care.

HEALTH LAW SURVEY: INTRODUCTION TO HEALTH LAW
Is a basic survey course that covers a wide range of important issues in health law, including physician-patient relations, access to health care, informed consent to medical treatment, basic medical malpractice suits against physicians, and bioethics in healthcare (e.g., end-of-life issues, surrogate parenthood, and assisted reproduction). This course has no health law prerequisites and is open to all upper-division law students. It is suitable as an elective for students who do not intend to make a career in health law and as a first taste of health law for students who are trying to assess whether health law is right for them.

HIV and the Law
Explores the legal implications of HIV infection for public health policy, education, employment, insurance, health care, and criminal law.

Law and Psychiatry
Is a study of current topics in law and psychiatry, including civil commitment, right to treatment, right to refuse treatment, competency to stand trial, the insanity defense, and the psychiatrist’s role in the sentencing process.

Legal Aspects of Bioethics
Examines the legal, ethics, and policy aspects of current controversies in bioethics. Topics include privacy and confidentiality, terminal care decisions, patients’ rights to refuse treatment, organ donation and transplantation, and experimentation involving human subjects.

Women and Health Law Seminar
Examines the gender implications of the health care system. Gender issues arise in many contexts, including reproductive rights, confidentiality and informed consent, health care financing, insurance, and criminal law.

Microbiology and Immunology Graduate Program
https://microbiology.utmb.edu/grad_program/
Faculty

Graduate Program Director:
Lynn Soong, M.D., Ph.D.

Professors
Aronson, Judith F., M.D.
Barrett, Alan D., D.T., Ph.D.
Boldogh, Istvan, Ph.D.
Bourne, Nigel, Ph.D.
Bukreyev, Alexander, Ph.D.
Casola, Antonella, M.D.
Chopra, Ashok, Ph.D.
Christodoss, Premkumar, M.D.
Cong, Yingzi, Ph.D.
Garofalo, Roberto P., M.D.
Garg, Nisha, Ph.D.
Geisbert, Thomas, Ph.D.
Houston, Clifford W., Ph.D.
LeDuc, James W., Ph.D.
Makino, Shinji, D.V.M., Ph.D.
Melby, Peter, Ph.D.
McBride, Gere, Ph.D.
Milligan, Gregg N., Ph.D.
Motin, Vladimir L., Ph.D.
Nichols, Joan E., Ph.D.
Niesel, David, Ph.D.
Peterson, Johnny W., Ph.D.
Pyles, Richard B., Ph.D.
Rajaraman, Srinivasan, M.D.
Rajarathnam, Krishna, Ph.D.
Rastellini, Christina, M.D.
Reyes, Victor E., Ph.D.
Shi, Pei-Yong, Ph.D.
Soong, Lynn, M.D., Ph.D.
Sun, Jiaren, M.D., Ph.D.
Torres, Alfredo G., Ph.D.
Tseng, Chein-Te Kent, Ph.D.
Walker, David H., M.D.
Wang, Tian (Tina), Ph.D.
Weaver, Scott, Ph.D.
White, Arthur Clinton Jr., M.D.
Yi, MinKyung, Ph.D.

Associate Professors
Bao, Xiaoyong, Ph.D.
Beasley, David W. C., Ph.D.
Bente, Dennis A., Ph.D.
Eaves-Pyles, Tonyia, Ph.D.
Endsley, Janice Jones, Ph.D.
Forrester, Naomi, Ph.D.
Ikegami, Tetsuro, Ph.D.
Pinchuk, Iryna, Ph.D.
Stephens, Robin, Ph.D.
Tang, Shao-Jun, Ph.D.

Assistant Professors
Castellanos, Alejandro, Ph.D.
Dann, Sara, M., Ph.D.
Hu, Haitao, Ph.D.
Hughes, Grant, Ph.D.
Mire, Chad, Ph.D.
Rajsabaum, Ricardo, Ph.D.
Objectives

One aim of this multidisciplinary program is to produce qualified scientists to fill the national need for investigators capable of successfully addressing themselves to understanding fundamental mechanisms in microbiology and immunology. The program also addresses understanding new health problems as they arise and developing new approaches to unresolved problems (e.g., antiviral agents). Still another goal of the program is to provide versatility so that these scientists may apply themselves to the constantly changing problems of research and teaching. Thus, students are offered the opportunity to acquire depth in their specialty and to address themselves meaningfully to diverse aspects of problems, ranging from molecular considerations to the pathophysiology of disease.

Essential Functions Required for Completion of Program

The following description details essential functions (abilities) needed to complete the Microbiology and Immunology degree program.

Observation (to Include the Various Sensory Modalities)

Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication

Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills

Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves.

Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical
Instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

**Intellectual and Cognitive Abilities**

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

**Professional and Social Attributes**

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

**Application of Legal/Ethical Principles and Professional Standards**

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.
Program of Graduate Work

The Ph.D. program aims to train scientists who will establish careers in resolving cutting edge basic biological and health-related problems. The department emphasizes innovative research and versatile approaches to problem solving. Students are required to acquire depth in a specialty area as well as breadth of knowledge. Individualized research programs are available in the laboratories of nationally and internationally recognized faculty working in broad areas including bacteriology, virology, molecular biology and genetics, immunology, and cancer. The program is multidisciplinary, requiring development of knowledge and skills in a number of related areas including biochemistry, cellular and molecular biology, pathophysiology, and statistics. During the first year students enroll as generalists in the Basic Biomedical Science Curriculum. First-year courses include biochemistry, cell biology, molecular biology and genetics, modular specialized courses, seminar, and ethics. Students will also begin laboratory rotations in the program(s). Training is carried out through lectures, seminars, individual or small-group discussions with faculty and visiting investigators, independent study, and independent scholarly research. Studies in the microbiology and immunology graduate program are supplemented by required advanced-level courses that include pathogenic bacteriology, virology, and immunology. Special topics courses are also offered for identified areas. Overall emphasis is placed on practice in critical and analytical thought and on the creative design and implementation of experimental procedures required for testing original and highly significant hypotheses. Research experience offered to students covers a broad range of biology including molecular, genetic, cellular, microorganisms, and animal and human biology, and may involve techniques in ultrastructure, histochemistry, molecular biology, biochemistry, immunochemistry, immunobiology, tissue culture, microbial genetics, and animal clinical studies. Teaching experience can be obtained by participation in instructional activities for the medical school and by frequent presentation of literature and research seminars.

Throughout the year, regularly scheduled seminars on biomedical topics are given in the Microbiology and Immunology Department and in other UTMB departments. Announcements of these seminars are circulated in advance to all faculty and students; graduate students are encouraged to attend. Students have access to laboratories equipped for tissue culture, animal studies, protein and nucleic acid characterization, ultrastructure, histochemistry and flow cytometry. Also, a P-3 laboratory for research of high-risk organisms (e.g., AIDS virus) is available. A BSL-4 facility is currently available on campus. In addition, cooperative facilities are available on campus for protein and nucleic acid sequencing and synthesis, hybridoma production, and electron microscopy, with a recombinant DNA and gene transfer laboratory, transgenic animal facility, and a nude mouse facility also available, among others. Opportunities for interaction with clinical research teams and basic scientists exist in conjunction with programs in normal human physiology and in pathobiology of disease at the General Clinical Research Center, the Sealy Center for Oncology and Hematology, Child Health and Research Facility, John Sealy Hospital, the Shriners pediatric burns hospital in Galveston, and other departments.

DEGREE

For the Doctor of Philosophy degree, a student entering with a bachelor’s degree and a background in the biomedical sciences (biochemistry, cell biology, molecular biology, genetics, microbiology) should anticipate a five-year program; students entering with a master’s degree should take less time. In general, certain basic courses or their equivalent are required; the remainder of the program of study is flexible and varies with the student’s background, interests, and goals. In the second year, a qualifying examination (written and oral) is given; this examination is based upon the student writing and defending an original NIH- styled research proposal related to the student’s research area. Admission to candidacy and appointment of a supervisory committee follows satisfactory completion of this examination and acceptance of a research proposal. This committee
directs and evaluates the student’s Ph.D. program and meets periodically thereafter to review the student’s progress. Finally, this committee schedules a public seminar based on the dissertation research and administers a final examination and defense of dissertation.

Physical Facilities

The department is located in the Medical Research Building and is well-equipped for research ranging from biochemical and molecular biology to animal studies. Students have access to laboratories equipped for tissue culture, animal studies, flow cytometry, recombinant DNA work, transgenic mouse production, protein fractionation and sequence analysis, histochemistry, and gene microarray techniques. In addition, cooperative facilities are available on campus for protein chemistry, hybridoma production, and electron microscopy, and include a nude mouse facility.

Opportunities for interaction with clinical research teams and basic scientists exist in conjunction with programs in normal human physiology and in pathobiology of disease at the Internal Medicine and Pediatrics General Clinical Research Center, the Sealy Center for Oncology and Hematology, Child Health and Research Facility, John Sealy Hospital, the Shriners pediatric burns hospital in Galveston.

MICR COURSE OFFERINGS

There are three courses required by the Department and offered following the completion of the first-year core curriculum.

Fall Term Courses
- International Internships in Vaccinology (MICR 6070)
- Research (MICR 6097)
- Thesis (MICR 6098)
- Dissertation (MICR 6099)
- Student Research Update Seminar (MICR 6142)
- Current Topics in Infectious Diseases and Immunity (MICR 6195)
- Scientific Writing & Grant Proposal Preparation (MICR 6255)
- General Virology (MICR 6403)
- Internship in Vaccinology (MICR 6143)

Spring Courses
- International Internships in Vaccinology (MICR 6070)
- Research (MICR 6097)
- Thesis (MICR 6098)
- Dissertation (MICR 6099)
- Student Research Update Seminar (MICR 6142)
- Current Topics in Infectious Diseases and Immunity (MICR 6195)
- Advanced Immunology (MICR 6408)
- Internship in Vaccinology (MICR 6143)

Summer Courses
- International Internships in Vaccinology (MICR 6070)
- Research (MICR 6097)
- Thesis (MICR 6098)
- Dissertation (MICR 6099)
- Training in Infectious Disease Outbreak Response (MICR 6140)
- Pathogenic Bacteriology (MICR 6315)
- Internship in Vaccinology (MICR 6143)
MICR COURSE DESCRIPTIONS

MICR 6070 (1-9 CREDITS)
INTERNATIONAL INTERNSHIPS IN VACCINOLOGY
The Sealy Center for Vaccine Development (SCVD), in conjunction with the World Health Organization (WHO) headquarters, sponsors an annual internship program. The traveling internship program will form the basis for this course. Students participating in this course will undertake an internship at the World Health Organization Headquarters in Geneva, Switzerland. Each student will be paired up with a mentor at WHO and a UTMB SCVD member to work on a defined project related to public health and vaccines for a period of 3 months (typically from early Spring to Fall of each year, with specific time-frames to be determined for each internship). Each internship project will involve significant contribution to a team tasked with developing a report on vaccines and a specific infectious disease for the WHO. Grading (satisfactory/unsatisfactory) will be based on participation, attendance, completion of assigned task(s), evaluations/feedback received from WHO and UTMB mentor(s), and submission of a final report to the SCVD by the student summarizing their internship experience and outcomes. Prerequisites: Students must have completed all required graduate program coursework and entered candidacy prior to commencing the internship. Written approval from the mentor is also required.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

MICR 6097 (1-9 CREDITS)
RESEARCH
Formal research directed toward Masters Doctor of Philosophy degree programs. Grading will be based upon the student's level of performance as reported by the student's research supervisor and will be assigned as satisfactory or unsatisfactory. Prerequisites: Admission to the microbiology and immunology program
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 3-27

MICR 6098 (3-9 CREDITS)
THESIS
Formal research and writing leading to the preparation and completion of the thesis for the Master of Science degree under the direction of the student's supervisory committee in special circumstances. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory or unsatisfactory. Prerequisites: Admission to candidacy for the master's degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

MICR 6099 (3-9 CREDITS)
DISSERTATION
Formal research and writing leading to the preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory or unsatisfactory. Prerequisites: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable
MICR 6140 (1 CREDIT)
TRAINING IN INFECTIOUS DISEASE OUTBREAK RESPONSE
This 3-day course in infectious diseases provides the students with the opportunity to test their own knowledge in solving an outbreak scenario, and to learn how institutions such as the Centers for Disease Control approach infectious disease outbreaks. In this three-day course students will be confronted and led through a fictive outbreak simulation. Using innovative and highly inter-professional learning approaches and guided by experts in the field, students will understand the steps required in an outbreak response; solve the etiology of the outbreak agent case by drawing on their previously acquired knowledge and skills in virology, immunology, bacteriology, and epidemiology; and learn how to interact with the public. Topics that will be included are sample collection and processing, diagnostic tool and immuno reagent development, countermeasure development, and public outreach. Grades will be satisfactory (S) or unsatisfactory (U) based on participation. A grade of satisfactory will depend on: a) attendance of the student to all scheduled sessions and discussions; b) a short report during the course; and c) writing one-page reflective paper that will serve as self-evaluation.
Prerequisites: Must have taken MICR 6403 – General Virology, MICR 6315 – Pathogenic Bacteriology, or MICR 6408 – Advanced Immunology.
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 6; Conference 18

MICR 6142 (1 CREDIT)
STUDENT RESEARCH UPDATE SEMINAR
Weekly student research update seminars for graduate students to present their current work. Students and faculty are invited and give the presenting student an opportunity for helpful critique and suggestions regarding their thesis project. A summary report is provided to the presenter with feedback received from attendants. Grading will be based on participation, attendance, and evaluations/feedback received.
Prerequisites: BBSC first year curriculum
Terms Offered: I, II
Years Offered: Annually
Hours per week: Seminar 1

MICR 6143 (1 CREDIT)
INTERNSHIP IN VACCINOLOGY
The Sealy Center for Vaccine Development (SCVD), in conjunction with the World Health Organization (WHO) headquarters, sponsors an annual Internship program. The proposed course will be associated with a UTMB-based Internship program that will involve preparation of a report by the student on a specific infectious diseases and vaccines topic, intended for use as a briefing document by a WHO expert committee. The student will work as part of a small group (2-3 students) under the supervision of a SCVD member. The internship will be conducted over a 3 month period, concurrent with the trainee's regular educational and research activities. Grading will be based on participation, attendance, effective performance of assigned tasks, evaluations/feedback received from mentors, and submission of a final report to the SCVD by the intern summarizing their internship experience and outcomes. Prerequisite: Consent to be enrolled required.
Prerequisites: For graduate students, successful applicants must have completed all required BBSC and/or program coursework prior to commencing the internship. Written approval from the mentor is also required.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 2

MICR 6195 (1 CREDIT)
CURRENT TOPICS IN INFECTIOUS DISEASES AND IMMUNITY
Seminar course intended to familiarize students with current research in the areas of infectious
diseases and immunology. Students attend weekly seminars in the Infectious Diseases and Immunity Colloquium. Students may substitute some seminars in the series with presentations from the monthly Immunology Research in Progress series. Students are required to enroll during the first two years in the program. Each student will be assigned a session per term to lead class by discussing an assigned topic relevant to a journal club article. Students will also participate in small group discussions and prepare essays. Grading will be based on attendance (30%), preparation and discussion leadership (20%), and reflective essays or review essay (50%).

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Conference/Discussion 1

MICR 6255
SCIENTIFIC WRITING & GRANT PROPOSAL PREPARATION
This course introduces the principles of scientific writing and grant proposal preparation in the new NIH format. The goal of this course is to familiarize students with the individual parts of an NIH-style grant application, to help students in acquiring scientific writing skills, and to prepare students for the qualifying exam in the Microbiology & Immunology graduate program. It consists of weekly lectures and small-group sessions during which experienced faculty mentors present didactic instruction on planning, organizing, and writing a hypothesis-driven grant application. Students will also work individually and in small groups on an original grant proposal. Students write a grant proposal with precise deadlines for submission of individual parts. Grading will be based on the assignments (30%), the final grant application (50%), and an oral defense of the proposal (20%).

Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Conference 2

MICR 6315
PATHOGENIC BACTERIOLOGY
The objective of this course is to introduce students to concepts of research on bacterial pathogens. Pathogens infecting man will be studied, with emphasis given to their pathogenic mechanisms, induction of immunity, and physiochemical characteristics. The course will consist of lectures and discussions. Grading based on written examinations.

Prerequisites: BBSC First-Year Curriculum
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 1

MICR 6403
GENERAL VIROLOGY
Principles and concepts of animal virology will be presented, but the majority of the course will be devoted to the study of viruses of medical importance. Emphasis will be placed upon the chemical and physical characteristics of viruses, viral interaction with the immune system, pathogenesis of viral infections, and the mechanisms of replication of viruses. The course consists of lectures and discussion periods. Grades will be based on exams (60%), participation/critical thinking and journal club discussion (15%), review paper and oral presentation (25%).

Prerequisites: BBSC First-Year Curriculum
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3; Conference 1
ADVANCED IMMUNOLOGY

An in-depth study of the immune response and related events with emphasis on the mechanism of cellular and humoral immunity. Some of the topics to be covered include antibody structure and function, antigen-antibody reactions, cells involved in the immune response, antibody formation, cellular immunity, mediators, tolerance, and immunogenetics. Material will be presented in lectures and assigned readings of texts, reviews, and research articles. Grading will be based on written examinations and class participation.

Prerequisites: BBSC First Year Curriculum

Terms Offered: II

Years Offered: Annually

Hours per week: Lecture 2; Conference/Discussion 2
Neuroscience Graduate Program

https://www.utmb.edu/ncb/GraduatePrograms/Neuroscience/default.asp

Faculty

Graduate Program Director, *ad interim*:
Owen Hamill, Ph.D.

**Professors**
Barral, Jose M., M.D., Ph.D.
Bhat, Krishna, Ph.D.
Cicalese, Luca, M.D.
Christadoss, Premkumar, M.D.
Chung, Jin Mo, Ph.D.
Cunningham, Kathryn A., Ph.D.
Dewitt, Douglas S., Ph.D.
Enkhbaatar, Perenlei, M.D., Ph.D.
Esenaliev, Rinat, Ph.D.
Gelman, Benjamin, M.D., Ph.D.
Huang, Li-Yen Mae, Ph.D.
Johnson, Kenneth M., Ph.D.
Liu, Danxia, Ph.D.
Meyer, Walter J., M.D.
Motamedi, Massoud, Ph.D.
Navarro, Javier, Ph.D.
Prough, Donald S., M.D.
Rassin, David, Ph.D.
Rastellini, Cristiana, M.D.
Taglialetela, Giulio, Ph.D.
Watson, Cheryl S., Ph.D.
Wu, Ping, M.D., Ph.D.

**Associate Professors**
Bente, Dennis, Ph.D.
Dineley, Kelly, Ph.D.
Cai, Ji Yang, Ph.D.
Gupta, Praveena, O.D., Ph.D.
Hamill, Owen P., Ph.D.
Kayed, Rakez, Ph.D.
Laezza, Fernanda, Ph.D.
Makishima, Tomoko, M.D., Ph.D.
Micci, Maria, Ph.D.
Tang, Shao-Jun, Ph.D.
Yin, Yuhui Whitney, M.D., Ph.D.
Zhang, Wenbo, Ph.D.

**Assistant Professors**
Chen, Yan, Ph.D.
Green, Thomas, Ph.D.
Hommel, Jonathan, Ph.D.
Kim, Yu Shin, Ph.D.
Krishnan, Balaji, Ph.D.
Sarkar, Partha, Ph.D.
Wairkar, Yogesh, Ph.D.

Adjunct Professor
Perez-Polo, J. Regino, Ph.D.

Hulsebosch, Claire E., Ph.D., *professor emeritus*
Objectives

The Neuroscience Graduate Program (NEUR) leads to the degree of Doctor of Philosophy (Ph.D.). The objective of the neuroscience program is to provide students with an inter- and multidisciplinary program of course work and research experiences that will enable trainees to become scholarly contributors to the field. It is anticipated that many of these graduates will become neuroscience teachers and researchers in academic institutions, although others will choose positions in industry or in government laboratories. The program offers the rigor that is required for graduates to be competitive for such positions following suitable postdoctoral training.

Essential Functions Required for Completion of Degree Program

The following description details essential functions (abilities) needed to complete the Neuroscience degree program.

Observation (to Include the Various Sensory Modalities)

Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills.

They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication

Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

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Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to
be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

**Intellectual and Cognitive Abilities**

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

**Professional and Social Attributes**

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

**Application of Legal/Ethical Principles and Professional Standards**

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the
other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

Program of Graduate Work
The Neuroscience Graduate Program (NEUR) is designed to provide students with a broad foundation of knowledge in the biomedical sciences and the fundamental concepts of five major fields of neuroscience: neuroanatomy, neurophysiology, molecular neurobiology, neuropharmacology, and behavioral science through a core of required courses in the Basic Biomedical Science Curriculum (BBSC) and in neuroscience. Advanced and elective courses allow students to attain a greater depth of knowledge in one or more of these areas. A number of the courses involve detailed examination of the contemporary literature. Seminars by visiting scientists and by local faculty provide a survey of areas of current research interests in neuroscience. Graduate students also present seminars on their research. Students are introduced to the research laboratories of the graduate program faculty through an orientation course and completion of two to four laboratory rotations in the first BBSC year. After this, students are expected to choose a supervisory professor in neuroscience and to begin work on a research problem, the solution of which will become the dissertation.

The research problem can be in any of the subdisciplines of neuroscience and can involve an analysis at any level from the molecular or membrane level to the systems level and behavior. Preparations available range from cell cultures to brain slices, to intact invertebrates or vertebrates. Experimental techniques that are familiar to members of the faculty include current methods of experimental neuroanatomy, such as retrograde and anterograde tracing and marking procedures; immunocytochemistry; electron and confocal microscopy; extra- and intracellular recording; voltage clamping, patch clamping, and microiontophoresis; recordings of neural activity in awake, behaving animals; behavioral analyses; high-performance liquid chromatography, mass spectroscopy, nuclear magnetic resonance, and MRI; measurements of neurotransmitters and their enzymes; receptor assays; isolation and characterization of peptides and proteins in neural and muscle preparations, including structural analysis; production of monoclonal antibodies; molecular biology and recombinant DNA technology; molecular genetics; stem cell research; and other modern approaches to the analysis of neural structure and function.

Neurobiology of Disease Track
Neurobiology of Disease is a separate training track within the Neuroscience Graduate Program (NGP) for medically trained personnel that will emphasize research in basic biomedical mechanisms that contribute to the etiology and expression of diseases of the nervous system.

This unique Ph.D.-training venue is a track within the neuroscience program that specializes, either by content or approach, in research related to disease processes and is focused on providing training to M.D.-degreed advanced trainees.

Ph.D. Degree
The typical student will emphasize course work during the first five terms; however, laboratory rotations also occur during this same time frame, and students must identify a research area and supervisory professor by the end of the third term (at completion of the first year in the BBSC program). A written comprehensive qualifying examination is given at the end of the second term of the second year. This examination is designed to test the overall comprehension of fundamental knowledge and principles of neuroscience and the ability to design, interpret, and analyze experimental problems. Following successful completion of the course work and the qualifying examination, the student does research in the laboratory of a supervisory professor to develop a dissertation proposal. This proposal takes the form of an NIH grant application, is presented as a seminar, and is then subject to an oral examination by a faculty supervisory committee. With acceptance of the
proposal by the supervisory committee, which will guide the dissertation work, the student is admitted to candidacy. Admission to candidacy should occur by May of the third year in the program.

The dissertation is complete when it is successfully defended in a final oral examination and the final, approved copy is presented to the Dean. During the course of each student’s program, there is a teaching opportunity. This involves participation in the teaching of the laboratories in the Neuroscience and Human Behavior course for medical students and graduate students; students may take the teaching course in the second or third year of the program. In addition to providing a review of basic material, the teaching requirement helps prepare students for teaching neuroscience in an academic setting. All students are expected to present a seminar each year until admission to candidacy; these presentations are critiqued to enhance the skills of the student. In addition, it is anticipated that research findings will be presented at national meetings. The development of effective communication skills, both written and oral, is an integral aspect of training in this neuroscience program. Students are also required to take the course Ethics of Scientific Research (MEHU 6101) and other courses related to scientific communication and ethical conduct.

Physical Facilities

The Neuroscience Program is based administratively in the Department of Neuroscience and Cell Biology, but faculty in 12 departments are participants in this interdisciplinary program. Research laboratories and other facilities for the training of graduate students are located in several buildings on the UTMB campus. The research laboratories of individual investigators contain the required equipment for carrying out specific research objectives. In addition, there is access to a variety of shared and common research facilities (computers, image analysis facilities, electronics shop, animal quarters, library, peptide and nucleotide analytical facilities, and others).

Curriculum and Course Descriptions

New students in the neuroscience graduate program will be required to take a core curriculum in the first year comprised primarily of courses in the Basic Biomedical Science Curriculum (BBSC), which is described elsewhere in this bulletin. Courses specific to neuroscience begin in the summer of the first year and continue through the end of the second term in the second year. An overview of the entire neuroscience curriculum is provided below. Courses specific to the BBSC or other graduate programs are described elsewhere in this bulletin. Courses specifically created by the neuroscience graduate program are described in the following section.

INFORMATION ABOUT THE COURSE OF STUDY

A. Course Requirements

Students in the Neuroscience Graduate Program will take the integrated first-year Basic Biomedical Sciences Curriculum (BBSC). In addition, a series of required and elective courses specific to the NGP are taken in the first and subsequent years. These include the course Integrative Neuroscience (NEUR 6403) and any combination of available electives for a minimum of 6 credit hours. Students are required to take a minimum of 9 credit-hours per term (The second number in each 4-number course identification code represents the credit hours for the course). Course evaluations by students are required for all didactic courses in the program. Grades will not be released for any course until all evaluations are received.
B. Minimal Performance Criteria

Students in the Neuroscience Graduate Program should maintain a grade of B or higher in all required courses of the program. Students who fail to do so will be required to make up the deficiency by a variety of means, including but not limited to, retaking examinations, taking a readings or special topics course, or repeating the course the next time it is offered. The remedial action to be utilized will be determined by the Advisory Committee and Program Director. Rules and requirements regarding probation and dismissal from the graduate school may be found in section 4.57 of the Academic Policies of the Graduate School of Biomedical Sciences.

C. Elective Courses

1. Students may choose elective courses to strengthen special areas of interest or weakness, or to provide background for research skills. A minimum of 6 credit hours of elective courses is required in any combination. Students may take additional hours if appropriate.

2. The elective courses available include any of the courses shown on the chart. Courses offered by other graduate programs may be taken in lieu of the electives listed, but approval of the Program Director is required for the substitution.

D. Laboratory Rotations

1. New students will meet with the NGP Program Director and Advisory Committee, who will introduce them to the research activities of our Program.

2. Each student will rotate through at least 2 laboratories of his/her choice during the first (BBSC) year, beginning with the fall term. Registration is for BBSC 6043 Laboratory Rotations. NGP students then register for lab rotation in the neuroscience program (NEUR 6042) in the lab they chose to join by the end of the BBSC year and continue to register for NEUR 6042 each term until they pass the written qualifying examination and enter into "Research". Credit hours depend on the time commitment of the student and faculty member but may not be for less than 3 credit hours (9 contact hours per week) per term.

E. Seminars

Each student is required to register for Seminar each term for the duration of his/her tenure in the graduate school. All students registered for the NGP seminar course (NEUR 6195) must attend at least 80% of fourteen Program-recommended seminars in each term (approximately one seminar per week). Regular and student seminars count toward satisfying the 14-seminar requirement. "Regular" seminars are those presented by non-students (local or visiting faculty, scientists, etc.). "Student" seminars are those presented by any NGP student and include conventional seminars or progress reports as well as defenses of dissertation proposals and dissertations.

In addition to the seminar attendance requirements, each student must write a brief statement about the seminar, summarizing in the style of NIH reviews (1) Overall impact of the work described in the seminar, and (2) Innovation. Students are graded S/U for the written summary (Form E in our Program Policies). Summaries will be reviewed/graded by the Director of the NGP seminar course (NEUR 6195).

Each student will also present one seminar each year of the neuroscience program, typically in the summer term, including the dissertation proposal, the dissertation defense, and other annual presentations. The Advisory Committee is responsible for running the seminar program for students. Two successful seminar series, the Mitchell Center for
Neurodegenerative Diseases Seminars and the Neuroscience & Cell Biology Departmental Seminars are offered, which provide our students with exciting opportunities to interact with external speakers and UTMB faculty and enjoy important presentations by students and postdoctoral fellows as well.

In addition to regular seminars, we are fortunate to be able to offer the James E. Beall II Memorial Lecture, which is co-sponsored by the Neuroscience Graduate Program and the Department of Neuroscience & Cell Biology and is given annually by distinguished investigators in the neurosciences.

NEUROSCIENCE COURSE OFFERINGS

Fall Courses
- Laboratory (NEUR 6042)
- Research (NEUR 6097)
- Dissertation (NEUR 6099)
- Neural Development & Neurogenetics Biennially - *Even Years* (NEUR 6140)
- Model Systems for Neuroscience (NEUR 6141)
- Neurodegenerative Disease: Proteinaceous Deposits in Dementias and Beyond (NEUR 6181)
- Implication of Improper Nucleic Acid Processing in Neurological Disease (NEUR 6182)
- Neurotrauma & Stroke: Injury to the Spinal Cord and Brain (NEUR 6183)
- Neurobiology in Retinal Diseases (NEUR 6184)
- Mechanisms of Substance Abuse and Chronic Pain (NEUR 6185)
- Seminar (NEUR 6195)
- Synapses: Development & Degeneration (NEUR 6221)

Spring Courses
- Laboratory (NEUR 6042)
- Research (NEUR 6097)
- Dissertation (NEUR 6099)
- Neurodegenerative Disease: Proteinaceous Deposits in Dementias and Beyond (NEUR 6181)
- Implication of Improper Nucleic Acid Processing in Neurological Disease (NEUR 6182)
- Neurotrauma & Stroke: Injury to the Spinal Cord and Brain (NEUR 6183)
- Neurobiology in Retinal Diseases (NEUR 6184)
- Mechanisms of Substance Abuse and Chronic Pain (NEUR 6185)
- Seminar (NEUR 6195)
- Teaching in Neuroscience (NEUR 6220)
- Neuroscience in Infectious Disease (NEUR 6226)
- Behavioral Neuroscience (NEUR 6325)

Summer Courses
- Laboratory (NEUR 6042)
- Research (NEUR 6097)
- Dissertation (NEUR 6099)
- Neurodegenerative Disease: Proteinaceous Deposits in Dementias and Beyond (NEUR 6181)
- Implication of Improper Nucleic Acid Processing in Neurological Disease (NEUR 6182)
- Neurotrauma & Stroke: Injury to the Spinal Cord and Brain (NEUR 6183)
Neurobiology in Retinal Diseases (NEUR 6184)
Mechanisms of Substance Abuse and Chronic Pain (NEUR 6185)
Seminar (NEUR 6195)
Integrative Neuroscience (NEUR 6403)

NEUROSCIENCE COURSE DESCRIPTIONS

NEUR 6042 LABORATORY ROTATIONS
(3-8 CREDITS)
The objectives of this required course are to provide students an opportunity to become familiar with the faculty and their research efforts in the Neuroscience Program by participating in the activities of the laboratory (gaining supervised, hands-on experience with techniques and experimental protocols) and by becoming acquainted with the laboratory staff and the goals of the research project. Students will be taught by discussions with the instructor, by reading relevant literature and by active participation in laboratory procedures. The long-term goal of this course is to provide exposure to a variety of experimental approaches and to help in the identification of a supervisory professor and dissertation project. Neuroscience Program students are required to spend at least 3 credit hours in each of three different laboratories (that is, do three different rotations), and must complete the three rotations before the end of their fifth term in the program. Grading is, A, B, C, F and based on participation in lab discussions and experiments.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory, 9-24 (variable)

NEUR 6097 RESEARCH
(1-8 CREDITS)
Formal research directed toward development of the dissertation research for the Doctor of Philosophy degree. Grading will be based upon the student's level of performance as reported by the student's research supervisor and will be assigned as satisfactory or unsatisfactory.
Terms Offered: I, II, III
Years Offered: Annually

NEUR 6099 DISSERTATION
(3-9 CREDITS)
Formal research and writing leading to the preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory or unsatisfactory.
Prerequisite: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Students registering for Dissertation are expected to register for a full-time course load.

NEUR 6140 NEURAL DEVELOPMENT & NEUROGENETICS
(1 CREDIT)
The diverse functions of the nervous system, ranging from sensory perception, motor coordination to motivation and memory, depend on the precise interconnections of billions of neurons. This course covers both general principles and specific topics in the development, plasticity, degeneration and regeneration of the nervous system. We will focus on genetic and cellular factors that control the production and survival of neurons, guide axons, and regulate the formation of synapses. Other specific topics include development-related degeneration and the function of stem cells during development and neural repair. The course will have two components: background introduction and critical reading of original articles. Students will be
evaluated based on their knowledge, acquisition/preparedness, critical thinking/problem-solving skills and participation/communication skills in group.

Terms Offered: I
Years Offered: Biennially-Even Years
Hours per week: Lecture 1; Conference/Discussion 2

NEUR 6141 (1 CREDIT)
MODEL SYSTEMS FOR NEUROSCIENCE
The brain is a magical organ with unknown mechanisms to process the multitude of signals from the outside world to generate unconscious and conscious sensations. Novel optical technologies along with animal models are being applied to detect signal trafficking in the brain, however we are still far from understanding the underlying mechanisms of signal processing and sensation, although progress has been made on understanding the signal transmission of neurotransmitters on the basis of the structural analysis of neurotransmitter receptors, which will help the designing novel therapies to neurological disorders. This course is structured to interrogate the mechanisms of brain development and function using state of the art technologies, but most importantly navigate at the frontiers of neurosciences and identify the major challenges that remain to be conquered in the exciting field of neurosciences.

Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 1; Conference/Discussion 1

NEUR 6181 (1 CREDIT)
NEURODEGENERATIVE DISEASE: PROTEINACEOUS DEPOSITS IN DEMENTIAS AND BEYOND
This course will explore the mechanisms, nature and neurobiology of proteinaceous deposits in protein misfolding diseases, including dementias. Other courses in this sequence will address other mechanisms and diseases of the nervous system. The course will meet once per week and will consist of 1 hour lecture followed by 1 hour faculty-lead discussions of recent literature related to the topic. The introductory lecture will initiate each topic, but successive classes will consist of student-generated discussion of assigned papers from the literature. Grades will be assigned based on student participation. This sequence of Neurobiology of Disease (NOD) courses is designed for students in the Neurobiology of Disease track and the Neuroscience Graduate Program, for MD-PhD students in neuroscience, and for any other graduate student interested in neurobiological diseases.
Prerequisite: Graduate Level Neuroscience Course
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 1

NEUR 6182 (1 CREDIT)
IMPLICATION OF IMPROPER NUCLEIC ACID PROCESSING IN NEUROLOGICAL DISEASE
This course will examine the newly emerging importance of how defects in nucleic acid post-transcriptional processing/splicing, nuclear and cellular transport, RNA toxicity, and RAN mediated translation impact neurodegenerative diseases. The course will meet once per week and will consist of 1 hour lecture followed by a 1 hour faculty-led discussion of the recent literature related to the topic. Introductory lectures will orient students in the field with seminal works and finding, while subsequent meetings will be driven by student-generated discussion of assigned papers from the literature that develop or challenge current dogma.
Prerequisite: Graduate Level Neuroscience Course
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 1

NEUR 6183 (1 CREDIT)
NEUROTRAUMA & STROKE: INJURY TO THE SPINAL CORED AND BRAIN
This course will explore the basic mechanisms of injury of neurotrauma and stroke as they pertain to the brain and spinal cord. This course will also feature discussions pertaining to therapeutics and medical interventions in the preclinical development phase. Other courses in this sequence will address relevant diseases of the nervous system. This course will meet once per week and will consist of faculty-led discussions of recent literature. An introductory lecture will initiate each topic, but successive classes will consist of student-generated discussion of assigned papers from the literature. Students will be graded based on the quality of their preparation and their ability to lead and contribute to classroom discussions. This sequence of Neurobiology of Disease (NOD) courses is designed for students in the NOD track of the Neuroscience Graduate Program, for MD-PhD students in neuroscience, and for any other graduate student interested in neurobiological diseases, from their clinical manifestations to the basic science underpinnings of their etiology and expression. This course has the option to be offered any term of any year with no permission requested. Grading system is standard A-F.

Prerequisite: Graduate Level Neuroscience Course
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 1

NEUR 6184
(1 CREDIT)
NEUROBIOLOGY IN RETINAL DISEASES
This course will explore the nature and basic mechanisms of neurobiological diseases related to ophthalmic/retinal diseases. The retina is an extension of the brain and has been recognized as a "window" of the brain. This course is to introduce retinal neurobiology in the context of major retinal diseases that lead to blindness and to discuss the potential association between neurological changes in the retina and brain diseases. Other courses in this sequence will address other diseases of the nervous system. The course will meet once per week and will consist of faculty-led discussions, lectures, paper reading and discussion. Evaluation will be based on attendance and active participation. Students will be graded based on the quality of their presentation and their ability to lead and contribute to classroom discussions. Grading system is standard A-F.

Prerequisite: Graduate Level Neuroscience Course
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 1

NEUR 6185
(1 CREDIT)
MECHANISMS OF SUBSTANCE ABUSE AND CHRONIC PAIN
This course will explore the nature and basic mechanisms of neurobiological diseases related to addiction and chronic pain. The objective of this course is specifically to expose students to the interface of basic science with clinical practice for the better understanding of mechanisms and treatment of addiction and chronic pain. Other courses in this sequence will address other diseases of the nervous system. The course will meet once per week at the noon hour and will consist of faculty-led discussions of recent literature related to the disease entities. An introductory lecture will initiate each disease topic, but successive classes will consist of student-generated discussion of assigned papers from the literature. Grades will be assigned based on student participation on an A-F scale. This sequence of Neurobiology of Disease (NOD) courses is designed for students in the NOD track of the Neuroscience Graduate Program, for MD/PhD students in neuroscience, and for any other graduate student interested in neurobiological diseases, from their clinical manifestations to the basic science underpinnings of their etiology and expression.

Prerequisite: Graduate Level Neuroscience Course
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 1

NEUR 6195
(1 CREDIT)
SEMINAR
The objectives of this course are to: 1) expose the students to a wide range of current topics in neuroscience and 2) provide the students with experience in organizing and presenting seminars. Exposure to current topics in neuroscience will be accomplished by required attendance at seminars presented by local and visiting scientists. Experience in organizing and presenting seminars will be obtained by requiring the students to organize and present a seminar each year until students are admitted to candidacy. Their performance will be evaluated by the program faculty. Entry-level students present seminars based on original literature in a selected topic area. Advanced students will be expected to present literature and experimental data related to their research experiences. Grading when enrolled for attendance only will be S/U. Grading when presenting will be A, B, C, F based on performance and continued attendance at other seminars.

Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Seminar 1

NEUR 6220
TEACHING IN NEUROSCIENCE
The objectives of this elective course are to provide students with an opportunity to gain experience in how to teach and to enhance their knowledge of neuroscience. Students will participate in teaching and discussion in the laboratories of the Neuroscience and Human Behavior course (NEUR 6503), which is offered to graduate students and medical students. The students have two one-hour discussion session with faculty lab instructors each week to review the material to be covered in lab and to practice teaching skills. They will then assist in two two-hour laboratory sessions each week. Students will be expected to review material in a group session in the lab, answer questions, point out and explain structures and functional relationships of laboratory specimens, assist with demonstrations and examinations, and assist in setting up and organizing lab materials. Grading will be based on knowledge of material (20%), ability to present reviews to class clearly (40%), ability to interact effectively with small groups in lab (20%), and participation in preparatory sessions and demonstrations (20%).

Prerequisite: NEUR 6503, NEUR 6403, or consent of instructor
Terms Offered: II
Years Offered: Annually

NEUR 6221
SYNAPSES: DEVELOPMENT & DEGENERATION
Synapses are fundamental units of communication in a nervous system that is composed of roughly a billion neurons. Almost all of the neurodegenerative disorders disrupt synapses and since they play such a central role in neuronal communication, this leads to a dramatic decrease in cognitive abilities of patients suffering with these debilitating disorders. The course will start with a brief introduction to synapse development and maintenance, leading into the molecular mechanisms of synapse degeneration in neurodegenerative disorders. The course aims to provide students with the essentials required to understand, and ask questions about molecular mechanisms of neurodegeneration.

Prerequisite: None
Terms Offered: III
Years Offered: Annually
Hours per week: Conference/Discussion 2

NEUR 6226
NEUROSCIENCE IN INFECTIOUS DISEASE
Sequelae are defined as a condition resultant of disease, typically a chronic complication of an acute illness. Neurological sequelae are those complications involving the brain and central nervous system and can include intellectual disability, seizures, emotional instability, vision loss, and hearing loss. Although many infections may lead to sequelae, the related pathology and the mechanisms associated with sequelae have not been fully identified. Recent outbreaks of Ebola and Zika virus have further exemplified the need for models to study the development of these conditions. a) The objective of this course is to provide an overview of the immune response to
viruses, bacteria and parasites, the neuroimmune response, neuroanatomy, CNS structural and functional domains, the blood brain barrier, and examples of viral, bacterial, and parasitic encephalopathies with particular focus on route of entry to the CNS (if known), specific neuroimmune responses (if known), and susceptible brain regions (if known). b) Teaching techniques to be employed will be didactic lectures and journal club presentations c) Methods of evaluation will be a) final exam, 2) journal club presentation d) Basis for grading will be 1) class participation, 2) in-class exams, 3) attendance, 4) journal club presentation.

Prerequisite: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

**NEUR 6325** (3 CREDITS)

**BEHAVIORAL NEUROSCIENCE**
The discipline of neuroscience has long used rodents as model organisms. Currently, genetically altered mice are widely used to test specific hypothesis regarding the neural substrates of learning and memory as well as the mechanisms underlying neuro-psychiatric and neurodegenerative disorders. The widespread use of transgenic and knockout mice in neuroscience research necessitates using behavior as an assay to evaluate CNS function. The didactic component of this course will provide a general background in behavioral neuroscience with an emphasis on understanding the anatomical (and neurochemical) pathways that underlie different rodent behaviors. The laboratory component will provide basic skills in assessing the behavioral phenotype of genetically altered mouse models, data analysis, and experimental design. This includes skills in performing an evaluation of rodent general health, reflexes, motor and sensory function, feeding and drinking behavior, emotional behaviors, learning and memory and reward/addiction-like behaviors. There are no exams; grades are based on performance in laboratory assignments and the presentation of a written behavioral neuroscience research proposal (~10 pages, NIH-NRSA format). This course will prepare Neuroscience and Neuropharmacology students for future work using and validating rodent neuro-behavioral models and is also suitable for students interested in utilizing genetically altered mouse models in their research.

Prerequisite: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

**NEUR 6403** (4 CREDITS)

**INTEGRATIVE NEUROSCIENCE**
This required course will form a basis for understanding the organization, functions and disorders of the nervous system. We will study the neurobiological mechanisms of major sensory, motor, emotional-affective and cognitive functions and dysfunctions. The format will be two weekly sessions of lectures with discussion about important concepts and current topics in neuroscience that focus on critical features of integrative nervous system functions: organizational principles of the nervous system, integration among systems, synaptic and cellular plasticity in physiological and disease states, and underlying cellular and molecular mechanisms. Grades will be based on class participation and on midterm and final written examinations.

Terms Offered: III
Years Offered: Annually
Hours per week: 4
Nursing Graduate Program

https://nursing.utmb.edu/future-students/academic-programs/phd-program/

Faculty

Graduate Program Director:
Alice S. Hill, R.N., Ph.D., F.A.A.N.

Professors
Bishop, Sheryl L., Ph.D.
Davila, Yolanda R., R.N., Ph.D.
Hill, Alice S., R.N., Ph.D., F.A.A.N.
Martin, Darlene (Cheyenne), R.N., Ph.D., F.A.A.N.
O’Keefe, Mary, R.N., Ph.D., J.D., F.A.A.N.
Rounds, Linda R., R.N., Ph.D. F.A.A.N.P., F.A.A.N.
Verklan, Terese, Ph.D., F.A.A.N.
Watson, Pamela, R.N., Sc.D.

Associate Professors
Mendez, Thomas, R.N.-B.C., Ph.D.
Phillips, Carolyn A., R.N., Ph.D.
Richard, Patricia L., R.N., Ph.D.
Wiggs, Carol, R.N., Ph.D.
Wisnewski, Charlotte, R.N., Ph.D.

Objectives

The Doctor of Philosophy Program in Nursing is designed to prepare scholars and researchers capable of advancing nursing practice and education. Three focus areas, health promotion, human response, and healing, characterize the conceptual base of the program and define the program’s scope. These three focus areas provide the structure to develop knowledge that will extend the understanding of the promotion of physical, psychological, and social well-being. They also are applied within the context of prevention and the maintenance or restoration of health.

Health is a resource for everyday life, not merely the absence of disease. It includes the ability to realize aspirations, find meaning, satisfy needs, and to change and cope with the environment that is uniquely experienced by individuals and groups. The unique function of nursing includes caring for individuals, sick or well; assessing their responses and health status; and assisting them with the performance of activities they would perform unaided if they had the necessary strength, will, or knowledge as they move toward wholeness. Nursing functions must be based on the systematic development of knowledge about humans in interaction with their life situations. The doctoral program addresses knowledge development that incorporates philosophical and ethical inquiry, the evaluation of interventions, and the development and testing of theories to expand the art and science of nursing and nursing practice.

The program prepares nursing scholars to:
• create conceptual systems that reflect synthesis, coherence, and the extension of knowledge about health promotion, human response, and healing within the context of biobehavioral research, vulnerable populations and contemporary pedagogies;
• design, conduct, communicate, and evaluate research that contributes to a body of knowledge in nursing science;
• test, generate, and extend knowledge about nursing practice that includes health promotion, human response, and healing into clinical settings;
• collaborate with others on the integration of conceptual, practical, and ethical knowledge of human health in the organization, implementation, and evaluation of health care practices and policies; and
• provide leadership to improve the local, national, and international health care environments.

Essential Functions Required for Completion of Program

The following description describes essential functions (abilities) needed to complete the Doctoral Nursing degree program.

Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when unable to read lips. They must be able to see objects up to 20 inches away. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet based or teleconferences.

Communication
Students must be able to convey thoughts and ideas in writing and when speaking. They must be able to encode information into written form through some effective means, and have communication skills sufficient to make presentations. They must be able to speak, read, and comprehend effectively and efficiently in the English language. They must be capable of communicating the background, research questions, hypotheses, methods, results, interpretations, and implications of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, faculty, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small- or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard.

Intellectual and Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to translate information from printed reports to actual research projects. This may involve the integration of their classroom experiences with those obtained from interaction with other researchers and reports in the literature. Each student must be capable of becoming proficient in the statistical analysis and interpretation of their observations.

Professional and Social Attributes
Students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must develop mature, sensitive, and effective professional relationships with others; function as a part of a team; and negotiate conflicts satisfactorily and fairly. Students must be able to focus their attention on activities and decision-making. They must be tolerant of the views of others and capable of assuming responsibility for their actions. They must be able to recognize and employ socially
acceptable actions and behaviors corresponding to environmental and situational demands.

Application of Legal/Ethical Principles and Professional Standards
Students must apply an ethical decision-making process in their studies (e.g. writing of papers, data collection), adhere to the practice standards of the nursing profession, adhere to the legal/ethical standards set forth by the Board of Nurse Examiners for the State of Texas, and participate in the legal/regulatory/social policy processes that influence health care and nursing practice and education. Students must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and function of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, to respect rights of privacy, and to show respect for human subjects.

Program
The program, offered in collaboration with the School of Nursing, has the availability of world-class clinical facilities that provide the opportunity for students to conduct research with multicultural populations. Small class sizes foster individual student attention with timely progression of students from entrance to degree completion. The program is 64 credit hours in length. To this end, students take 15 credits as core courses, including history and philosophy, theory, ethics, health policy development, leadership, and ethics of science. These courses provide the foundation for the students’ doctoral studies and bases for advancing nursing knowledge. Students take an additional 18 credits in research methods and data management/analysis. These courses are designed to provide the foundation for investigating original research ideas. Both quantitative and qualitative methods are presented as approaches to studying nursing phenomena. An additional 9 credits are allocated to understanding the central foci of the program. These courses included the study of health promotion, human response and healing, clinical investigations, and concept analysis. Nine credit hours are allocated to electives and independent study, and 3 credit hours are allocated to a research practicum. The research practicum is a course designed for students to study specific aspects of a project with a faculty member. For example, a student may work with a faculty member who is designing a study, analyzing data, interpreting findings, writing results, or using a particular intervention strategy. Finally, 9 credits are allocated to research seminar (3 credits) and dissertation (6 credits).

GNRS COURSE OFFERINGS

Fall Term Courses
- Research Practicum (GNRS 6039)
- Independent Study (GNRS 6088)
- Research (GNRS 6097)
- Dissertation (GNRS 6099)
- Doctoral Research Seminar (GNRS 6340)
- History and Philosophy of Science in Nursing (GNRS 6341)
- Qualitative Research Methods (GNRS 6348)
- Survey of Instrumentation Methods (GNRS 6352)
- Nursing Science I (GNRS 6357)
- Concepts and Theories in Nursing (GNRS 6400)
- Pedagogy: Teaching, Research and Scholarship in the Clinical Environment (GNRS 6362)

*Required courses for BSN to PhD track only

Spring Term Courses
- Research Practicum (GNRS 6039)
- Independent Study (GNRS 6088)
- Research (GNRS 6097)
- Dissertation (GNRS 6099)
Doctoral Research Seminar (GNRS 6340)
Quantitative Research Methods (GNRS 6346)
Qualitative Data Management (GNRS 6351)
Nursing Science II (GNRS 6358)
Advanced Statistics (GNRS 6402)
*Health Care Policy (GDNP 6325)
*Informatics in Transformation of Healthcare (GDNP 6337)
*Pedagogy: Teaching, Research and Scholarship in the Clinical Environment (GNRS 6362)

*Required courses for BSN to PhD track only

**Summer Term Courses**
- Research Practicum (GNRS 6039)
- Independent Study (GNRS 6088)
- Research (GNRS 6097)
- Dissertation (GNRS 6099)
- Doctoral Research Seminar (GNRS 6340)
- Ethics in Health Care and Research (GNRS 6347)
- Clinical Investigations in Nursing (GNRS 6350)
- Quantitative Data Management (GNRS 6361)
*Pedagogy: Teaching, Research and Scholarship in the Clinical Environment (GNRS 6362)

*Required courses for BSN to PhD track only

**GNRS COURSE DESCRIPTIONS**

**GNRS 6088**
INDEPENDENT STUDY
(1-9 CREDITS)
Detailed or in-depth study in a specific topic area. Topic and mode of study are agreed upon by student(s) and instructor. May be repeated when topics vary.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor. A course plan must be completed, signed by both the faculty and the student, and submitted to and approved by the Nursing Ph.D. program director.
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

**GNRS 6097**
RESEARCH
(3-9 CREDITS)
Formal research directed toward completion of the Doctor of Philosophy degree. The student will develop a research proposal on a topic of his or her own choosing with faculty advice.
Prerequisites: Completion of required course work
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

**GNRS 6099**
DISSERTATION
(3-9 CREDITS)
Students registering for Dissertation are expected to register for a total of 9 credit hours. Formal research and writing leading to the preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student’s supervisory committee. Grading will be based upon the student’s level of performance as reported by the chairperson of the student’s supervisory committee and will be assigned as satisfactory, needs improvement or unsatisfactory.
Prerequisites: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
DOCTORAL RESEARCH SEMINAR
This course is designed for students who are initiating candidacy for the doctoral degree. Participants present their proposals for research in nursing. Emphasis is placed on collegial exchange and shared learning through analysis and critique. Evaluation of student progress is based on presentation and participation.
Prerequisites: Admission to candidacy for the Nursing Ph.D. Program
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Seminar 3

HISTORY AND PHILOSOPHY OF SCIENCE IN NURSING
This course focuses on the study of the history and scope of knowledge in the science of health promotion, human response, and healing and its relationship to nursing science. Epistemological assumptions, theoretical explanations, empiricism, intervention, and social outcomes will be explored. Diverse ways of knowing will be contrasted with the processes of scientific discovery. Evaluation of student progress is based on seminar participation, science paper, and final exam.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

QUALITATIVE RESEARCH METHODS
This course guides students in developing knowledge and skills required for the conduct of qualitative investigations that seek to elicit subjective interpretations of health, healing, and human response phenomena from persons who know and live with them. Selected research approaches and their philosophical and epistemological traditions are explored and critiqued for their usefulness in revealing rich descriptions of contexts, experiences, and meanings. Theoretical, ethical and practical issues are critically analyzed in the context of knowledge development, trustworthiness, diffusion, utilization, and evaluation. Evaluation of student progress is based on course participation, critiques, interpretive exercise, written first draft of proposal and presentations.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6341, 6400
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

SURVEY OF INSTRUMENTATION METHODS
The course provides a study of the theories and methods of instrument development and psychometric assessment applied to nursing. The basic psychometric properties to be assessed and methods to apply them in advance of conducting research are explored. Evaluation of student progress is based on preparation of expert panel review, writing assignments, and objective exam.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

NURSING SCIENCE I
This course emphasizes theories and research related to health promotion, human response, and healing. The analysis, critical evaluation, and interpretation of research in these areas provide students with the foundation to explore original ideas for the purpose of generating nursing knowledge. Theories and related research will be presented and discussed. Students will delineate areas of research interest consistent with the course foci. Evaluation is based on papers, class presentations, and class participation.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 3

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GNRS 6362

PEDAGOGY: TEACHING, RESEARCH AND SCHOLARSHIP IN THE CLINICAL ENVIRONMENT

This course explores the interplay of scholarship, pedagogy and clinical expertise in the patient care environment. Students’ self-assessments will determine the specific clinical populations and care environments where they will participate in selected clinical learning experiences and guided readings. Emphasis also is placed on student’s exploration of the clinical and research literature related to the selected patient population, identification of researchable questions related to that patient population and the ramifications of teaching students within the unique clinical venue.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: I, II, III

Years Offered: Annually

Hours per week: Lecture 3

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GNRS 6400

CONCEPTS AND THEORIES IN NURSING

The course provides an introduction to the nature of scientific inquiry and theoretical conceptualizations within the discipline of nursing. Origins and strategies of theory development and concept analysis are examined with particular emphasis on methods and processes of theory construction, application and evaluation and approaches to concept analysis. Theories and concepts will be evaluated within the context of published research reports. Evaluation of student progress and mastery is determined by class participation, written papers and formal presentations.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 4

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GNRS 6039

RESEARCH PRACTICUM

As part of the research development of the nursing Ph.D. student, this course is designed to provide the student with opportunities to practice and master a variety of research skills and competencies. Building upon prior didactic learning, students in this experience have the opportunity to select specific areas of research interest and work directly with a faculty researcher in a specific project and role.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor. A course plan must be completed, signed by both the faculty and the student, and submitted to and approved by the Nursing Ph.D. program director.

Terms Offered: I, II, III

Years Offered: Annually

Hours per week: Variable

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GNRS 6346

QUANTITATIVE RESEARCH METHODS

(3 CREDITS)
This course is designed to explore the use of quantitative research approaches in the study of human response, health promotion, and healing processes in nursing. The course focuses on quantitative research methodologies, including designs, sampling, measurement methods, and analysis. Emphasis will be placed on models used in writing quantitative questions and hypotheses, and on the governing principles and decision points of research design. Students will be given the opportunity to develop their ideas about human response, health promotion, and healing processes in nursing in the design of a research project using quantitative approaches. Evaluation of student progress is based on participation, presentation, and paper. Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

GNRS 6351
QUALITATIVE DATA MANAGEMENT
This course continues the exploration of qualitative research that began with GNRS 6348: Qualitative Research Methods. The course introduces students to qualitative data management techniques and a variety of analytic strategies used by qualitative researchers to transform and interpret qualitative data. Data analytic strategies are discussed and critiqued from a variety of perspectives, including the impact of the philosophical foundations of selected qualitative approaches on the forms of data collected and how data are managed and analyzed. Practical experiences will assist students to develop the beginning skills required to collect and analyze qualitative data, make informed decisions about analytic strategies, articulate the thinking that supports data analyses, report qualitative findings and interpretations, and engage in detailed discussions of trustworthiness. Ethical and practical issues related to online qualitative research as well as selected computer software programs that support data collection, management and analysis are examined and critiqued. Theoretical and practical issues relevant to the contributions qualitative research can make to nursing's knowledge of human response, health promotion and healing are discussed. Evaluation of student progress is based on class participation, data collection, management and analysis, written papers, class presentations and critiques.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6400, 6341, 6348
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

GNRS 6358
NURSING SCIENCE II
This course builds upon Nursing Science I, emphasizing application of theories and research processes related to Health Promotion, Healing and Human Response within the context of Biobehavioral, Vulnerable Populations, and Contemporary Pedagogy research. Students learn principles of human subjects' protection and develop skills in analysis and synthesis of research data, delineation of researchable question(s), and identifying appropriate research methodology. Evaluation is based on completion of online modules, participation, presentations, written papers, and journal assignments.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6357
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

GNRS 6402
ADVANCED STATISTICS
This is an applied course in statistical analysis that covers widely used univariate and multivariate analyses with an emphasis on understanding and application of fundamental analytical techniques. The course goals are to gain a working vocabulary of important statistical methods, to understand fundamental design issues related to statistical analyses, and to improve
the ability to critically evaluate published findings. Evaluation of student progress and mastery is based on timely completion of assigned modules and homework, homework exercise, module exams, midterm and final exams.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 4

GNRS 6347
ETHICS IN HEALTH CARE AND RESEARCH
This course examines substantive moral and ethical issues that emerge in contemporary health care and explores the technological, socio-political, legal, and economic variables that have helped shape these dilemmas. There is an analysis of nurses’ and other health professionals’ historical traditions as moral agents and patient advocates as well as analysis of current ethical-legal obligations and challenges/barriers to those advocacy roles in a rapidly changing health care environment. The course explores comparative ethical theories and models of ethical decision-making that may serve as a framework for guiding both clinical practice and scholarship in health care. There is also an examination of ethical-legal issues that arise in the context of conducting research. Evaluation of student progress is based on seminar participation, oral presentation, and term paper.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3

GNRS 6350
CLINICAL INVESTIGATIONS IN NURSING
This course focuses on specific clinical investigations in nursing with emphasis on health promotion, human response to illness, and healing practices. The use of concepts and theories in clinical investigation, methodological issues in data management, and instrumentation and measurement are examined within the context of clinical significance to nursing practice. Evaluation of student progress is based on research analysis, completion of a proposal, and seminar participation.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6357, 6358

Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3

GNRS 6361
QUANTITATIVE DATA MANAGEMENT
This is a course in research data management specifically focused on facilitating the design and implementation of quantitative research projects as well as the preparation of data for statistical analyses. It is intended to address required database structures for existing statistical packages to reinforce basic principles of research design and required statistical level of measurement for proper analytical decisions. Students will be required to design and set up basic database, collect an exemplar sample of data, then test their data structures with basic, widely used statistical computer analyses through a series of computer exercises utilizing SPSS as an exemplar. Weekly homework assignments will address data structure, level of measurement, coding, documentation, selection of variables appropriate to various analyses and exemplar statistical computer analyses. Finally, exercises with translating results into graphic displays will complete the cycle of design, collection, data entry, data verification, data analyses and display.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor

Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3
Pharmacology and Toxicology Graduate Program

https://www.utmb.edu/phtox/PHTOX-Graduate-Program

Faculty

Graduate Program Director:
Kenneth M. Johnson, Ph.D., Professor
Department of Pharmacology and Toxicology

Professors
Ahmed, Mahmoud S., Ph.D.
Ansari, G.A.Shakeel, Ph.D.
Cunningham, Kathryn A., Ph.D.
Elferink, Cornelis, Ph.D.
Emmett, Mark R., Ph.D.
Fofanov, Yuriy, Ph.D.
Garofalo, Roberto P., M.D
Hellmich, Mark R., Ph.D.
Johnson, Kenneth M., Ph.D.
Motamedi, Massoud, PhD.
Nilsson, Carol, M.D., Ph.D.
Papaconstantinou, John, Ph.D.
Pettitt, Bernard, Ph.D.
Snodgrass, Wayne R., Ph.D.
Sowers, Lawrence, Ph.D.
Szabo, Csaba, Ph.D.
Zhou, Jia, Ph.D.

Associate Professors
Dineley, Kelly T., Ph.D.
Falzon, Miriam, Ph.D.
Laezza, Fernanda, Ph.D.
Rudenko, Gabrielle, Ph.D.
Yin, Yuhui Whitney,
MD,PhD
Zhang, Wenbo, Ph.D.

Assistant Professors
Allen, John A., Ph.D.
Anastasio, Noelle C., Ph.D.
Green, Thomas A., Ph.D.
Hommel, Jonathan C., Ph.D.
Rudra, Jia, Ph.D.
Rytting, Erik, Ph.D.
Zhang, Kangling, Ph.D.
Objectives of Training Program

Pharmacology and toxicology are interdisciplinary sciences, depending heavily on a strong background in biochemistry, cellular and molecular biology, genetics, and physiology. While students are completing foundation courses to provide this background, the Basic Biomedical Science Curriculum (BBSC) also offers introductory, short, modular eight-week courses (2 credit hrs). The choice of these is up to the student, but the program in pharmacology and toxicology requires that all students take Principles of Molecular Pharmacology, Pharmacokinetics, and Biotransformation (BBSC 6208) and Systemic Physiology and Translational Biology (BBSC 6209). In addition, students are required to complete a series of short courses with a PHTO prefix that are directly related to pharmacology and toxicology research in this program. A minimum of 4 credit hours of electives in a specific subspecialty of pharmacology or toxicology are designed to prepare students for more advanced work in the fields of neurobiology, endocrinology, molecular toxicology, drug metabolism, cellular signaling, or cancer.

Based on this course work, along with seminars, journal clubs, and laboratory rotations, the student is expected to be able to focus critically on a research area, analyze the relevant literature, and, with the guidance of a supervisory professor, ask a specific, relevant and important research question that will serve as the basis of the student’s dissertation project. By working closely with the supervisory professor and other faculty with diverse expertise, the student will proceed to design appropriate experiments and to use appropriate methodological and statistical analysis to answer the research question. Through this process the student should also be able to recognize the strengths and limitations of the model system and the approach taken, enabling him or her to assess the significance of the work. Normally, this dissertation work is expected to lead to several research papers published in well recognized journals in the student’s field of interest.

Students in this program have the opportunity not only to acquire expertise in a single research area, but also to develop a solid foundation in the skills needed for planning and executing research in new areas in the future. With additional postdoctoral training, the graduate should be prepared for an independent research and/or teaching career in an academic, industrial, or governmental setting.

Essential Functions Required for Completion of Program

The following description details essential functions (abilities) needed to complete the Pharmacology and Toxicology degree program.

Observation (to Include the Various Sensory Modalities)
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process,
retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

Communication
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves.

Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities
Students must be able to think creatively and systematically. They must be able to measure, calculate reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. Students must be able to apply information from these various sources to their own research problems, and then to generate and test working hypotheses. They must be able to develop new techniques as needed to
advance their research project. Each must also become proficient in the statistical analysis and interpretation of experimental observations. In order to succeed in these endeavors students must develop and sustain a strong motivation to do biomedical research.

**Professional and Social Attributes**

Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty, and in addition, be able to function as a part of a team and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. Each must also conduct research that is original, and reproducible. They must also be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are also expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and situational demands.

**Application of Legal/Ethical Principles and Professional Standards**

Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

**Programs of Graduate Work**

Although there is a considerable degree of flexibility to accommodate the individual student, the Basic Biomedical Science Curriculum (BBSC) core provides a broad base in biochemistry, cell and molecular biology, and statistics to allow the student to understand a particular problem of interest in pharmacology or toxicology, and how to formulate testable hypotheses. The ultimate goal of the graduate program in pharmacology and toxicology is to provide training for students to become productive, independent research scientists. The training provided consists of both formal and informal interaction with the program’s research faculty during research rotations, departmental seminars, and courses. It is during this training period that each student will have the opportunity to meet, interact with, and ultimately choose his/her prospective Ph.D. advisor. Of course, it is imperative that the faculty and students maintain a close and cordial relationship during the training period. Equally important is that both are open and frank when discussing research or any other issues that arise that could impede progress toward completion of the research in the lab as a whole.
Research currently under way by faculty in the PHTO program provides opportunities for addressing pharmacology research questions at a wide variety of experimental levels ranging from whole animals to single cells to single proteins. The mechanisms by which specific drugs and toxins do what they do is a universal theme in pharmacology and toxicology and is widely pursued in this program, as is the structural and molecular basis of gene expression of specific receptors, enzymes and other proteins. Currently under investigation are questions such as:

1. How do signaling molecules such as protein kinases and GTP-binding proteins regulate various important cellular processes?
2. What mechanisms underlie the addictive and neurotoxic properties of abused drugs?
3. What neurotransmitters and receptors are involved in diseases such as depression, schizophrenia, anxiety, and post-traumatic stress disorder? How do sex hormones affect these diseases?
4. How do hormones and growth factors regulate cancer cell growth?
5. What are the redox sensitive mechanisms that regulate expression of genes involved in lung inflammation and neurodegeneration?
6. How does transcriptional control of cell growth and programmed cell death maintain liver homeostasis?
7. How can image analysis be used to recognize or quantitate labeling, cell types, or pathologic changes in photomicrographs, photographs, or MRI data sets?
8. Is drug adduction of enterocyte proteins a causal factor in NSAID enteropathy?
9. What are the molecular mechanisms by which environmental enrichment impacts drug use?
10. How do early inflammatory illness and/or illicit drug use impact mental health?

A complete list of current research is available from the departmental website (http://www.utmb.edu/phtox/). Please click on the faculty name under the faculty member’s photograph for research interests.

Pharmacology and Toxicology Ph.D. Degree Requirements

1. Successful completion of the first-year basic biomedical science curriculum (BBSC) including two modules covering the principles of pharmacology and systemic physiology.
2. Successful completion of the three-part series in basic medical pharmacology and toxicology (5 credit hours) and four semester hours of approved electives.
3. At least one laboratory rotation (in addition to, or as part of the BBSC laboratory rotation requirement) in pharmacology and toxicology.
4. A passing score on the comprehensive examination* in Pharmacology and Toxicology, usually taken in the late spring or early summer of the second year in the graduate program. This exam consists of written dissertation proposal and a subsequent oral defense of the proposed experiments. The proposal normally stems from original research completed in lab of the supervisory professor in the student's second year. This proposed experiments initially serve as the basis for research leading to a doctoral dissertation. Acceptance of this dissertation and its public defense constitute the final requirements for award of the Ph.D. degree.

*Entrance to candidacy requires successful completion of both the comprehensive examination (usually in May of the second year) and
defense of the dissertation proposal. The comprehensive exam consists of the defense of preliminary data as well as the plans for additional research.

Pharmacology and Toxicology M.S. Degree Requirements

1. Successful completion of all recommended courses.
2. Successful completion of at least one eight-week laboratory rotation.
3. Successful completion of an original research project suitable for publication.
4. Writing and successful public defense of the thesis project or publication of the thesis project with the MS candidate as first author.

Physical Facilities

The Pharmacology and Toxicology Department is well-equipped to carry on research in many areas of molecular, cellular, biochemical, physiological, toxicological, and behavioral pharmacology.

Among the many techniques in routine use are extracellular and intracellular electrode recording of neuronal activity including use of whole-cell patch and sharp electrode recordings; heterologous expression, promoter deletion, transcription factor analysis and site-directed mutagenesis; detection, quantitation, and analysis of mRNA by RT-PCR, ribonuclease protection assays, in situ hybridization, and Northern blotting; detection and analysis of proteins by immunochemistry, Western blotting, 2D-gel electrophoresis, and mass fingerprinting; computer-aided 3-D modeling of enzymes and receptors, X-ray crystallography, genomic and proteomic analyses of responses to specific drugs; fluorescence microscopy, development of software programs for image analysis, separation and detection of transmitters, hormones, xenobiotics and their metabolites by mass spectrometry and HPLC with UV florescence and electrochemical detection; analysis of ligand-receptor interactions by radioligand binding and determination of functional parameters such as IP3 and cAMP; culture of several cancer and primary cell types; and analysis of drug and environmental changes operant and non-operant behavior in mice and rats.

PHTO Course OFFERINGS

**Fall Term Courses** Lab Rotation (PHTO 6022)
- Research (PHTO 6097)
- Thesis (PHTO 6098)
- Dissertation (PHTO 6099)
- Addiction Sciences and Neurotherapeutics (PHTO 6120)
- Neuroaddicts Journal Club (PHTO 6121)
- Advances in Mental Health Research (PHTO 6123)
- Pharmacology & Toxicology Student Journal Club (PHTO 6190)
- Seminar in Pharmacology & Toxicology (PHTO 6195)
- Molecular Toxicology (PHTO 6214)
- New Drug Development (PHTO 6219)
- Neuropharmacology (PHTO 6223)
- Introduction to the Toxicological Risk Assessment (PHTO 6224)
- Autonomic, Cardiovascular and Central Nervous System Pharmacology (PHTO 6312)
- Genome-Wide Analytical Technologies for Biomedical Research (PHTO 6318)
- Principles of Environmental Toxicology (PHTO 6319)
Spring Term Courses
- Lab Rotation (PHTO 6022)
- Research (PHTO 6097)
- Thesis (PHTO 6098)
- Dissertation (PHTO 6099)
- Addiction Sciences and Neurotherapeutics (PHTO 6120)
- Neuroaddicts Journal Club (PHTO 6121)
- Advances in Mental Health Research (PHTO 6123)
- Pharmacology & Toxicology Student Journal Club (PHTO 6190)
- Seminar in Pharmacology & Toxicology (PHTO 6195)
- Synthetic Methods to Biomolecules (PHTO 6211)
- ECT Pharmacology (PHTO 6213)

Summer Term Courses
- Lab Rotation (PHTO 6022)
- Research (PHTO 6097)
- Thesis (PHTO 6098)
- Dissertation (PHTO 6099)
- Advances in Mental Health Research (PHTO 6123)
- Seminar in Pharmacology & Toxicology (PHTO 6195)

PHTO COURSE DESCRIPTIONS

PHTO 6022 (1-8 CREDITS)
LAB ROTATION
The objectives of this course are to acquaint students with the research activities of individual faculty members and to assist students in choosing their areas of specialization. The faculty member and student will design a research project and work out a time schedule committing the student to three to 24 hours per week in the laboratory. The student will prepare an abstract describing the objectives and methodology of the study and then conduct the study under the faculty member's supervision. A final report stating the methods, results, interpretation, problems encountered, and suggestions for future research will be required. In addition to carrying out the research proposal the student will be expected to gain a knowledge of the current literature relevant to the project. Grading will be based on the student's laboratory performance, final written report, and an oral presentation of the project. Grading will be A, B, C, F. Normally, a student entering the program without an advanced degree will be required to complete 12 hours of credit with a grade of B or better prior to gaining admission to candidacy. Individual requirements may vary depending on the research experience of the student.
Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 3-24

PHTO 6097 (1-9 CREDITS)
RESEARCH
Research on thesis or dissertation project under the direction of supervising professor. The research is graded as satisfactory (S) or unsatisfactory (U).
Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 3-27

PHTO 6098 (3-9 CREDITS)
THESIS
Formal research and writing leading to the preparation and completion of the thesis for the Master of Science degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory or unsatisfactory.
Prerequisites: Admission to candidacy for the master's degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable Students registering for Thesis are expected to register for a total of 9 credit hours per term.

PHTO 6099 (3-9 CREDITS)
DISSERTATION
Formal research and writing leading to the preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student's supervisory committee. Grading will be based upon the student's level of performance as reported by the chairperson of the student's supervisory committee and will be assigned as satisfactory or unsatisfactory.
Prerequisites: Admission to candidacy for the Ph.D. degree
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable Students registering for Dissertation are expected to register for a total of 9 credit hours per term.

PHTO 6120 (1 CREDIT)
ADDICTION SCIENCES AND NEUROTHERAPEUTICS
This course will provide an interactive workgroup for trainees to discuss their research in addiction science with graduate students, postdoctoral fellows, and faculty. Emphasis will be placed on therapeutic development and trainees will learn how to approach existing projects with a therapeutic development prospective. Presentation formats will vary in scope and level of analysis, depending on the needs of the trainee. Examples of trainee presentation formats include: expansion of an existing project for grant proposal development, and detailed discussion of data analysis and interpretation. Intermittently, faculty will present information on their research program to provide students with an overview of cutting-edge neuroscience and drug discovery/development topics. Grades will be satisfactory/unsatisfactory based on in-class participation and presentations quality.
Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Conference/Discussion 2

PHTO 6121 (1 CREDIT)
NEUROADDICTS JOURNAL CLUB
The Neuroaddicts Journal Club provides a more cohesive venue for trainees and exposes mentees to a wider range of neuroscience and addictions topics. The goals are for mentees to learn critical thinking of the published literature, the requirements and construction of high quality manuscripts, and presentation skills. Within this environment, mentees have a prime opportunity to refine the ability to converse in both scientific and collegial domains, and become comfortable with asking questions and thinking critical/constructively.
Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Conference/Discussion 2

PHTO 6123 (1 CREDIT)
ADVANCES IN MENTAL HEALTH RESEARCH
This course will provide a solid understanding of current mental health research and promote understanding of factors advancing future groundbreaking mental health research. The course will have a flexible format, including sessions where students discuss relevant papers, present their own data, discuss a wide range of career-development issues, learn about pharmacotherapeutic development, learn advanced grant-writing principles, discuss relevant ethical issues, and learn advanced research techniques. Attendance 50%, participation in classroom discussion 500%, a satisfactory grade requires a score of 80%.
Prerequisites None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Discussion 2

PHTO 6190 (1 CREDIT)
PHARMACOLOGY & TOXICOLOGY STUDENT JOURNAL CLUB
This course is designed to provide an opportunity for students to practice formal presentation skills and discuss science. Students will select research articles from pharmacological journals for presentation to students and student groups. Each student will present and discuss at least one paper per semester depending on the number of students enrolled in the course. Grades will be based on attendance and quality of presentation. Pharmacology students are required to be enrolled in this course every term offered, except for the last term.
Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours Per Week: Conference/Discussion 1

PHTO 6195 (1 CREDIT)
SEMINAR IN PHARMACOLOGY & TOXICOLOGY
Presentations by guest lecturers, staff, and students on the progress of their own research, as well as review of recent advances in pharmacology. Students will receive a grade of satisfactory (S) or unsatisfactory (U) based on attendance and participation.
Prerequisites: Students are required to be enrolled in this course every term offered, except for the last term.
Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Seminar 1

PHTO 6211 (2 CREDITS)
SYNTHETIC METHODS TO BIOMOLECULES
Modern methods for the synthesis of biomolecules will be covered. Biomolecules include various natural products, unnatural amino acids, peptides, nucleotides, carbohydrates, bioactive small molecular chemical probes and drug candidates. The lecture topics will include modern synthetic methods that are useful to access various biomolecules. These synthetic methods include but not limit to solid phase synthesis, combinatorial synthesis, and fundamental organic synthetic approaches such as reductions, oxidations, functional group protections, carbon-carbon bond formation, asymmetric alkylation, asymmetric
allylation, metal-halogen exchange, organolithium reagents, directed ortho metalation, Stille reaction, Suzuki reaction, Heck reaction, stereoselective aldol reaction, olefination, asymmetric epoxidation and catalytic epoxide-opening reactions, asymmetric Diels-Alder reaction, olefin metathesis, synthetic methods for heterocyclic compounds, etc. Course consists of two exams and the grading system Standard A-F.

Prerequisites: Undergraduate organic chemistry

Terms Offered: II

Years Offered: Annually

Hours per week: Lecture 2

PHTO 6213
ECT PHARMACOLOGY
Survey of Pharmacology course covering drugs that affect the endocrine system, drugs used in cancer chemotherapy, anti-parasitic drugs, drugs to treat gastrointestinal (GI) system, anti-histominers, anti-inflammatory drugs and an introduction to toxicology and specific toxic agents.

Prerequisites: None

Terms Offered: II

Years Offered: Annually

Hours per week: Lecture 4.5

PHTO 6214
MOLECULAR TOXICOLOGY
This course will explore in detail the molecular and cellular mechanisms responsive to toxic stimuli using selected examples. In addition, the course will also examine current concepts and research strategies employed in toxicology. The course is presented in three parts: Part 1 - Metabolism and disposition of drugs and toxicants (i.e., absorption, distribution, activation and deactivation of environmental chemicals); Part II - Genotoxic and epigenetic toxicology; Part III - Toxicology in the age of genomics and proteomics.

Prerequisites: None

Terms Offered: II

Years Offered: Annually

Hours per week: Lecture 4.5

PHTO 6219
NEW DRUG DEVELOPMENT
This course will provide a comprehensive overview of the drug discovery and development process, focusing on drug development science, regulation, and industry. Students will learn how promising new drugs are discovered, screened, and evaluated from the standpoint of their safety and efficacy. How drug commercialization decisions are made at each major phase in the drug development process. How information technology is used to increase drug development productivity as well as enhance the commercial potential of drug candidates. Topics include: Molecules to medicines; Drug discovery, design, and screening; Early testing and Safety; Clinical research; Global drug review and approval. Trends and issues in pharmaceutical drug development; Case history, etc. The course grade will be based on class participation (50%) and class project and presentation (50%).

Terms Offered: III

Years Offered: Annually

Hours per week: Lecture 1; Conference/Discussion 4

PHTO 6223
NEUROPHARMACOLOGY
An eight week course meeting three times per week to present the principles of the study of drugs that influence neural systems. The format of the course will be a combination of
faculty and student presentations and discussion. Grades will be based upon two exams, a research paper, and a student presentation.
Prerequisites: Permission of instructor or BBSC Core Curriculum
Terms Offered: 1
Years Offered: Annually
Hours per week: Lecture 4; Conference/Discussion 1; Laboratory 6

PHTO 6224  (2 CREDITS)
INTRODUCTION TO THE TOXICOLOGICAL RISK ASSESSMENT
The objective of this course is to provide a basic foundation on the toxicological risk assessment process. The course format is lecture-based with supplement from online materials and experiences, as well as practical application aligned with book chapter commentary, and case studies. Students will be provided a risk assessment simulation exercise to experience and understand the risk assessment process. Within this course, students learn about: 1) the building blocks of risk assessment, 2) the risk assessment process, 3) how risk assessment is applied and used in decision making scenarios, 4) current and emerging issues in risk assessment, and 5) the skills and professional resources available to those interested in risk assessment. After completing the course, the student will be able to: 1) define and explain toxicological risk assessment, 2) comprehend the application of risk assessment, 3) demonstrate effective use of risk assessment technique, 4) demonstrate competent science and math skills associated with risk assessment, 5) employ ethical principles in the application of risk assessment, 6) demonstrate the ability to work effectively in teams and in discussion-based format.
Course performance grading will be standard letter grades, based on exams, individual projects, class participation/discussion, and attendance.
Prerequisites: None
Terms Offered: 1
Years Offered: Even Years
Hours per week: Lecture 2

PHTO 6312  (3 CREDITS)
AUTONOMIC, CARDIOVASCULAR AND CENTRAL NERVOUS SYSTEM PHARMACOLOGY
This fifteen-week course serves as an introduction to the cellular, biochemical, and molecular effects of pharmacological agents acting on the autonomic and central nervous systems as well as the cardiovascular and renal systems. Prior to detailed presentations of the various classes of agents used to treat disorders of the aforementioned systems, the pertinent physiology of each system will be reviewed. The therapeutic use, mechanism of action, adverse effects, and absorption, distribution, and metabolism will be emphasized for each pharmacological agent presented in class. This course will be graded on the basis of four in-class examinations.
Prerequisites: None
Terms Offered: 1
Years Offered: Annually
Hours per week: Lecture 3

PHTO 6318  (3 CREDITS)
GENOME-WIDE ANALYTICAL TECHNOLOGIES FOR BIOMEDICAL RESEARCH
New developments in technologies such as proteomics, metabolomics, epigenetics, and molecular imaging are expanding our knowledge of the biological world at a rapid pace. These analytical approaches and expertise are accessible at UTMB. The student is offered education in cutting-edge technologies for application in biomedicine. The course is a blend of lectures, literature seminars, and practical demonstrations of data acquisition and data analysis. At the end of the course, the student will be able to identify and apply experimental strategies that best fit their biomedical experimental hypothesis. Grading: The examination will consist of a 5-page research proposal that describes the application
of genome-wide technologies to a biomedical hypothesis. The exam will effectively integrate the student's working knowledge of materials discussed in seminars, lectures and practical demonstrations.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 2

PHTO 6319  (3 CREDITS)
PRINCIPLES OF ENVIRONMENTAL TOXICOLOGY
This course will be a graduate-level presentation of fundamental principles of environmental toxicology, including basic concepts like ADME (absorption, distribution, metabolism, and excretion), mechanisms of toxicity and injury, inflammation and ROS, overviews of discipline-specific toxicology (e.g., genetic toxicology, immunotoxicology, and toxicant-associated carcinogenesis), as well as organ-system-based toxicology covering major organ systems of the body (e.g., neurotoxicology, hepatotoxicology, renal toxicology, cardiovascular toxicology, and respiratory toxicology), and including developmental toxicology. Grades will be calculated based on 2 mid-term and final in-class exams, and class attendance.

Prerequisites: None
Terms Offered: I
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3
Clinical Science, Population Health Sciences, Master in Public Health, Rehabilitation Sciences

http://pmch.utmb.edu/education

Faculty

Graduate Program Director PHS: M. Kristen Peek, Ph.D.
Graduate Program Director CS: Karl E. Anderson, M.D.
Graduate Program Director MPH: Christine Arcari, M.P.H., Ph.D.
Graduate Program Director RS: James Graham, Ph.D.

Professors
Anderson, Karl E., M.D.
Baillargeon, Jacques G., Ph.D.
Chonmaitree, Tasnee, M.D.
Davis, Jeffrey R., M.D.
Eschbach, Karl, Ph.D.
Fraser, John Jr., M.D., J.D., M.P.H.
Freeman, Vicki S., Ph.D.
Goodwin, James S., M.D.
Jacobs, Danny O., M.D., M.P.H.
Herndon, David N., M.D.
Jennings, Richard T., M.D.
Kuo, Yong-Fang, Ph.D.
LeDuc, James, Ph.D.
Lu, Lee-Jane, Ph.D.
Markides, Kyriakos S., Ph.D.
Mayhall, C. Glen, M.D.
Ottenbacher, Kenneth J., Ph.D.
Paddon-Jones, Douglass, Ph.D.
Peek, M. Kristen, Ph.D.
Ramanujam, V.M. Sadagopa, Ph.D.
Rasmussen, Blake B., Ph.D.
Rudkin, Laura L., Ph.D.
Sidossis, Libros, Ph.D
Sumen-Velas, Oscar, Ph.D.
Vanderploeg, James, M.D., M.P.H.
Weller, Susan C., Ph.D.
Wong, Rebeca, Ph.D.

Associate Professors
Al Snih, Soham, Ph.D.
Arcari, Christine, M.P.H., Ph.D.
Croisant, Sharon A., Ph.D.
Carroll, Richard M., Ph.D.
Fisher, Steven, Ph.D.
Graham, James E., Ph.D.
Spratt, Heidi, Ph.D.

Assistant Professors
Arceneaux, Cassandra, M.D., M.P.H.
Castleberry, Tarah, Ph.D.
Chen Nai Wei, Ph.D.
Cooksey, Catherine Sue, PH, M.P.H.
Downer, Brian, Ph.D.
Jennings, Kristopher, Ph.D.
Jupiter, Daniel, Ph.D.
Karmarkar, Amol, Ph.D.
Kaul, Sapna, Ph.D.
Lyons, Elizabeth, Ph.D., M.P.H.
Mathers, Charles H., M.D.
Murray, Kristy, D.V.M., Ph.D.
Mutambudzi, Miriam, Ph.D., M.P.H.
Pennel, Cara, Ph.D.
Porter, Craig, BSc, Ph.D.
Prochaska, John, P.H.
Rogers, Selwyn, Ph.D.
Veeranki, Sreenivas Phani, Ph.D.
Wooten, Kevin, Ph.D.
Programs

Reductions in morbidity and mortality during the 20th century resulted in large part from effective health promotion and disease prevention programs. In the 21st century, these activities will continue to be central to improving population health and reducing health disparities. The PHS Graduate Programs including Clinical Science, Population Health Sciences, Master in Public Health, and Rehabilitation Sciences prepare students to conduct, communicate, and apply research aimed at the protection and promotion of population health.

The Clinical Science (CS) program provides advanced training in clinical and health services research involving human subjects and populations. Nationally, there is increasing emphasis on preparing researchers to focus on discovery and application within clinical and translational medicine. The CS Program’s aim is to train individuals to investigate basic human biology, particularly as related to disease etiology and pathogenesis; to translate advances in the basic sciences into new treatments for human diseases; and to improve health care services in a rapidly changing health care environment. The CS program leads to the Ph.D. or M.S. degree. This multi-disciplinary area of study is designed to provide health care professionals with the didactic and experiential education required for the pursuit of academic or practical careers in health and medicine with an emphasis on studies in humans as individual study subjects or as populations. Physicians and other health care professionals who complete this training are positioned to become future leaders in academic medicine and clinical research. They are qualified for faculty positions as well as for other research positions such as in industry.

The Population Health Sciences (PHS) program trains students to develop and carry out independent and collaborative interdisciplinary research relevant to disease prevention and health promotion and restoration in human populations. Training emphasizes the development and mastery of high-level quantitative skills in data collection and analysis. The PHS program emphasizes an ecological perspective on population health that explores the interplay of individual biological and behavioral factors with aspects of the physical, social, and policy environments. Research focuses on health risks, determinants, outcomes, and interventions in clinical and community settings. Students in this program can obtain an M.S. or Ph.D. degree.

The Master in Public Health (MPH) program contributes to the protection and promotion of health in human populations by preparing students to practice skillful and evidence-based preventive medicine and public health, conducting and communicating research that informs the diverse fields within public health, and providing interdisciplinary expertise in the service of academic, professional, and community-based public health organizations. The MPH program works toward this mission through the development, integration, and continual improvement of activities from our rigorous instructional program, collaborative and productive research agendas, and wide-ranging service commitments. Students in this program obtain an MPH in one of three tracks: Aerospace Medicine, Epidemiology, or Biostatistics.

The Rehabilitation Sciences (RS) program includes an emphasis on the Institute of Medicine’s Enabling–Disabling Model of rehabilitation and health. This model focuses on the need for outcomes research to reduce and prevent disability, and to advance evidence-based health care in rehabilitation. Through interdisciplinary experiences, including a solid theoretical and methodological foundation in clinical and community health-related rehabilitation services, students are provided with advanced training in rehabilitation sciences, including assessment, development, restoration, and maintenance of independent function in persons with physical and cognitive impairments. Rehabilitation Sciences also include methods to prevent disability and the examination of adaptation to functional impairment, and social limitations resulting from a disability. Students in this program will obtain a PhD and is directed towards individuals who have a degree in a rehabilitation-related field and have expressed a clear commitment to a career in rehabilitation and disability research.

The PHS graduate programs offer three dual-degree options, Medicine and Public Health (M.D.-M.P.H.), Doctorate and Public Health (Ph.D.-M.P.H.), and Medicine and Clinical Science (M.D.-M.S.). The Ph.D. program in PHS and RS and the M.P.H. degrees with tracks in
Aerospace Medicine, Epidemiology, and Biostatistics, are all accredited by the Council on Education for Public Health (CEPH).

**ESSENTIAL FUNCTIONS OF THE PROGRAM**

The following description details essential functions (abilities) needed to complete any of the Population Health Sciences programs. The PHS graduate programs support the opportunity afforded individuals with disabilities by The Americans with Disabilities Act of 1990 and encourage potential students to explore their interests and consider the match between their abilities and the job requirements for careers in population health, public health, clinical science or rehabilitation sciences.

If accepted into any of the programs, students requiring accommodations for successful achievement are encouraged to identify their needs as soon as possible to enable instructors to provide reasonable accommodations. Guidelines for establishing a disability and requesting accommodations are contained in Students with Disabilities: An Institutional Policy (1997). For a copy of the policy and assistance with this process, students should contact the UTMB Coordinator of Services for Students with Disabilities (CSSD) at 301 University Blvd., Galveston, TX 77555-0106 or call (409) 772-1463. Any information regarding a disability is considered confidential; only those individuals responsible for assuring the reasonable accommodations will have access to this information.

**Student Job Description**

According to Students with Disabilities: An Institutional Policy (1997, p. 8), all candidates for degrees at The University of Texas Medical Branch at Galveston must be able to perform the following essential functions with or without reasonable accommodations:

1. **Observation** (to include the various sensory modalities)—accurately observe close at hand and a distance to gather data and learn skills.
2. **Communication**—communicate effectively and efficiently; process and comprehend written material; proficient in English (written and oral).
3. **Psychomotor Skills**—execute the various tasks and any physical maneuvers that are required within each curriculum or course.
4. **Intellectual and Cognitive Abilities**—measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information; comprehend three dimensional relationships; and understand the spatial relationships of structures. Creative problem solving and scientific reasoning require all of these intellectual abilities.
5. **Professional and Social Attributes**—exercise thoughtful judgment and promptly complete all responsibilities required of each curriculum or course; develop and maintain mature, sensitive, and effective professional relationships with others; function effectively under stress; adapt to changing environments; display flexibility; and function in the face of uncertainties and ambiguities. Express concern for others; interpersonal competence and motivation are requisite for all curricula or courses.
6. **Ethical Standards**—demonstrate professional attitudes and behaviors; perform in an ethical manner in dealings with others. All PHS curricula require personal integrity and the adherence to the highest standards of professional conduct.

In addition, students in any of the PHS programs will need to perform the following essential cognitive, affective, and psychomotor functions, with or without reasonable accommodations:

1. Process, retain, and integrate information from the following types of sources: oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides;
film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; internet-based or teleconferences; lab, equipment, and machinery; evaluation and intervention tools; and community-based preventive activities.

2. Complete coursework that may require independent mobility to various locations on and off campus and other geographic areas; individual, partnered, or group efforts; satisfactorily following written or oral instructions; recording personals opinions, knowledge, or ratings; verbalizing personal thoughts, feelings, and other opinions; instruction of others; presenting oral reports; facilitating group discussions; role playing; managing time effectively; exposure to hazardous materials; working with individuals with infectious diseases and terminal illnesses; and working in potentially life-threatening situations or with such agents.

3. Take and pass in a timely fashion scheduled and pop quizzes, exams, practical demonstrations, or other field assessments in a variety of formats. During the PHS educational experiences, the student may be required to attend class or other learning sessions that meet at times other than conventional workday hours such as during the evening hours or on weekends. Students must be able to physically attend classes of up to three hours duration. Required learning experience may also involve relocation to other sites in Texas or surrounding states at the student’s expense.

**Lecture**

**Essential Functions**

1. Process, retain, and integrate information from the following types of sources:
   a. oral delivery/reading by instructor(s) or student(s)
   b. blackboard data and diagrams
   c. printed material (handouts, manuals, texts)
   d. overhead transparencies
   e. slides
   f. film and video segments
   g. audio recordings
   h. live demonstrations
   i. computerized records

2. Respond to questions asked or problems formulated. Ask questions pertinent to topic.

3. Participate in large- and small-group discussions and tasks in a fashion that recognizes others’ need to understand.

4. Complete in-class exercises/activities that may require:
   a. recording personal opinions, knowledge, or ratings
   b. following written or oral instructions

5. Present oral reports (planned or impromptu) or do role-plays or other active learning strategies.

6. Take and pass tests in a timely fashion in a variety of formats, both written and computer-generated.

7. Demonstrate the following professional behaviors:
   a. arrive punctually
   b. notify faculty if circumstances prevent attendance
   c. satisfactorily make up missed assignments
   d. assume responsibility for personal actions
   e. demonstrate functional level of self-confidence and assurance
f. demonstrate the ability to be a cooperative and contributing member of the group

h. state own opinions assertively

i. establish priorities relative to assignments

j. demonstrate honesty and personal integrity

k. handle personal anxiety

l. respect the rights of others

m. handle numerous assignments and responsibilities simultaneously

**CURRICULUM**

The M.S. and Ph.D. curriculum plans includes core program requirements as well as curriculum specific courses. Research projects and elective courses can be tailored to meet individual student’s interests and career goals. Students in the CEPH accredited programs have additional requirements. Degree requirements include:

- A minimum of 36 credit hours (M.S.)
- Core courses in clinical and population health sciences
  - Biostatistics
  - Epidemiology
  - Prevention and Public Health
  - Research Design and Methods
  - Seminar
- Curricular track and elective courses
- An Ethics of Science course
- Written and oral qualifying examinations (Ph.D.)
- Completion of an original research project resulting in a written thesis (M.S.) or dissertation (Ph.D.)
- An oral presentation and defense of the dissertation research (Ph.D.)

The Graduate Program Directors for each program serve as the student’s initial advisor and will guide the student in developing a course plan that includes all curriculum specific requirements. Students select elective courses from among the diverse offerings of the PHS Graduate Program or from other GSBS Programs. Among the courses available within PHS are advanced courses in biostatistics and epidemiology and courses addressing theory, methods, and research in health disparities, aging, infectious disease, environmental health, applied nutrition, rehabilitation studies, vaccine policy, health behavior, and health care services research.

The typical Ph.D. curriculum plan includes two years of course work providing the student with strong quantitative research skills and an understanding of theory and methods within the specific curricular area. Students also work on mentored research projects during these academic years. The student takes the qualifying examination in the third year to demonstrate proficiency in the required knowledge and skills and to show readiness to conduct independent research. Submission of an approved dissertation proposal advances the student to candidacy for the degree. Completion, presentation, and defense of the dissertation project are the final requirements in the curriculum plan.

PHS courses and curricula provide a unique interdisciplinary and interprofessional experience. M.D. and Ph.D. teaching faculty members come from a range of clinical and population health science disciplines and have varied areas of research expertise. Students enrolled in PHS degree programs include medical
students, residents and fellows, nurses, physical therapists and other health professionals, and traditional graduate students.

**phs Course Descriptions**

All course offerings are contingent upon adequate student enrollment.

**PHS 6011 (1-9 CREDITS) COMMUNITY HEALTH RESEARCH**
This course allows the student, under faculty guidance, to engage in a limited research project unrelated to his or her thesis or dissertation, but concerned with preventive medicine or community health. Credit and hours to be arranged.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

**PHS 6020 (3-6 CREDITS) SPACE LIFE SCIENCES LABORATORY ROTATION**
This course will provide an opportunity for students to gain working experience in a space life sciences laboratory, to collect data, and to conduct experiments under the supervision of a mentor. The primary goal of this course is to assist students in choosing their areas of dissertation specialization. The students' performance in the laboratory will be evaluated by the supervising mentor to provide the course grade.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory

**PHS 6033 (1-9 CREDITS) CLINICAL SCIENCE RESEARCH**
The objectives of this course are to acquaint Clinical Science graduate students with the research activities of individual faculty members and provide opportunities to practice and master research skills and competencies. This course allows the student to engage in a limited research project in clinical and translational science, as broadly defined, that is unrelated to his or her planned thesis or dissertation. The research topic will relate to the student's individual educational needs, and must be approved by the student's academic advisory committee. A GSBS faculty member must agree to supervise the research and evaluate the performance of the student. Grading is based on accomplishments during the course and an end-of-semester research report. Credit may range from 1-9 hours, based upon time applicable to work on the clinical research project and must be specified at the time of course registration. A written research plan that specifies an identified mentor and Instructor consent are required for enrollment.

Prerequisites: Permission of instructor
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Laboratory 3-27

**PHS 6056 (1-4 CREDITS) TOPICS IN BIOSTATISTICS**
This is a reading course for students interested in particular areas of biostatistics. The course changes from year to year depending on the needs of the individual students. Materials on graphical methods in categorical data analysis and other areas that include structural equations models and survey sampling will be reviewed. The student is evaluated with written papers and oral examinations on a weekly basis. Credit and hours to be arranged.
Prerequisites: PHS 6443; permission of instructor
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 2-8

PHS 6077 (3-6 CREDITS)
RESEARCH PRACTICUM IN SOCIOMEDICAL SCIENCES
This course is designed to provide the student an opportunity to gain practical experience in the design and/or implementation of research. A student may choose to do a practicum as part of an ongoing faculty research project or as an independent experience in a community or institutional setting. Selection of the research topic will depend on individual needs of the student and must be approved by the student’s academic advisory committee. A faculty member will agree to supervise the practicum.
Prerequisites: PHS 6485
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 3-6

PHS 6097 (1-9 CREDITS)
RESEARCH
This course is designed to afford the student the opportunity to develop a thesis or dissertation proposal under faculty guidance. The proposal development may involve a literature search, preliminary experimentation, or a pilot field study. The research will be preliminary but relevant to the thesis or dissertation. Credit and hours to be arranged. Teaching technique is tutorial in nature.
Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

PHS 6098 (3-9 CREDITS)
THESIS
Formal preparation and completion of the thesis for the Master of Science degree under the direction of the student’s supervisory committee. Grading is based on the student’s level of performance as reported by the chairperson of the student’s supervisory committee and is assigned as satisfactory, needs improvement or unsatisfactory.
Prerequisites: Admission to candidacy for the master’s degree Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

PHS 6099 (3-9 CREDITS)
DISSERTATION
Formal preparation and completion of the dissertation for the Doctor of Philosophy degree under the direction of the student’s supervisory committee. Grading is based on the student’s level of performance as reported by the chairperson of the student’s supervisory committee and is assigned as satisfactory, needs improvement or unsatisfactory.
Prerequisites: Admission to candidacy for the Ph.D. degree Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Variable

PHS 6133 (1 CREDIT)
INTRODUCTION TO THE DESIGN OF EXPERIMENTS
This course provides students an introduction to the design and analysis of experiments and introduces a variety of experimental designs that are commonly used in biomedical research. Those designs include the completely randomized design, randomized block design, split-plot design, factorial experiment, and experiments with repeated measures and covariates. Analysis and interpretation of data from each type of those designs will be
discussed with examples including construction of analysis of variance tables. Selection of sample size will also be discussed. Issues regarding procedures for multiple comparisons and contrasts of means will be introduced. Statistical analysis will be conducted using the SAS statistical software package.

Prerequisites: PHS 6443 and a working knowledge of a statistical package, e.g., SAS, SPSS, StatView

Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 1

PHS 6135 (1 CREDIT)
CLINICAL RESEARCH: TOOL AND TECHNIQUES
This course provides an overview of methods that are important in clinical investigation and is supported by the General Clinical Research Center (NIH funded). Core topics include basic concepts of study design, statistics, epidemiology, drug development, tracer methods, pharmacokinetics, nutritional assessment, molecular methods, and gene therapy (Part I of the course). Part II is tailored to the interests of particular students. Session formats include lectures, group discussions, problem-based learning, and literature review. Students will be evaluated by participation in discussions.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 1

PHS 6140 (1 CREDIT)
SCHOLARS IN EDUCATION
The course provides two to three modules each semester using inquiry-based interactive class sessions. Major topics include Principles of Teaching and Learning, Curriculum Development, Instructional Methods, Instructional Technology, Learning Organizations, Education Evaluation, and Medical Education Scholarship. Besides attending sessions, participants will be assigned two to four hours of between-session readings and/or educational exercises. During the semester each participant will carry out an individual educational research or development project, develop an educational portfolio, or present a project to a group of invited guests. Students will be evaluated based on their participation during class and performance on project, portfolio, or presentation.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Biennially-Even Years
Hours per week: Discussion 1

PHS 6150 (1 CREDIT)
INTRODUCTION TO SAMPLING METHODS
This is an introductory course. It will emphasize the logic of sampling selection and will cover basic probability sampling designs including simple random sampling, stratified sampling, cluster sampling, and stratified cluster sampling. An understanding of the advantages and disadvantages of ratio estimators will be covered as well. The statistical estimators of a population’s mean, total, and proportion will be covered. Students will be expected to read and understand significant amounts of assigned material and be prepared to lead a discussion of the material during class. Half of each class will be used for lecture and half will be reserved for discussions of the assigned readings. Students will consider various sampling plans pertaining to their individual areas of study. Student evaluations will be based on an exam and class participation in discussions.

Prerequisites: College algebra; Intro to Statistics; permission of instructor Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Conference 1

PHS 6195 (1 CREDIT)
SEMINAR
This course is a survey of current problems, programs, and needs in population health sciences. Seminar is intended to provide students with continuing education on issues and advances in the field, serve as a forum for the exchange of information about student research interests, and offer practical experience to prepare the student for research presentations.
Prerequisites: None Terms Offered: I, II
Years Offered: Annually
Hours per week: Seminar 1

PHS 6210 (2 CREDITS) INTRODUCTION TO DATA MANAGEMENT
This course provides an introduction to the management of data using computer packages. The basics of data management language and data steps will be presented. The course includes instruction in how to read, write, edit, and store data. Instruction is provided on modification, combination, and updating of data sets, as well as production of data summaries. Packages covered may include SAS, Minitab, or S+.
Prerequisites: Permission of instructor Terms Offered: I
Years Offered: Annually
Hours per week: Laboratory 3; Lecture 1

PHS 6215 (2 CREDITS) EPIDEMIOLOGIC RESEARCH USING LARGE PUBLIC DATABASES
The purpose of this course is to provide students with the skills required to manage and analyze large public databases such as SEER and Medicare data for epidemiologic research. These databases carry great potential for answering many important research questions and for evaluating the outcomes of medical care. Many techniques and skills learned from using these typical databases could readily be applied in the analysis of other large datasets. The course format consists of two-hour meetings a week with lectures and hands-on exercises. Evaluation methods: class participation, homework assignments, midterm and final proposals, and presentation.
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

PHS 6220 (2 CREDITS) COMMUNICABLE DISEASES
This course will offer students an introduction to public health methods for the control of infectious diseases and the impact of infectious disease as a co-morbidity of chronic disease. These principles will be elucidated by studying major infectious disease groups that affect human health. Topics will include pathobiology, epidemiology, epidemic potential, and international health impact. Emphasis will be on methods of identification, suspected infectious agent, occurrence, reservoir mode of transmission, incubation, period of communicability, susceptibility and resistance, methods of control, reporting and legal requirements, and on research needs and discovery of new public health methods for the surveillance and control of major disease groups. Global Health trends will be presented and students will be introduced to the various control measures currently employed by public health practitioners and clinical preventive medicine specialists. Outbreak investigation will be presented and the role of infectious disease in disaster will be discussed. Student will be graded based on class participation and preparation, a presentation on a selected topic, quizzes and a final exam.
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2
PHS 6223 (2 CREDITS)
COMMUNITY HEALTH PRACTICE I
The expectation is that the student will integrate the information learned in the academic curriculum in the context of a hosting entity that is concerned with an aspect of community health in various environments such as communities, workplaces, or institutions. This will be accomplished through systematic analysis of issues, incorporation and appropriate use of data, and applications of subject matter expertise such as biometry, epidemiology, social behavior sciences, management and policy sciences, and environmental sciences. At the conclusion of this integrative experience in community health practice, each student will present a seminar that describes their observations and that relates their understanding of the salient features related to effective practice of community health in the context of their assignment. This course is designed for the residency curriculum.
Prerequisites: PHS 6382; PHS 6227
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 2

PHS 6227 (2 CREDITS)
INTRODUCTION TO OCCUPATIONAL INJURY AND ILLNESS
This course will be taught in lecture format, with handouts and slides, using one text as reference. It will serve as an introduction to occupational medicine for the three residencies in Preventive Medicine (Aerospace, General Preventive Medicine, and Occupational Medicine) and will be open to fourth-year medical students and residents at UTMB to take as an elective without credit. Students will learn the history of occupational medicine and get an overview of a variety of work- and health-related subjects. The course will be offered in the summer with an intensive five-day curriculum comprising a total of thirty hours of contact time. The course will be conducted with an optimum mix of lectures, case discussions, challenging exercises, and interesting site visits.
Prerequisites: Permission of instructor
Terms Offered: III
Years Offered: Annually
Hours per week: 1 Lecture; 1 Discussion

PHS 6233 (2 CREDITS)
EPIDEMIOLOGY OF INFECTIOUS DISEASES
This course is designed as an introduction to the epidemiologic and public health aspects of infectious diseases of importance in the United States and globally. Emphasis will be placed on specific diseases and their etiology, distribution, determinants, prevention and control. After completing this course, students should be able to understand the epidemiologic characteristics of various infectious diseases, and how epidemiologic methods are applied to study these diseases. Students will gain knowledge through lectures, class discussion, an outbreak exercise and an individual project.
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

PHS 6250 (2 CREDITS)
DIRECTED STUDIES IN METABOLISM
This course will introduce students to research in metabolism and keep them abreast of the latest developments in this field by utilizing readings and discussion of current literature and presentation and discussion of current research by staff and guest speakers. Grading S/U except for students giving a presentation.
Prerequisites: Admission to PHS graduate program for study in this area
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Conference/Discussion 2
PHS 6261  (2 CREDITS)
IMMUNIZATION FOR THE PROTECTION OF THE PUBLIC HEALTH
This course will provide students with an understanding of vaccine development and
immunization policies. By completion of this course students should understand: 1. The
impact vaccines have made on the public health; 2. The development, composition, testing
and use of vaccines; the regulatory imperatives for vaccine production; 3. The factors that
affect the availability, supply, delivery and administration of vaccines; 4. The balance of
vaccine safety and vaccine efficacy; 5. The impact of health economics on the availability
and use of vaccines; 6. That public health objectives may differ substantially from the
objectives of other stakeholders; 7. The development and implementation of immunization
policy. The student will be evaluated based on class participation and a final examination.
Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

PHS 6312  (3 CREDITS)
MINORITIES AGING AND HEALTH
This course provides students an opportunity to obtain an overview of issues related to the
health of America’s elderly from different ethnic minorities. Special emphasis will be given to
mortality and life expectancy, chronic disease and disability, diet and nutrition, mental health,
health services and long-term care, and health policy. This lecture and discussion course
will be graded with a mid-term exam, a final take-home examination, a term paper, and
class participation.
Prerequisites: Permission of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 1

PHS 6313  (3 CREDITS)
LONGITUDINAL DATA ANALYSIS
This course will introduce students to the analysis of longitudinal data. The topics will be
motivated by actual data sets, chosen by the instructor or possibly the students, and will
cover both continuous and categorical outcomes. Statistical concepts and theory will be
presented and related to applied settings where possible. Topics will include a review of
matrices, paired data, general linear models for longitudinal data, the mixed model, time
varying covariates, general estimating equation (GEE) methods, and weighted least squares
(time permitting).
Homework and exams will require the use of SAS. Grading will be on the A-F scale and
based on class attendance and participation, weekly homework assignments, and two
take-home exams.
Prerequisites: PHS 6443 and PHS 6344
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

PHS 6314  (3 CREDITS)
METHODS IN HEALTH SERVICES RESEARCH
This course provides students with the means of applying epidemiologic and biostatistical
methods to the design of population based studies in health services research. Such
studies are commonly used in the field to assess the utilization, cost and outcomes of
health services in community settings. Course material is covered in three sections, which
addresses measurement issues, study design and statistical approaches. Topics include
confirmatory factor analysis in scale development, data management and measurement
issues with administrative dates, the use of randomized controlled trials and case control
studies in health services research, the analysis of complex sample survey data, Poison
regression and the statistical comparison of population based rates of health care use and outcomes. A standard G-1 grading system will be used for this lecture course. The final grade will be based on class participation, two case studies, and a research proposal.

Prerequisites: None

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 3

PHS 6316 (3 CREDITS)
EPIDEMIOLOGY OF CANCER
This is an introductory course that will acquaint students with basic information on cancer biology and pathophysiology, focusing on biochemical and molecular mechanisms of carcinogenesis including biomarkers of cellular injury, mutagenesis, and neoplastic processes as these relate to the epidemiology of the most common forms of cancer. Patterns of cancer occurrence will be reviewed to identify variations and to familiarize students with various theories about the etiologies of the family of diseases known as cancer. The course will explore the significance of physical, chemical, and behavioral risks as etiologic agents. Attention will be given to factors that affect disease incidence and survival including the application of primary prevention and screening and early detection activities. Methodological issues pertinent to cancer epidemiology will be discussed and students will learn about common cancer data sources such as the SEER program. The course will employ a variety of learning strategies including lecture/discussion, reading assignments, and student projects. Grades will be based on participation in discussion, student presentations, mid-term and final exams, and a term project wherein students will be encouraged to select a cancer of a specific organ site or system and to review the epidemiology, focusing attention on factors that lend themselves to modification such as hazardous exposure to smoking, radiation, chemicals, occupations and manufacturing processes, and dietary or sexual practices.

Prerequisites: PHS 6330, PHS 6443 and undergraduate pathophysiology course or permission of instructor

Terms Offered: III

Years Offered: Biennially- Even Years

Hours per week: Lecture 3

PHS 6318 (3 CREDITS)
SOCIOMEDICAL APPROACHES TO HEALTH STUDIES
The primary goals in this course are to provide students with an overview of theory and knowledge in sociomedical sciences (SMS) and to introduce students to methods of integrating this information into the practice of health promotion at both the clinical and community levels. Subject areas covered in the course will include research methods in SMS, social and behavioral determinants of health status, assessment of social and behavioral risk factor profiles in patients and communities, and social and behavioral science contributions to the design and implementation of health promotion activities. At the end of the course, students should have general knowledge regarding methods of data collection in sociomedical sciences; critical evaluation of SMS research articles; observed associations of social, cultural, behavioral, and psychological factors to health outcomes; hypothesized causal pathways linking these factors to health outcomes and the evidence for the various hypotheses; principles of health behavior and behavior change at the individual, interpersonal, and group levels; the application of social and behavioral science principles and knowledge to the practice of both clinical preventive medicine and public health; assessment of community (broadly defined) health needs; and evaluation of social and behavioral intervention.

Prerequisites: None

Terms Offered: I

Years Offered: Annually

Hours per week: Lecture 1; Conference or Discussion 2
PHS 6321  (3 CREDITS) SURVIVAL ANALYSIS
This course exposes students to the following: scope of survival analysis; the clinical trial environment; define failure times; left and right censoring; accelerated failure time testing; distributions of failure times (particularly families of exponentially distributed failures); hazard functions; survivorship functions; product limits and actuarial estimators; statistical tests for comparing failure Time distributions; statistical software for survival analysis; competing risks and proportional hazards; time dependent covariates; issues in monitoring clinical trials, including interim analysis; and sequential clinical trials. Grading will be based on two take-home examinations (30 percent each) and the development of two survival-outcomes-based clinical studies protocols and analysis plans (20 percent each).
Prerequisites:  PHS 6443 (Statistical Methodology I) and PHS 6344 (Statistical Methodology II)
Terms Offered:  III
Years Offered:  Biennially-Even Years
Hours per week:  Lecture 3

PHS 6322  (3 CREDITS) DESIGN AND METHODS IN CLINICAL, NUTRITIONAL, AND ENVIRONMENTAL TOXICOLOGY RESEARCH
The course provides an in-depth review of research design concepts and applications for clinical, nutritional, and environmental toxicology investigations. The course is composed of several major topics: a) elements of research design, b) analytical techniques for chemicals, c) analytical techniques using biological materials, d) functional assays in toxicology, e) functional assays in clinical investigations, f) applications for techniques to investigations, and g) integration of concepts into the design of investigations. Besides attending lectures, students will read and discuss selected research articles and prepare a grant-style research proposal. Students will be evaluated based on their participatory activities in class, quality of grant proposal, and performance in the final examination.
Prerequisites:  PHS 6443
Terms Offered:  II
Years Offered:  Annually
Hours per week:  Lecture 3

PHS 6326  (3 CREDITS) COMMUNITY HEALTH PRACTICE II
This course provides an in-depth practical learning experience in the practice of public health. Through mentored assignment within public or related agency, the student will undertake a specific project formulated and planned in a Community Health Practice I (PHS 6223) that will demonstrate an integration of elements of the academic curriculum including specific subject matter expertise in a public health discipline such as biometry, epidemiology, social behavior sciences, management and policy sciences, environmental sciences, etc. These projects typically respond to ongoing service demands or other needs of the hosting entity. At the conclusion of this integrative experience in community health practice, each student will present a seminar that describes their observations and that relates their understanding of the salient features related to effective practice of community health in the context of their assignment. This course is designed for the public health program. Students will be evaluated based on public health practice experience, proposal, report, and performance.
Prerequisites:  PHS 6223 Community Health Practice I Terms Offered:  II
Years Offered:  Annually
Hours per week:  Conference/Discussion 3

PHS 6328  (3 CREDITS) ENVIRONMENTAL HEALTH AND TOXICOLOGY
The course is intended to provide students with knowledge about health effects that can be caused by exposure to environmental contaminants, e.g., air, water, and food-borne
biological and chemical agents. Students will be taught about how to recognize, document, diagnose, and manage the problem. In addition, they will be taught about the mechanisms involved in the development of environmental disease. The course will involve lectures and student presentations. Students will be graded based on their performance on two examinations and their presentations.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 1

PHS 6329 (3 CREDITS)
MEDICAL TOXICOLOGY
This course is an intensive five-day, 30 contact-hour course. There will be extensive handouts and classes will be lecture style, with some tours of poison control centers and toxicology labs. The format covers the material in the board exam for medical toxicology. Although the course is intended for PHS residents, it is open to all graduate students in Pharmacology and Toxicology. Grading is based on a multiple choice examination and class participation. Students must have a basic understanding of pharmacology, human physiology, and disease states.

Prerequisites: Permission of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2

PHS 6330 (3 CREDITS)
INTRODUCTION TO EPIDEMIOLOGY
This course provides an introduction to the theory and practice of epidemiology. The historical development of epidemiologic research, theories of disease causation, epidemics and their prevention, measures of disease frequency, risk and other measures of effect, point and interval estimation, various epidemiologic study designs, confounding and effect modification, and an introduction to stratified analysis are covered in the lectures. Case studies that illustrate the application of epidemiologic principles to substantive issues of health and illness are discussed during the class. A standard A-F grading system will be used for this course.

Prerequisites: PHS 6443 or permission of instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

PHS 6331 (3 CREDITS)
ADVANCED EPIDEMIOLOGIC METHODS
This lecture course is designed to provide a rigorous overview of epidemiologic methods in clinical and public health research. In view of the growing need for quantitative approaches in epidemiology, the main thrust of this course will be statistical methods and interpretations pertinent to practice of modern epidemiology. Students will be evaluated based on class participation, homework assignments, mid-term exams, and a final take-home exam.

Prerequisites: PHS 6443 or permission of instructor
Terms Offered: II
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

PHS 6340 (3 CREDITS)
INTRODUCTION TO HEALTH ECONOMICS
This course provides an introduction to the theory and methods used in the field of health economics. Through a combination of lectures, paper presentations, and discussion, students will develop the tools needed to think rigorously about the role of individual and institutional incentives in their own research and critically evaluate health policies and
health services research. Students will be graded based on class participation, an oral presentation, a written paper, and demonstration of their ability to use these tools by preparing and defending a research proposal.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

PHS 6341 (3 CREDITS)
CATEGORICAL DATA ANALYSIS
This course provides researchers an introduction to some of the major techniques used in analyzing categorical data. This includes a review of probability and some common discrete distributions. Log-linear models, weighted least squares, and logistic regression are presented. In addition, techniques for small samples and for survey samples are discussed. Most of the examples are drawn from published articles, although occasionally an artificial data set is used to emphasize a particular point. For more than two variables, most computations require the use of a computer. Throughout the course either SAS or BMDP software has been used. Grades will be based on an examination and term paper.
Prerequisites: PHS 6443 (Statistical Methodology I) or equivalent
Terms Offered: I, III
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

PHS 6344 (3 CREDITS)
STATISTICAL METHODOLOGY II
Continuation of Statistical Methodology I with emphasis on the statistical design and analysis of experiments. Analysis of variance and covariance, estimation of variance components, multiple comparison techniques, principles of repeated measures, pooling of experiments, and non-parametric statistics.
Prerequisites: PHS 6443 or equivalent; permission of instructor
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

PHS 6348 (3 CREDITS)
MEASUREMENT ISSUES
The objectives for this course are an understanding of the major definitions of perspectives on and methods for assessing validity and reliability of measurement, and a review of the major issues in measurement in self-report forms; multi-item scales; and observational, physiological, anthropometric and mechanical methods. The course is presented in two sessions of one and a half hours each per week. There will be a literature review and assigned research articles to be read for each session. Students will write critical comments on the readings for each class, which will be organized around discussion of the readings. Grades will be based on midterm and final exams, a course paper applying measurement concepts to an area of interest of the student, comments on readings, and class participation.
Prerequisites: Basic course in statistics, a second course is recommended
Terms Offered: I
Years Offered: Biennially-Even Years)
Hours per week: Seminar 3

PHS 6354 (3 CREDITS)
LINEAR MODELING
The objective of this course is to provide the essentials of linear modeling, including multiple linear regression and analysis of variance, with computer methods to implement algorithms and to analyze data. Content includes general linear models, testing hypotheses, power of the F test, replications, constraints and ANOVA, and computer implementation. Classes will consist of lecture and discussion. Grades are based on examinations at the quarter and half-way points of the term and an oral final examination based on assigned computer analysis of data associated with specific problems.
Prerequisite: PHS 6352 or equivalent
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 1; Conference/Discussion 2

PHS 6355 (3 CREDITS)
TRACER METHODOLOGY
All aspects of tracer methodology in metabolic research will be covered, particularly including stable isotope methodology. Analytical issues will include instrumentation, sample preparation, and (primarily) calculation of results. General topics related to metabolic/nutrition research include the doubly labeled water technique to measure energy expenditure; substrate oxidation studies; specific labeling patterns in quantifying TCA cycle activity, glycolysis and gluconeogenesis; urea kinetics; glucose uptake and lactate/pyruvate kinetics; fat metabolism (particularly lipolysis and reesterification); and some basic aspects of compartmental modeling. Grades are based on examinations at the quarter and half-way points in the semester and on a required presentation near the semester termination.
Prerequisites: None, but physiology and biochemistry are recommended Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 1; Conference/Discussion 2

PHS 6366 (3 CREDITS)
AGING AND HEALTH
This course provides an opportunity to obtain an overview of the influence of social and behavioral factors in the aging process and of the relationship between the aging process and health and disease. Emphasis is given to trends in mortality and longevity, leading causes of death and disability in old age, issues in prevention and health promotion, mental health, and institutionalization and its alternatives. In addition, the effect of demographic changes and changes in health of older people on social institutions and social and health policy are examined.
Prerequisites: Permission of instructor
Terms Offered: I
Years Offered: Annually
Hours per week: Conference/ Discussion 3

PHS 6370 (3 CREDITS)
CULTURE AND HEALTH
This course is designed to give students the skills to conduct research with a cross-cultural emphasis. It will focus on the systematic study of cultural beliefs, from the development of interview materials to the analysis of formal questionnaire responses. Attention will be paid to issues involved in the application of standardized instruments in multi-ethnic settings: reliability, validity, modification, and translation. Students will be expected to conduct interviews and complete a research project assessing cultural beliefs.
Prerequisites: PHS 6443
Terms Offered: II
Years Offered: Annually
Hours per week: Conference/Discussion 3

PHS 6371 (3 CREDITS)
RESEARCH METHODS IN SOCIOMEDICAL SCIENCES
This course is designed to acquaint the student with the basic procedures of conducting research in the sociomedical sciences, including conceptualization of a research question; operational definition; and measurement, design, analysis, and preparation of a scientific paper.
Prerequisites: PHS 6330, PHS 6443, and permission of instructor Terms Offered: I
Years Offered: Annually
Hours per week: Seminar 3
PHS 6378  (3 CREDITS)
HEALTH BEHAVIOR
This course will examine a number of behaviors that have significant implications for health. Focus will be on smoking, exercise, compliance/management of chronic disease, nutritional habits, coping/stress management, substance abuse, and use of safety devices. These topics will be surveyed as to their epidemiology, medical and non-medical outcomes, assessment, behavior change, and theoretical considerations.
Prerequisites: None
Terms Offered: I
Years Offered: Biennially-Odd Years
Hours per week: Conference/Discussion 3

PHS 6379  (3 CREDITS)
SOCIAL AND BEHAVIORAL EPIDEMIOLOGY
The purposes of this course are to illustrate the steps involved in moving from a hypothesis about a social or behavioral factor involved in a disease process to measurement of the key concepts, to illustrate a variety of epidemiologic approaches and their sequencing in a cumulative program of research, to offer a conceptual framework for behavioral epidemiology, and to review the psychosocial contributions to several chronic and infectious diseases and causes of disability.
Prerequisites: PHS 6330
Terms Offered: I
Years Offered: Annually
Hours per week: Conference/Discussion 3

PHS 6380  (3 CREDITS)
SOCIETY AND HEALTH CARE
A critical analysis of modern health care delivery systems focusing on the United States and cross-national comparisons. Topics include historical origins, organizational structure, utilization patterns, economic and political aspects, and provider-consumer issues. Analysis of problems in providing care, professional socialization of healers, the sick role, patient role, health status, institutional functioning, and social policy will be addressed.
Prerequisites: Second-year status in sociomedical sciences or permission of instructor
Terms Offered: I
Years Offered: Biennially-Odd Years
Hours per week: Conference/Odd Years

PHS 6381  (3 credits)
APPLIED RESEARCH METHODS
The student will be given the opportunity to demonstrate a knowledge of historical and policy issues and the basic approaches used in research, the point at which a problem is amenable to investigation by formal research methods, specific theoretical research models and techniques for analyzing and developing both quantitative and qualitative forms of research and evaluation studies, specific methods and procedures for reviewing and assessing the research literature, and designing his/her own research or evaluation study.
Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Conference/Discussion 3

PHS 6382  (3 CREDITS)
INTRODUCTION TO AEROSPACE MEDICINE
The objective of this course is to develop comprehension and appreciation of major contributions to the advancement of aviation and space flight by life science professionals,
and awareness of current and future challenges. Each course participant should demonstrate comprehension of the course objectives by writing a brief paper of research questions yet to be answered.

Prerequisites: Permission of instructor

Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3

PHS 6384  (3 CREDITS)
HEALTH POLICY AND MANAGEMENT
The course focuses on current policies to increase accountability in health care delivery and the implications of these policies for the management of health care organizations and public health programs. The evolution of the U.S. health care system is examined with emphasis on those forces underlying the current reshaping of medical practice and the delivery of public health services. Methods, measures, and data used to evaluate the costs and outcomes of health services are presented and discussed. The principal functions of health care managers are also addressed in the context of applying effective operations management approaches that increase financial and clinical accountability in providing services to defined populations.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 3

PHS 6387  (3 CREDITS)
OUTCOMES RESEARCH
This course provides an introduction to the methods used in the design and implementation of studies aimed at assessing the effectiveness of medical interventions. Its goal is to provide students with the means of applying epidemiologic concepts and methods to the measurement and analysis of health care outcomes. The first part of the course will focus on alternative research designs, measurement issues, sources of data, and analysis techniques for comparing patterns of care and assessing outcomes of preventive services and medical therapies. The components of a research protocol are reviewed with specific examples from funded studies in health care research. In the second part of the course, research design and measurement issues will be presented and evaluated in the context of specific public health and clinical examples.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

PHS 6390  (3 CREDITS)
INTRODUCTION TO REHABILITATION SCIENCE AND ENGINEERING
This interdisciplinary course provides an introductory study of rehabilitation science and engineering from basic selected theories. The course is divided into four modules that highlight reflective practice, research, and evidence related to the dynamic interplay between disability, rehabilitation science, and engineering; cognitive disabilities; motor disabilities; and psychosocial disabilities. Qualitative and quantitative methods will be presented. Students will be evaluated based on class participation and two independent projects.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3

PHS 6391  (3 CREDITS)
EVIDENCE-BASED REHABILITATION: ISSUES AND METHODS
The aim of this course is to introduce students and professionals to the concepts of
evidence-based practice and outcome measurement in rehabilitation. The course will emphasize the growing need for evidence-based practice in rehabilitation and discuss how the methods and procedures developed in clinical medicine can be used to establish evidence-based strategies for persons with disability and/or chronic disease. Students will be evaluated based on class participation, exercises, and a written and oral report.

Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 3

PHS 6392 (3 CREDITS)
INTRODUCTION TO ASSISTIVE TECHNOLOGIES
This interdisciplinary course provides an introduction to the principles of assistive technology with emphasis on objective quantification of human function and the analytic design of enabling and augmenting devices and methods. The fundamentals of information transfer in sensory systems and instrumentation and measurement will be reviewed extensively prior to the study of solutions for design and/or identification of appropriate assistive devices. Evaluation will be based on mid-term and final examinations structured solely upon the required textbook for this course and lecture material, preparation of a short paper (6 pages maximum) reviewing a new assistive technology of the student’s choice (Students with an engineering background have the option of submitting a new assistive device design.), and class participation (based on attendance and participation).

Prerequisites: None
Terms Offered: II
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

PHS 6393 (3 CREDITS)
BIOPSYCHOSOCIAL PERSPECTIVES OF DISABILITY IN ADULT POPULATIONS
This course provides a broad understanding of disability from a biological, psychological, and social perspective. It includes definitions and epidemiology of disability; the demographic, comparative, and differential patterns of aging; the biological/physiological processes of aging and the linkage to onset of disability; and the leading theories of aging. Emphasis is also given to psychological and social factors that may complicate or reduce the burdens of disabilities. Various issues related to health promotion and illness prevention among persons with disabilities are examined.

Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 3

PHS 6394 (3 CREDITS)
QUALITY OF LIFE: THEORY AND MEASUREMENT IN REHABILITATION
This interdisciplinary course provides an introduction to concepts associated with quality of life as an outcome of rehabilitation intervention and an issue in social policy development. Emphasis is given to definitions of the concept, measurement of outcomes, and the influence of social policy on rehabilitation practices. Evaluation will be based on mid-term and final examinations based on readings and lectures material, preparation of a short paper (10 pages maximum) on a topic of the student’s choice related to quality of life issues, class presentation on an instrument or issue relevant to quality of life, and class participation (based on attendance and active engagement).

Prerequisites: None
Terms Offered: III
Years Offered: Biennially-Odd Years
Hours per week: Lecture 3

PHS 6401 (4 CREDITS)
PREvention AND PUBLIC HEALTH
This course provides students the opportunity to acquire an applicable knowledge and general appreciation of the concepts, theories, issues, and trends basic to an understanding of the physical, biological, and social interdependencies that orient work and research in population health sciences. Organized in a seminar format, the course will focus on fundamental perspectives from history and philosophy, basic themes in governmental involvement with health needs, important issues in health behavior and social policy, and concepts of environmental management. Grade will be based on written examinations, class participation, and a term paper.
Prerequisites: Approval from course director
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2; Conference/Discussion 2

PHS 6443 (4 CREDITS)
STATISTICAL METHODOLOGY I
The objective of this course is to provide the student with a basic understanding of the use and interpretation of certain classical and state-of-the-art statistical techniques in the study of health and biomedical problems. Topics to be covered are basic probability; sensitivity and specificity; Bayes’ Rule; population measures of location and dispersion; Gaussian distributions; point estimation; confidence intervals; classical and practical hypothesis testing; simple analysis of variance with mean separation tests; nonparametric procedures for one- and two-way classifications; least squares regression and correlation, including lack of fit tests; simple categorical data analysis including goodness of fit; and homogeneity of proportions.
The course is didactic. Course grade will be based on homework, three one-hour closed-book examinations, and an optional final.
Prerequisites: College algebra and permission of instructor Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 3; Optional Lab 1

PHS 6456 (4 CREDITS)
BASIC AND APPLIED NUTRITION
The goal of this course is to integrate basic concepts in biochemistry, physiology, and cell biology as they contribute to an understanding of nutritional effects and requirements at the cellular level and for the whole body. The topics to be covered are nutritional metabolism, physiology, and carbohydrates; amino acids/proteins; lipids; minerals, trace elements, and vitamins; digestion and absorption in the gastrointestinal tract; nutritional assessment; nutritional epidemiology; National Nutrition Surveys; and specific topics including antioxidants, gene expression, exercise and nutrition, and methods in nutrition research.
The course will consist of three lecture hours and one hour of discussion of a relevant journal article per week. Students will be graded on a mid-term and final written examination and participation in journal article discussion.
Prerequisites: BBSC 6401 (Biochemistry); BBSC 6302 (Cell Biology), or equivalent
Terms Offered: Term I
Years Offered: Annually
Hours per week: Lecture 3; Conference/Discussion 1
M.D.-Ph.D. Combined Degree Program
https://www.utmb.edu/mdphd/

Graduate Program Director, *ad interim*
Jose Barral, M.D., Ph.D.
Professor and Vice-Chair for Operations,
Department of Neuroscience & Cell Biology
Associate Dean for Academic Affairs,
Graduate School of Biomedical Sciences

Never in the history of medicine have there been such great opportunities for advancing the cause of human health. Recent advances in understanding the human genome and how it functions are opening new vistas for therapy and offering new approaches for disease prevention. The challenge is how to translate these advances in biomedical research into tangible improvements in human health. No one is better prepared to do this than the M.D.-Ph.D. graduate who is uniquely trained to carry advances at the laboratory bench to the patient’s bedside.

UTMB offers an M.D.-Ph.D. Combined Degree Program for eligible students interested in training for a career in biomedical research. The program is highly competitive and selective. The graduate of this program will feel as much at home at the patient’s bedside as in the research laboratory, and will be prepared to embark on a career focusing on unraveling the causes of disease or translating advances in biomedical sciences into improved patient care.

**Essential Functions Required for Completion of Program**

The following description details essential functions (abilities) needed to complete the M.D.-Ph.D. Combined Degree Program in addition to those listed in the School of Medicine Bulletin.

**Observation (to Include the Various Sensory Modalities)**
Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor’s/mentor’s physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient’s gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

**Communication**
Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors.
In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

**Psychomotor Skills**
Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactical surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

**Intellectual and Cognitive Abilities**
Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses. They must develop and sustain a strong motivation for biomedical research. They must be able to develop new techniques as needed to advance their research project. Each must become proficient in the statistical analysis and interpretation of experimental observations.

**Professional and Social Attributes**
Students must exercise good judgment and promptly complete all requirements of the courses, curriculum, and program in which they are enrolled. They must develop mature, sensitive, and effective professional relationships with peers, colleagues, and faculty; be able to function as a part of a team; and negotiate conflicts satisfactorily and fairly. They must be capable of significant workloads that require long hours, attention to detail, and accurate and thorough recording of experiments and data; hence students must be able to adapt positively to stress and assume responsibility and accountability for their actions. They must be able to adapt to changing environments; display flexibility, patience, and open-mindedness; and function in the face of uncertainties and ambiguities. Concern for others, appreciation of the support of the public, competence in inter-personal relationships, and demonstrated motivation and commitment are expected of all students. Students must be able to focus their attention on activities and decision-making. They must show respect for research animals and valuable equipment. Each must conduct original research that is reproducible and reliable. They must be able to be punctual, tolerant of the views of others, and capable of assuming responsibility for their actions. They must be able to recognize and employ socially acceptable actions and behaviors corresponding to environmental and
situational demands.

Application of Legal/ethical Principles and Professional Standards
Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.

The Integrated Curriculum
A novel integrated curriculum can be tailored to individual student needs and graduate/medical program requests. The curriculum is organized as follows:
**Summer before Year 1:** Research rotation
**Year 1:** Medical school course work in mornings. Practice of Medicine course and graduate school course work in the afternoons.
**Summer after Year 1:** Research rotation and graduate school courses (consult program director)
**Year 2:** Practice of Medicine course work in the mornings. Medical school course work in the afternoons. USMLE Part 1 is taken at the end of this year. A third research rotation is an option.
**Year 3:** Begin dissertation research. Graduate preliminary exams are typically taken during this year (refer to specific graduate program).
**Years 4 and 5:** Uninterrupted dissertation research.
**Years 6 and 7:** Clinical (third-year) clerkships (12 months), fourth-year clerkships (five months).

Financial Assistance
The stipends for M.D.-Ph.D. students are competitive, with the stipend for a beginning student set at the current graduate assistant stipend level. Students accepted into the M.D.-Ph.D. Program receive full support for both medical school and graduate school tuition.

Tracks
Students in the M.D.-Ph.D. Program may choose to pursue a Ph.D. in one of three tracks:

**M.D.-Ph.D. Program in Basic Biomedical Sciences**
- Biochemistry and Molecular Biology
- Cell Biology
- Experimental Pathology
- Humanpathophysiology and Translational Medicine
- Microbiology and Immunology
- Neuroscience
- Pharmacology and Toxicology
- Population Health Sciences

**M.D.-Ph.D. Program in Preventative Medicine and Community Health**
- Clinical Science
- Population Health Sciences
- Rehabilitation Sciences

**M.D.-Ph.D. Program in Medical Humanities**
In addition to the above, UTMB also offers the M.D.-Ph.D. degree in the medical humanities, through the Medical Humanities Graduate Program in the Institute for Medical Humanities.

Admission Criteria

Criteria for selection include such factors as:

- Undergraduate grade point average
- Performance on the MCAT
- Previous research experience
- Motivation for a career in medical research

At least two letters of recommendation must be provided from individuals who can comment on the applicant’s abilities and achievements in research.

Applicants must also satisfy admission requirements set forth by the School of Medicine.

To obtain additional information about UTMB and the M.D.-Ph.D. program, please contact:

M.D.-Ph.D. Combined Degree Program
301 University Boulevard
Galveston, TX 77555-1041
mdphd@utmb.edu
(409) 772-8145

Mdph Course DESCRIPTIONs

These courses are designed to be taken by students enrolled in the M.D.-Ph.D. Combined Degree Program.

MDPH 6001  (3-9 CREDITS)
M.D.-PH.D. LABORATORY ROTATION
The objectives of this course are to provide students an opportunity to become familiar with the faculty and their research efforts in the graduate school by participating in the activities of the lab and by becoming acquainted with the lab staff and the goals of the research project. Letter grades will be determined by the instructor and will be based on lab performance.
Prerequisites: Enrolled as a student in the M.D.-Ph.D. program, not yet enrolled in a specific graduate program
Terms Offered: III
Years Offered: Annually
Hours per week: Variable

MDPH 6101  (1 CREDIT)
M.D.-PH.D. SEMINAR
This seminar course focuses on research activities in various graduate programs and other topics of interest to M.D.-Ph.D. students. Students register for this course for the duration of the M.D.-Ph.D. program. Grading is based on attendance and is determined on a pass/fail basis.
Prerequisites: Enrollment as a student in the M.D.-Ph.D. Program.
Terms Offered: I, II
Years Offered: Annually
Hours per week: Seminar 1

MDPH 6102  (1 CREDIT)
PATHOBIOLOGY SEMINAR
This course is designed to supplement the medical school pathobiology and host defense block. Students will review current literature related to disease pathogenesis covered in the medical school and will be graded on class performance.
Prerequisites: Prior or concurrent enrollment in Pathobiology (IMC 1210)
Terms Offered: II
Years Offered: Annually
MDPH 6202  (2 CREDITS)
CURRENT TOPICS IN NEUROSCIENCE AND HUMAN BEHAVIOR
This course is designed to supplement the medical school neuroscience and human behavior block. Students will meet twice weekly to review current neuroscience literature covered in the medical school and will be graded on class performance.
Prerequisite: Prior or concurrent enrollment in Neuroscience and Human Behavior (IMC 1220)
Terms Offered: II
Years Offered: Annually
Hours per week: Conference/Discussion 3

MDPH 6203  (2 CREDITS)
CURRENT TOPICS IN MOLECULES, CELLS, AND TISSUES
This course is designed to supplement the medical school molecules, cells and tissues block. Students will review current literature related to the molecular mechanisms of diseases covered in the medical school and will be graded on class performance.
Prerequisites: Prior or concurrent enrollment in Molecules, Cells and Tissues (IMC 1120)
Terms Offered: I
Years Offered: Annually
Hours per week: Conference/Discussion 3
Post-Baccalaureate Research Education Program (PREP)

https://microbiology.utmb.edu/PREP/

PREP Director:
Gracie Vargas, Ph.D., Associate Professor Department of Neuroscience & Cell Biology

The PREP program is designed to provide underrepresented students who have an aptitude for science with the motivation, academic tools, research skills, and self-confidence to pursue a PhD in biomedical science. Students enter the PREP for a year experience that provides extensive laboratory research training and special learning opportunities that build not only knowledge but also analytical and thinking skills. The PREP certificate program requires the completion of the Post-Baccalaureate Research Training Curriculum. This curriculum provides critical biosafety (BBSC 6217) and Ethics of Scientific Research (MEHU 6101) training as well as exposure to research seminars. Two critical courses – BBSC 6103 Introduction to the Study of Biological Systems and BBSC 6104 Critical Reading of Scientific Literature are also included. There is also exposure to current research across the breadth of biomedical science through BBSC 6195, the Frontiers of Science Seminar course (taken twice). This provides a total of 7 hours of instruction at the graduate level to enhance the background of these PREP students and to build their confidence as they consider doctoral training in the biomedical science.

Immersion of the student in the PREP curriculum will complement laboratory, departmental, and graduate student social and other enrichment activities that will promote the scholar’s motivation for a PhD. Other special features of the PREP include extensive counseling, close mentoring and the option for successful PREP Scholars to enter a doctoral program of study at UTMB or other top flight graduate school in advanced standing. Upon successful completion of the seven semester credit hour PREP course of study the enrollee will receive a Post-Baccalaureate Research Training Certificate. Details for the required courses can be found in the Basic Biomedical Science Curriculum (BBSC) and Medical Humanities (MEHU) sections of this Bulletin.

Courses

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>BBSC 6103</td>
<td>Introduction to the Study of Biological Systems</td>
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<tr>
<td>BBSC 6104</td>
<td>Critical Reading of the Scientific Literature</td>
</tr>
<tr>
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<tr>
<td>BBSC 6217</td>
<td>Principles of Laboratory Safety</td>
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Essential Functions Required for Completion of Program

Observation (to Include the Various Sensory Modalities)
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Communication

Communication skills are critically important in science, academics, and research, since teaching is done, results are reported, and information is shared. Students must be able to communicate (speak, write, read, comprehend) effectively and efficiently in the English language. They must be capable of communicating the background, hypothesis, goals, results, and interpretations of their research projects to other students, faculty, and visitors. In addition, they must be able to communicate basic information in their area of research and related fields to other students, workers, and visitors. They must be able to respond to questions asked or problems formulated and to ask pertinent questions in a one-on-one, small-, or large-group format.

Psychomotor Skills

Students must have sufficient motor capacities and mobility to attend class. They must be able to manipulate a standard or adapted computer keyboard. Physically, they must be able to carry out laboratory experiments at a standard-height or adapted laboratory bench. They must be able to dress in protective clothing such as lab coats and disposable gloves. Students must have sufficient motor capacity (e.g., strength, dexterity, and coordination) to be able to use multiple types of laboratory equipment, including but not limited to microscopes, centrifuges, spectrophotometers, computers, and dissecting/surgical instruments. Students must be able to independently retrieve from storage, lift, move, and manipulate equipment (some of which is highly delicate and sophisticated with fine controls); animal cages; cans and bottles of reagents; and other essential supplies as necessary to execute various types of experiments. If appropriate to their research, they may also have to become proficient in the handling of experimental animals. Students must also be able to perform fine motor tasks such as stereotactic surgery, dissections, or positioning of micropipettes or recording electrodes with the aid of micromanipulators. They must be able to handle, transfer, and manipulate, using acceptable protocol, reagents in quantities as appropriate to their research, including hazardous materials such as radio-labeled materials and hazardous chemicals.

Intellectual and Cognitive Abilities

Students must be able to think creatively and systematically. They must be able to measure, calculate, reason, analyze, synthesize, integrate, remember, and apply information for the purposes of developing models, analyzing data, writing papers, and making presentations. Creative problem-solving and reasoning require all of these intellectual abilities in order to generate and test hypotheses. Students must be able to comprehend three-dimensional relationships and understand the spatial relationships of structures. They must be able to translate information from printed reports to actual hands-on laboratory experiences. This will involve the integration of their classroom experiences with those obtained from interaction with other scientists and trainees and from reports in the literature, as well as knowledge developed from working in the laboratory. They must be able to apply information from these varieties of sources to their own research problems and generate and test working hypotheses.
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Students must demonstrate the highest standards of professional ethics, attitudes, and behavior in course work, laboratories, and interactions with others. They must demonstrate honesty, integrity and reliability, and adhere to standards reflecting the values and functions of the scientific profession. This includes a responsibility to acquire and share data in an honest and timely manner, respect the right of privacy, and show respect for research animals and valuable equipment. Students must apply an ethical decision-making process in their studies (e.g., writing of papers, data collection), avoid plagiarism, and adhere to the other legal/ethical standards set forth by the Graduate School of Biomedical Sciences of the University of Texas Medical Branch.
Postdoctoral Scientists Certificate Program
http://gsbs.utmb.edu/postdocs/current/certificate-program.asp

Program Co-Directors:
Jose M. Barral, M.D., Ph.D.
Timothy A. Reistetter, Ph.D.

Program Manager:
Tammie Taylor, M.L.A.

Faculty
The entire faculty of the GSBS participates in the Postdoctoral Certificate program.

The Graduate School of Biomedical Sciences (GSBS) requires advanced training for postdoctoral scientists at UTMB. Courses in this program provide training in core competencies and specialized topics that scientists require for professional success. For example, Practical Scientific Writing covers organizing to write a manuscript, reviewing punctuation and grammar and reviewing and critiquing one’s manuscript. These skills are essential not only for publishing one’s research, but also for grant applications, peer review and other academic research tasks, and are transferrable to most non-academic career tracks.

Seven certificates are available. The first, core, certificate is Advanced Biomedical Research Strategies. Secondary certificates are available in focused career areas: management skills, teaching and mentoring, translational research teams, bioinformatics, translational burns research and patient centered outcomes research. Each certificate consists of 12 semester credit hours (SCH) and is designed to be earned in a one-year (three-term) course of study. The certificates are structured for maximum flexibility, both for course sequencing and time management. Most courses are offered at times that do not conflict with laboratory schedules, so that participants may give full attention to their laboratory duties and learning.

Each certificate consists of one to three core (required) courses, a series of recommended electives, and a spectrum of elective courses. To promote maximum flexibility and individualized career preparation, elective courses may be applied to any of the four certificates. In addition, a base course (Mentored Research) is available to all postdoctoral scholars; it consists of focused research, manuscript preparation and supervision in their area of concentration.

ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

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Students must be able to decode written documents and hear in situations when not able to read lips. Students must be capable of learning and assimilating laboratory skills. They must be able to accurately observe near and distant objects in order to learn techniques, conduct experiments, and gather reliable data using a variety of sensory modalities. For instance, students must be able to observe and comprehend an instructor's/mentor's physical movements as he/she manipulates laboratory equipment, experimental animals, cells and reagents; a patient's gait or verbal response; a chemical reaction or experimental results (e.g., color change, banding on gels, odor, viscosity, temperature); a microscopic or computer image or gross anatomical specimen. They must be able to process auditory information such as signals from instruments, animal vocalizations, and verbal input from instructors, colleagues, or experimental subjects/patients. Students must be able to process, retain, and integrate information from a variety of sources, including but not limited to oral delivery by instructor(s) or student(s); blackboard data and diagrams; printed material (handouts, journals, manuals, books, medical records, computers, computer printouts); PowerPoint presentations; overhead transparencies; slides; film and video segments; audio recordings; live demonstrations; one-to-one and group interactions in the classroom; demonstrations; and internet-based or teleconferences.

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**COURSE DESCRIPTIONS**

**CTPS 6001**

**MENTORED RESEARCH FOR POSTDOCTORAL SCHOLARS**

(1-4 CREDITS)

This course consists of the training the postdoctoral scholar’s supervisor provides regularly in the laboratory and, thus, requires no class attendance. When research prevents a postdoc from leaving the lab bench, he or she may register for only Mentored Research. This course is designed to fine-tune postdoctoral scholars’ basic research skills in the laboratory or other location where the research takes place. The course consists of research in keeping with the postdoc’s field, and overseen by the mentor.

- **Prerequisites:** None
- **Terms Offered:** I, II, III
- **Years Offered:** Annually
- **Hours per week:** Mentoring 1-4

**CTPS 6101**

**RESEARCH SEMINAR**

(1 CREDIT)

This course is designed for postdoctoral scholars to observe and learn to develop and present seminars about their research. After completing the course, participants should be able to:

- Discuss their research with scientists in a way that helps advance the project.
- Develop a presentation that concisely presents the research.
- Develop learning objectives that the audience will receive from the presentation.
- Demonstrate the ability to engage the audience in the research project.
- Observe and objectively assess and discuss another scientist’s research.

- **Prerequisites:** None
- **Terms Offered:** I, II, III
- **Years Offered:** Annually
- **Hours per week:** Lecture 1

**CTPS 6102**

**JOURNAL CLUB**

(1 CREDIT)

This course is designed for postdoctoral scholars to learn to critically read and evaluate scientific journal articles and discuss them with colleagues; to lead discussions about published research developments, and to plan discussions for journal club meetings. After completing the course, participants should be able to:

- Discuss relevant research developments with colleagues in a way that evaluates their validity.
- Develop a discussion agenda that asks critical questions.
- Develop a discussion style that is not personally critical or judgmental of the other participants and their ideas.
- Identify important journal articles that deserve discussion, and may prompt novel ideas about the topic.
Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 1

CTPS 6103 (1 CREDIT)
CAREER DEVELOPMENT FOR POSTDOCTORAL SCIENTISTS
This course/program is designed to guide postdoctoral scholars in their careers via regular meetings with and oversight by their research mentors. After completing the course, which will be repeated annually, postdoctoral scientists will have:

- Reviewed the AAMC Compact between Postdoctoral Appointees and their Mentors, to which both parties agree upon their respective commitments and both parties sign.
- Written an Individual Development Plan (IDP), following guidelines established by the Science Policy Committee of the Federation of American Societies for Experimental Biology (FASEB) either as published by the American Association for the Advancement of Science (AAAS), or as developed by the GSBS at UTMB, which both sign.
- Begun to implement the plan by conforming their curriculum vitae to the standard university application format.

The course consists of individual self-assessment, career opportunities research and near-term goal-setting by the postdoc and discussion, planning and implementation with the mentor. Grading will be based on submission of a completed and signed IDP, signed AAMC Compact Between Mentee and their Mentor, and updated curriculum vitae to the Graduate School of Biomedical Sciences. After the first year of the development plan, the scholar and faculty mentor will complete a mutual evaluation of the progress in meeting goals established in the IDP and successful completion of commitments outlined in the compact.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Mentoring 1

CTPS 6104 (1 CREDIT)
PRACTICAL SCIENTIFIC WRITING
The fall course is designed for postdoctoral scientists and senior graduate students who are non-native English speakers and need advice about their manuscripts. In spring, it is designed for native English speakers. The course covers organizing to write a manuscript, reviewing punctuation & grammar, and reviewing and critiquing one’s manuscript. It will help participants develop an effective writing style for scholarly documents, with special emphasis on research articles and grant proposals. After completing the course, participants should:

- Demonstrate improved skill in writing clear, concise and effective prose.
- Describe the form, content and modes of argument normally used in scientific articles and grant proposals.
- Use strategies that drive the persuasive presentation of ideas in scientific articles and grant proposals.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6106 (1 CREDIT)
LIBRARY TOOLS AND RESOURCES
This course is designed to prepare postdocs and advanced graduate students with the basic skills in using library resources to help with efficient and effective information retrieval and management, to manage references using bibliographic management software and to inform about various metrics used to determine research impact. Participants may elect to learn about the following library tools:

- EndNote Basic
- MyNCBI: My Bibliography and SciENcv
After completing the course, students will be able to:
- Identify 3 major indicators of research impact.
- Utilize the Library's web page to locate at least 3 resources for measuring research impact.
- Discuss advantages and disadvantages of impact measures.
- Establish an account on EndNote Web.
- Understand how to import references from a variety of library databases.
- Organize references with folders and share references/bibliographies.
- Format references in a variety of styles and utilize the "Cite While You Write Feature."

Participants who provide completion certificates demonstrating they satisfactorily finished five of the class modules offered by the library will receive credit in the term in which they register for this course. Ideally, this would be in the academic term immediately following completion of the five classes.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 1, plus online practice and application

CTPS 6107
ANIMAL RESEARCH TOPICS AND IACUC PROTOCOL ESSENTIALS
This course is designed to prepare post-docs and advanced graduate students with information pertaining to the research use of animals. After completing the course, students should:
- Appreciate the regulations and guidelines applicable to animal research developed by United States. Department of Agriculture (USDA), the Public Health Service (PHS), and the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC).
- Identify functions and processes of UTMB’s Institutional Animal Care and Use Committee (IACUC), including IACUC protocol submission procedure and the committee’s review process.
- Be familiar with proper IACUC protocol writing techniques and have knowledge of how to correctly respond to the various components of the protocol application.
- Know the Animal Resource Center policies and procedures.
- Understand animal research publishing guidelines and society views.
- Recognize how the Post Approval Monitoring program is a resource for animal research.

To earn a satisfactory grade, each student must complete the online portion of the course, attend all class meetings; read class handouts; participate in class exercises,

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 1.5

CTPS 6108
GENERAL LABORATORY SAFETY & GOOD LABORATORY PRACTICES
This course is designed to prepare postdoctoral scholars and advanced graduate students with basic tools and information about biomedical laboratory safety and the FDA’s Good Laboratory Practices (GLP) regulations, codified under Title 21 Part 58 of the Code of Federal Regulations. After completing the course, participants will be prepared to:
- Discuss UTMB laboratory policies
Develop safe lab processes and procedures, including emergency procedures.
• Develop inventory tracking and storage procedures for hazardous chemicals.
• Identify regulatory agencies and their policies regarding lab safety.
• Identify potential hazards in the lab and develop procedures for correcting them.
• Identify the scope and applicability of the GLP regulations as applied to preclinical studies and product development.
• Apply the GLP regulations to efficacy studies in accordance with the FDA’s Animal Rule and subsequent Guidance for Industry of Animal Models.
• Understand the differences between a basic research laboratory and a regulated study.
• Understand the differences between protocols and standard operating procedures.
• Utilize the GLP regulations to establish quality systems within a research laboratory.

Prerequisites:  None
Terms Offered:  I, II, III
Years Offered:  Annually
Hours per week:  Lecture 4, plus online training and application

CTPS 6109 (1 CREDIT)
RESEARCH PROJECTS MANAGEMENT 101
This course is designed to provide training in the management of sponsored research projects. After completing the course, participants should be prepared to:
• Discuss the laws and regulations related to research finances.
• Discuss the life cycle of a successful grant application.
• Prepare the components of a grant proposal.
• Report effort expended on a research grant.
• Manage financial aspects of a grant.
• Discuss cost principles related to grant management.
• Close out a grant.

Prerequisites:  None
Terms Offered:  I, II
Years Offered:  Annually
Hours per week:  Lecture 1.5

CTPS 6110 (1 CREDIT)
PREPARING PROPOSALS & PUBLICATIONS
This course is designed to provide tools necessary to prepare to write grant proposals and research manuscripts. After completing the course, students should be prepared to:
• Use the campus web-based search program to identify funding opportunities and receive funding alerts.
• Search for and identify investigators with similar research interests who may be collaborators, consultants or mentors.
• Write clearly and avoid common mistakes in grammar, punctuation and scientific writing styles.
• Cite manuscripts submitted to PubMedCentral and clinical trials registered in ClinWeb in proposals.

Prerequisites:  None
Terms Offered:  I, II
Years Offered:  Annually
Hours per week:  Lecture 1.5

CTPS 6111 (1 CREDIT)
EFFECTIVE PRESENTATION SKILLS
This course is designed to prepare postdoctoral scholars and advanced graduate students with basic tools to design and deliver effective presentations using sound principles of public speaking. It will also help them learn to control nervousness when speaking before a group.

Prerequisites:  None
Terms Offered:  I, II
Years Offered:  Annually
CTPS 6112 (1 CREDIT)
BIOSAFETY LEVEL 2
This course will offer students an in-depth understanding of biosafety principles, practices and techniques that are necessary to successfully conduct research in a BSL2 laboratory. Topics will include risk assessment, personal protective equipment (PPE), proper use and selection of biological safety cabinets (BSCs) & chemical fume hoods, aerosol producing procedures, biological and chemical exposures, transport of biological materials, disinfection, waste handling, and emergency laboratory procedures. Emphasis will be on development of competencies in fundamental laboratory techniques and using risk assessment to work safely and aseptically in the laboratory. This course also requires successful completion of an online training module.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 2.5

CTPS 6113 (1 CREDIT)
NAVIGATING THE IRB & INVESTIGATOR RULES
This course is designed for those with responsibilities in human subjects research. The course prepares researchers to: Identify the purpose, history and structure of the Institutional Review Board (IRB); Develop a framework for research with humans and human tissues, as well as vulnerable populations; Develop a protocol for submission to and review by the IRB; Report adverse events related to human research; Develop forms for obtaining informed consent from potential research subjects; and Develop acceptable methods for obtaining informed consent.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2.5

CTPS 6114 (1 CREDIT)
ANIMAL BIOSAFETY LEVEL 2
This course provides an in-depth understanding of biosafety principles, practices and techniques necessary to successfully conduct research in an ABSL2 laboratory. Topics include Animal Biosafety Levels, Personal Protective Equipment (PPE), Proper Use and selection of Biological Safety Cabinets (BSCs), Aerosol Producing Procedures, Biological Exposures, Transport of Animals and Biological Materials, Disinfection, Waste handling, and Emergency laboratory procedures. Emphasis is on development of competencies in fundamental laboratory techniques and using risk assessment to work safely and aseptically in the laboratory. This course also requires successful completion of an online training module.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Lecture 2.5

CTPS 6115 (1 CREDIT)
TRANSLATIONAL RESEARCH MANAGEMENT 1: TEAM BUILDING & MEETING MANAGEMENT
This course is designed to prepare postdocs and advanced graduate students with the basic tools to develop their management skills for leading translational research projects. With completion of this course, the participant will be able to: diagnose team effectiveness and dynamics; understand the role of norms, roles, goals, and team procedures, and to apply techniques to develop such; plan and facilitate both traditional and virtual meetings in a highly professional manner; use facilitation tools and techniques to develop and lead teams; follow established models of teams and groups, and apply the latest practices (cross functional teams, new product teams) to translational team efforts.
CTPS 6116  
TRANSLATIONAL RESEARCH MANAGEMENT 2: EFFECTIVE LEADERSHIP  
(1 CREDIT)  
This course is designed to prepare postdocs and advanced graduate students with the basic tools to develop their management skills for leading translational research projects. With completion of this course the participant will be able to: diagnose one’s own development needs relative to project leadership competencies; understand and apply contemporary theories and techniques of leadership with an emphasis on new paradigm and emergent institutional focus; understand steps, stages, and processes of employee empowerment; apply various leadership, empowerment, and coaching techniques to translational teams and team members.

Prerequisites: None  
Terms Offered: II  
Years Offered: Annually  
Hours per week: Online 2.5

CTPS 6117  
TRANSLATIONAL RESEARCH MANAGEMENT 3: CONFLICT RESOLUTION AND NEGOTIATIONS  
(1 CREDIT)  
This course is designed to prepare postdocs and advanced graduate students with the basic tools to develop their management skills for leading translational research projects. With completion of this course the participant will be able to: diagnose personal conflict management skills and negotiations strengths and weaknesses; understand the needed behavioral skills associated with resolving conflict, building trust, and negotiating successfully; understand and apply various types of individual, dyadic, and multiple party forms of negotiation.

Prerequisites: None  
Terms Offered: III  
Years Offered: Annually

CTPS 6118  
ANIMAL BIOSAFETY LEVEL 3  
(1 CREDIT)  
This course provides an in-depth understanding of biosafety principles, practices and techniques necessary to successfully conduct research in an ABSL3 laboratory. Topics include Animal Biosafety Levels, Personal Protective Equipment (PPE), Proper Use and selection of Biological Safety Cabinets (BSCs), Aerosol Producing Procedures, Biological Exposures, Transport of Animals and Biological Materials, Disinfection, Waste handling, and Emergency laboratory procedures. Emphasis is on development of competencies in fundamental laboratory techniques and using risk assessment to work safely and aseptically in the laboratory. This course also requires successful completion of an online training module.

Prerequisites: None  
Terms Offered: I, II, III  
Years Offered: Annually  
Hours per week: Lecture 2.5

CTPS 6119  
TEACHING PRACTICUM - LABORATORY  
(1 CREDIT)  
This course is designed to prepare postdoctoral scholars to help teach basic pathology and laboratory medicine to medical students and to help them learn to identify what the results are showing them, as part of the problem based learning (PBL) courses within the UTMB School of Medicine, and under the guidance of a faculty co-facilitator. The postdoctoral co-facilitator will spend two hours per day for two days each week in the lab, plus faculty planning sessions, for 10 consecutive weeks. As a result, permission of the postdoctoral scholar’s mentor is required. Contact Dr. Judith Aronson, jaronson@utmb.edu, for scheduling as soon as you register. After completing the course, participants should be prepared to develop a laboratory demonstration
style that encourages the medical students to assimilate knowledge using real and virtual medical materials; answer medical students’ questions appropriate to what they are supposed to learn and will use as physicians; and develop a method for evaluating students' knowledge and preparation. Postdoctoral scholars also must attend faculty facilitating meetings to learn the focus of the material to be covered in the laboratory sessions. Before co-facilitating a laboratory session, each postdoctoral scholar must attend facilitating workshops provided by the Department of Pathology at a time and place to be determined. This instruction will take place before the laboratory sessions begin. Please contact Dr. Judith Aronson, jaronson@utmb.edu, to reserve your place in the workshops.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Participation 4

CTPS 6120
TEACHING PRACTICUM – GSBS SMALL GROUP FACILITATION
This course is designed to prepare postdoctoral scholars to facilitate discussions in the small group sessions of courses within the UTMB Graduate School. Facilitation topics may include problem sets, paper discussions, and review of course topics. The postdoctoral facilitator will spend two hours per day for 1-2 days per week in the classroom, plus faculty planning sessions, for 15 consecutive weeks. As a result, permission of the postdoctoral scholar’s mentor is required. Contact Dr. José Barral, jmbarral@utmb.edu, for permission to register. After completing the course, participants should be prepared to develop a facilitating style that encourages discussion among the graduate students that will help them achieve the desired result; develop a method for evaluating the students’ knowledge and preparation; and demonstrate the ability to encourage participation by everyone in the group.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2-4

CTPS 6121
EFFECTIVE LABORATORY & RESOURCE MANAGEMENT
This course is designed to prepare postdocs and advanced graduate students with the basic tools to develop and lead a laboratory in academia or industry, manage resources and personnel effectively, and evaluate funding and technology transfer options. After completing the course, postdocs and senior graduate students should be prepared to: successfully negotiate the appointment, tenure and promotion process; hire, manage and retain personnel; prepare and manage a budget and research resources; know when to seek a grant or contract and why; know the difference between regulated studies and grants & contracts, and how to manage them; identify when and why to obtain a grant with multiple investigators and how to manage it; successfully obtain patents and built new businesses and protect intellectual property; and apply export controls and use select agents. The course consists of lectures, discussion and presentations. Grading (satisfactory/unsatisfactory) will be based on attendance and participation in classroom discussions.

Prerequisites: None
Terms Offered: III
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6122
PRESENTATION PRACTICUM
Effective presentation of one's research is critical to advancement in the scientific community. This course is designed to provide postdoctoral scientists and senior graduate students with experience in presenting a seminar and learning to perform critical reflection as a routine part of the evaluation process, in order to instill a more scholarly approach to this most important part of the scientific process. Participants will spend time with their mentors preparing their
presentations (selecting salient research findings, appropriate figures, etc.); set dates with appropriate programs; give the presentations; review audience evaluations, and prepare their own reflective materials, mostly in the form of “minute-paper” self-evaluations. All these materials will be utilized for grading purposes.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Mentoring 1

CTPS 6123
INTERPERSONAL COMMUNICATIONS AND LEADERSHIP

This course is designed to enhance postdocs' interpersonal communications skills and leadership ability, using the Myers-Briggs Type Indicator® (MBTI) to ascertain personality type expression preferences. After an initial introductory session, participants complete an MBTI Assessment online. The instructor receives the results and schedules one-on-one confidential meetings to review with each participant. Returning to the classroom setting, participants learn more about their preferred type expression and type dynamics, including ways to employ their type preferences as a leader and a follower, to improve interpersonal communications, manage change and conflict, and network more effectively. Class size limited to 10.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2.5

CTPS 6124
PERSONAL INFLUENCE AND COMMUNICATIONS

This course is designed to be a 100% online post-doctoral class. Through use of directed readings, diagnostic instruments, case studies, and personal application exercises and plans, the overall purpose is to provide students with the behavioral skills and the understanding of how to more effectively relate to their peers, managers, employees, and research-related constituents. A particular focus for this course will involve how to influence without formal authority and how to reduce resistance to change.

Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Online 2.5

CTPS 6125
UNDERGRADUATE TEACHING - OBSERVATION

This is the first of two courses in a module designed to prepare postdoctoral scholars to teach science subjects in the undergraduate college setting, under the guidance of a faculty mentor at a local undergraduate college or school. Participants observe and discern different teaching methodologies and develop a teaching philosophy. In this phase (teaching observation) CTPS 6125, the postdoc instructor completes 12 hours of classroom observation and at least an equal amount of time discussing the experience with the on-site course director and faculty members observed, and then writes a critique of each observation experience. As a result, permission of the postdoctoral scholar's mentor is required. This course is required before the second phase (teaching experience), CTPS 6126.

Prerequisites: None
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6126
UNDERGRADUATE TEACHING - EXPERIENCE

(1 CREDIT)
This is the second of two courses in a module designed to prepare postdoctoral scholars to teach science subjects in the undergraduate college setting, under the guidance of a faculty mentor at a local undergraduate college or school. Participants observe and discern different teaching methodologies and develop a teaching philosophy. Undergraduate Teaching – Observation, CTPS 6125, Undergraduate Teaching – Observation, is required before this course. In the Experience phase, the postdoc instructor completes 24 hours of training, which includes meeting with the on-site course director and the faculty for the course in which the teaching will take place, classroom preparation, teaching a segment of a scientific course, providing a laboratory teaching activity, possibly in the postdoc’s own lab, and writing a critical self-evaluation. As a result, permission of the postdoctoral scholar’s mentor is required.

Prerequisites: CTPS 6125
Terms Offered: I, II
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6127
IMPROVING RESEARCH WITH CORE SUPPORT (CORE FACILITIES)
In this course, students will be introduced to the Core Facilities at UTMB in order to expand their research projects. They will attend an introductory session in which the course instructor will describe the Core Facilities available at UTMB. Over the following several weeks, students will meet with the directors of at least six separate facilities. During these meetings, students are expected to determine the breadth of services offered and associated costs. Students will then prepare a presentation on the core facilities that they explored. The presentation will include a brief proposal incorporating the services of two cores into their research.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6128
PROBLEM SOLVING AND DECISION MAKING
CTPS 6128 is a completely online postdoctoral (and senior graduate students) web course. The course is designed for those who wish to develop specific skills and knowledge in the management of scientific projects and translational science. This course is set up for a sixteen-week semester, and is structured as a completely asynchronous course to assist with the time management needs of those interested, but for whom a traditional delivery model would be difficult. Seven specific modules are developed along the lines of similar context. One textbook is required, comprehensive PowerPoint slides are provided, and students are required to read and report on select journal articles using links to the Moody Medical Library. Assignments range from brief quizzes to a semester-long Harvard Business Case Analysis, to a Personal Application Project to apply knowledge and skills. All assignments are based on individual effort and completion. Students who complete this course will be prepared to:

- Identify one’s own problem solving style and its relative strengths and weaknesses.
- Identify specific techniques to engage others to participate in decision making on the basis of situational factors.
- Understand the stages and steps of decision making and problem solving.
- Effectively apply various models and techniques to reach qualitative and quantitative decisions.
- Facilitate others in creative problem solving.
- Understand the role of innovation in the scientific and research management enterprise.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Online 2.5
CTPS 6129
TRANSLATIONAL RESEARCH PROJECT MANAGEMENT

CTPS 6129 is a completely online post-doctoral (and select graduate students) web course. The course is designed for those who wish to develop specific skills and knowledge in the management of scientific projects and translational science. This course is set up for a 16-week semester, and is structured as a completely asynchronous course to assist with the time management needs of those interested, but for whom a traditional delivery model would be difficult. Seven specific modules are developed along the lines of similar context. One textbook is required, comprehensive PowerPoint slides are provided, and students are required to read and report on select journal articles using links to the Moody Library. Assignments range from brief quizzes to a semester-long Harvard Business Case Analysis, to a Personal Application Project to apply knowledge and skills. Depending upon size of the class, all assignments are based on individual effort and completion. Students who complete this course will be prepared to:

- Understand the steps, stages, and roles involved in effective project management.
- Develop skills in organizing project teams, selecting members, clarifying tasks and roles, and implementing effective reporting structures.
- Develop skills involving project leadership and followership for high impact scientific teams.
- Develop an understanding of overall project operations and controls involving planning, coordination, and tracking.
- Develop effective processes of effective project communications and effective constituent relations.

Prerequisites: None
Terms Offered: I
Years Offered: Annually
Hours per week: Online 2.5

CTPS 6130
COMPREHENSIVE GRANT WRITING

This course is designed to advance the knowledge that graduate students receive in basic grant-writing courses their programs may offer. At the same time, it will teach postdocs and graduate students who have not learned the basic skills, what they need to know in order to write a viable research fellowship or grant award application. The course will include topics on finding funding, grantsmanship, working with sponsored programs, writing specific aims and research strategy sections, and addressing abstract, subjects protection, etc. A session on NRSA and other types of fellowships also will be provided. At the end of the course, participants should have completed key sections of their applications, ready for submission.

Prerequisites: None
Terms Offered: II
Years Offered: Annually
Hours per week: Lecture 2.5

CTPS 6201
TEACHING PRACTICUM - SMALL GROUP FACILITATION

This course is designed to prepare postdoctoral scholars to facilitate discussions in the small group problem based learning (PBL) courses within the UTMB School of Medicine, under the guidance of a faculty facilitator. After completing the course, participants should be prepared to develop a facilitating style that encourages discussion among the medical students that will help them achieve the desired result; develop a method for evaluating the students’ knowledge and preparation; and demonstrate the ability to encourage participation by everyone in the group. Before co-facilitating a small group session, each postdoctoral scholar must attend the facilitating workshop provided each term by the Office of Educational Development. Postdoctoral scholars also must attend faculty facilitating meetings to learn the focus of the material to be covered in the small group sessions. They will prepare to facilitate the discussion as necessary.

Prerequisites: None
CTPS 6203
BIOSAFETY LEVEL 3
This course will offer students an in-depth understanding of biosafety principles, practices and techniques that are necessary to successfully conduct research in a BSL3 laboratory. Topics will include risk assessment, personal protective equipment, proper use and selection of biological safety cabinets & chemical fume hoods, aerosol producing procedures, biological and chemical exposures, transport of biological materials, disinfection, waste handling, and emergency laboratory procedures. Emphasis will be on development of competencies in fundamental laboratory techniques and using risk assessment to work safely and aseptically in the laboratory. The principal objective of this course is to perfect participants’ practices and techniques for BSL3 laboratory work. At the completion of this course students will be able to evaluate laboratory standard operating procedures by risk assessment, demonstrate mastery of appropriate associated safety techniques, and employ, with proficiency, aseptic techniques and safe use of PPE and BSCs. This course also requires successful completion of an online training module.

Prerequisites: None
Terms Offered: I, II, III
Years Offered: Annually
Hours per week: Lecture 2

CTPS 6301
COLLEGE TEACHING AND LEARNING
This course is designed to prepare postdocs and advanced graduate students with the basic tools to develop and lead courses at the postsecondary level. After completing the course, students should be prepared to:

• Develop a teaching philosophy statement.
• Develop a framework for an introductory level course syllabus.
• Develop a framework for a “first lecture.”
• Demonstrate the ability to implement one or more active learning strategies.
• Role-play possible scenarios involved in collaborative/group learning.
• Develop a resource guide and portfolio for use in teaching college courses.
• Observe and reflect upon one or more college courses at an off-site college classroom.

The course consists of lectures, discussion and presentations, with a significant online component.

Prerequisites: None
Terms Offered: I
Years Offered: Varies
Hours per week: Lecture 3

CTPS 6302
ADVANCED BUSINESS MANAGEMENT
This course is designed to provide instruction in business management practices. At the end of the course, participants will be able to draft a marketing plan, establish personnel policies and procedures, create and read a financial statement, and be familiar with federal grant-reporting requirements.

Prerequisites: None
Terms Offered: II
Years Offered: Varies
Hours per week: Lecture 3
Helpful Phone Numbers and Addresses

Alumni Field House
215 Holiday Drive, Route 1103
(409)266-2348

Bookstore
1.106 Mary Moody Library Bldg.,
Route 0936
(409) 772-1939

Student Housing Dormitories Office
416 Texas Ave./Vincent Hall, Room 110
Route 0865
(409) 772-1898
Reporting maintenance issues:
(409) 772-4040

Family Medicine
Primary Care Pavillion (PCP)
400 Harborside Drive-Suite 104 Route 1120
(409) 772-2166

Moody Medical Library
914 Market Street
Route 1035
(409) 772-2371

Office of Student Life
Lee Hage Jamail Student Center-2nd floor
Route 1316 - (409) 772-1996

Enrollment Services
Ashbel Smith Bldg-2nd Floor
Route 1305 - (409) 772-1215

Parking
404 8th St.-Rebecca Sealy Bldg., 2.756
Route 0118
(409) 772-1581

Pastoral Care
1.220 John Sealy Towers Hospital,
Route 0201
(409) 772-3909

Student Health Services
Lee Hage Jamail Student Center-3rd floor
Route 1369
(409) 747-9508

Student Services
Lee Hage Jamail Student Center-2nd Floor
Route 1316
(409) 747-9055

University Police
404 8th St.-Rebecca Sealy Bldg., 2.712
Route 0101
Non-Emergency:
(409) 772-2691
Emergency: 911
Off campus - (409) 772-1111

For additional information, contact the individual school:

School of Nursing
University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1029
(409) 772-8271
https://nursing.utmb.edu/

School of Medicine
University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-0133
(409) 772-2671
https://som.utmb.edu/

School of Health Professions
University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1028
(409) 772-3001
https://shp.utmb.edu/

Graduate School of Biomedical Sciences
University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1050
(409) 772-2665
https://gsbs.utmb.edu/
The University of Texas System
Executive Offices

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Barry McBee
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