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The catalog is effective with the 2010–2012 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 on line 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.

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The University of Texas Medical Branch 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.

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.

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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.

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- 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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Graduate School of Biomedical Sciences
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Introduction

**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 2005–2006. 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**

Cary W. Cooper, Ph.D.
Dean

Dorian H. Coppenhaver, Ph.D.
Senior Associate Dean for Student Affairs

David W. Niesel, Ph.D.
Vice Dean

Norbert K. Herzog, Ph.D.
Assistant Dean for Recruitment

Jo Bremer, M.A.
Director, Office of Postdoctoral Affair
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

1. 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. The award is a plaque and check for $1000.

2. 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. The award is $1,000.

3. 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. The award is $1000.

4. Robert Bennett Tuition Scholarship—This scholarship recognizes an outstanding student enrolled in the GSBS. The award is $1,000.

5. 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. The award will be determined.

6. 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. The award is a check for $1000.

7. Barbara Bowman Scholarship—This scholarship is presented to an outstanding student in the program of biochemistry and molecular biology or biophysical, structural or computational biology program. The award will be $500.

8. Dennis Bowman Memorial Scholarship—Open to all students enrolled in the GSBS and awarded to an outstanding student and citizen of UTMB. This award is $1,000.

9. 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). The award is a plaque and a check for $4000.
10. **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. The award is $27,000 (stipend) plus a $1000 travel award.

11. **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. This award is $1000.

12. **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. The award is a check for $1000.

13. **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. The award is a plaque and a check for $2000.

14. **GSBS Associates Scholarships**—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). Two awards of $1,000 each.

15. **GSBS Associates Christina Fleischmann Travel Awards**—These awards are to supplement Ph.D. candidates’ travel to present their work at national and international meetings. Two awards of $500 are available.

16. **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. The award is $200.

17. **Ann and John Hamilton Endowed Scholarship**—This award is presented to recognize demonstrated academic excellence. The award is $1000.

18. **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. The award is $1000.

19. **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. The award is $500.

20. **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. The award is a certificate and check in the amount of $1,000.

21. **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. The award is a check for $500.

22. **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. The award is $1,000.

23. **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. The award is $1000.

24. **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. The award is $1000.
25. 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.

26. 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. The award is $1,000.

27. Bohdan Nechay Tuition Scholarship—This scholarship recognizes an outstanding student enrolled in the GSBS. The award is $1,000.

28. David and Janet Niesel Scholarship—This award is open to all students enrolled in the GSBS, and rewards an outstanding student and citizen of UTMB. This award is $1000.

29. Salute to Nursing Scholarship—A scholarship established through the School of Nursing’s annual the Salute to Nursing fund-raiser is available for a student who is either enrolled or eligible for acceptance by the GSBS as a regular, full-time, degree-seeking student in the Doctoral Program in Nursing. The scholarship shall be allocated on the basis of academic qualifications and/or standing. The award is $1,000.

30. 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. The award is $1000.

31. 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. The award is a check for $1000.

32. Shirley Patricia Parker Scholarship—This scholarship honors a graduate student doing research in the field of oncology and who is in financial need. The award is $1,000.

33. 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. The award is a plaque and check for $500.

34. 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. The award is $1,000.

35. 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. The award is $1000.

36. Margaret Saunders Travel Award—This award is to supplement Ph.D. candidates’ travel to present their work at national and international meetings. One award of $1,000 is available.

37. 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. Two awards of $1,300 each.

38. 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. The award is a check for $1000.

39. 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. The award is a check for $500.

40. 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. One award is available for $500.

41. **Robert Shope Endowed Scholarship**–This award recognizes a student based on academic credentials, recommendations and demonstration of a commitment to pursing a career in infectious disease research. The award is $1000.

42. **Katherina 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. The award is a plaque and check for $500.

43. **Stephen C. Silverthorne Memorial Scholarship**–This award is presented to a student on the basis of perseverance and excellence in any field of research. The award is a plaque and check for $500.

44. **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. This award is $5,000.

45. **John Stanton Scholarship**–This scholarship award was presented for the first time in 2006 and will recognize an outstanding student in the microbiology and immunology graduate program. The award is a certificate and a check in the amount of $1,000.

46. **University Federal Credit Union Scholarship**–This scholarship, sponsored by the UFCU, honors excellence in academics and citizenship for outstanding students in the GSBS. The award is $1000.

47. **UTMB Retirees Scholarship Award**–This award recognizes an outstanding graduate student. This award is $1,000.

48. **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. The award is a plaque and check for $500.

49. **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. The award is $2,000 and a plaque.

50. **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. The award is a plaque and check for $500.

51. **Betty Williams, Ph.D. Tuition Scholarship**–This scholarship recognizes an outstanding bench scientist with special consideration for disadvantaged students. The award is $1,000.

52. **Center for Tropical Diseases Graduate Student Award**– The World Health Organization Collaborating Center for Tropical Diseases award is given to a UTMB graduate student who has made a significant contribution to studies on an emerging or tropical infectious disease through research in basic science, epidemiology or clinical science. The award is a check for $500.

53. **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. The award is $1,000.

54. **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. This award is $2,000.
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 signed approvals prior to the twelfth class day of the fall and spring terms and the 10th class day of the summer term. 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 “W”, withdrew with no indication of level of performance if the student does not drop (withdraw from) all courses in the current registration. Students drop a course(s) after one of these deadlines (official census date), by preparing a brief written statement explaining the reason for dropping the course(s) and securing the signature of the instructor, the student’s program director and the dean.

In accordance with Texas Education Code Section 54.006, a student who withdraws as a result of military service may choose to (1) receive a refund of tuition and fees, (2) if eligible, be assigned an incomplete (I), or (3) at the institution’s discretion, receive a final grade in courses where a substantial amount of the coursework has been completed and a mastery of the material demonstrated.

**Courses that Begin After the Census Date**

The course(s) may be added before the class begins or within the first five days after the class starts by completing a Request for Class Schedule Change Form. Adding the course requires permission of the course co-director or instructor, the program director and the dean of the Graduate School. Students will be billed for the additional cost in tuition and fees for each course added.

These course(s) may be dropped before the course begins by completing a Schedule Change Form. Dropping the course requires permission of the program director and the dean of the Graduate School. In this case, the course will not appear on the student’s transcript. Tuition and fees paid for the course are not charged when the course is dropped before it begins; an appropriate refund will be made if tuition and fees already have been paid. A course(s) dropped (withdrawn from) after the course begins but before it ends is recorded on the transcript with a grading symbol of “W”, withdraw, with no indication of level of performance, provided the student does not drop all courses in the current registration. Students may drop a course(s) after the course(s) begins and before it ends, by preparing a brief written statement explaining the reason for dropping the course(s) and securing the signature of the instructor, the student’s program director and the dean.

Students with more than two (2) grading symbols of “W” on their transcript or more than one (1) “W” in the same course shall be subject to dismissal from the Graduate School.

The total registration must be no less than nine credit hours in any given term for the student to remain in full time status.
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).

Not Reported (NR)

The symbol for “not reported” (NR) is issued when an instructor cannot have the final grade prepared for a student by the reporting deadline or in cases when a course extends beyond the usual Graduate School reporting deadline. A grading symbol “NR” is valid for a period not to exceed one term. NR may be changed to S or U or to A,B,C, or F.

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) or “unsatisfactory” (U). An S grade qualifies the student to receive course hour credits towards the degree. No more than 9 credit hours for research courses may be credited toward the minimum hour requirement 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.

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, emotional, physical, or psychological reasons of such length of time that the work missed cannot be made up and an alteration in the academic schedule is required. Permission for up to three terms of leave of absence from a graduate program may be granted by the dean.

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 dean/assistant dean. 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.

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 senior associate dean for student affairs, the associate vice president for student services, the students’ ombudsman and the director of Office of Diversity and Equity (ODE) can provide guidance with any of the issues listed below.

Seeking Assistance. The Student Non-Academic Grievance Procedures Institutional Handbook of Operating Procedures (IHOP) Policy 7.1.14 outlines the general procedures to be followed should a student wish to file a formal grievance.

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

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

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 senior 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 any of the individuals listed above. Ultimate responsibility rests with the ODE.

Conduct and Discipline. Written allegations of violations of the Student Conduct and Discipline Policy (IHOP Policy 7.1.3) should be submitted to the senior associate dean for student affairs officer 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 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 3 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. 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.

If you have a documented disability or would like to obtain information regarding services for students with disabilities at UTMB, please contact the coordinator of services for students with disabilities at (409) 772-1996.

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 diagnostian. 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.
- Human Pathophysiology and Translational Medicine .................. M.S., Ph.D.
- Clinical Science ............................................................................. M.S., Ph.D.
- Experimental Pathology ................................................................. 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 Doctoral ........................................................................... Ph.D.
- Pharmacology and Toxicology ....................................................... M.S., Ph.D.
- Population Health Sciences ......................................................... M.S., M.P.H., 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.

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 Basic Biomedical Science Curriculum (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
- 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 diseases

The BBSC is composed of three 16-week foundation courses (biochemistry, cell biology, and molecular biology and genetics), a series of eight-week elective courses, laboratory rotations, and a set of specialized courses and activities (ethics, seminar, statistics, orientation, and electives).

**Course Schedule**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBSC 6401</td>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>BBSC 6402</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BBSC 6195</td>
<td>Frontiers of Science</td>
<td>1</td>
</tr>
<tr>
<td>BBSC 6101</td>
<td>Academic Success Skills and Ethics</td>
<td>1</td>
</tr>
</tbody>
</table>
BBSC 6301 Laboratory Rotations (optional) 3-6
BBSC 6104 Critical Reading of Scientific Literature (optional) 1

**Term II**
BBSC 6403 Molecular Biology and Genetics 4
BBSC 6301 Laboratory Rotations (2) 6
BBSC 6195 Frontiers of Science 1
Electives* 1-4

**Term III**
BBSC 6301 Laboratory Rotations (2) 6
MEHU 6101 Ethics in Scientific Research 1
BBSC 6122 Introduction to Biostatistics and Experimental Design
In Basic Sciences 1
Electives* 1-4

*A total of five credit hours is required.

YEARS 2–5
Graduate Programmatic Requirements, Electives and Dissertation Research through Graduation

**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. Physically, they must 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.

**REQUIRED COURSES**

**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. Descriptions for each can be found beginning on the next page. The second digit in the course number represents credit hours.

**Required Courses**

The following are required foundation courses in the Basic Biomedical Science Curriculum:

**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

**Term offered:** I

**Year offered:** Annually

**Hours per week:** Lecture 3; Conference/Discussion 2
BBSC 6402

CELL BIOLOGY
This is a required foundation course in the Basic Biomedical Science Curriculum (BBSC). It is a 16-week course taught throughout the term to acquaint students with the basic principles of modern cell biology. The topics 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. Each week there will be three lectures, and one or both of the following activities: 1) small-group discussion sessions of a research paper and/or 2) enrichment sessions featuring research that illustrates the principles of the preceding lectures. Grades will be based on the performance on in-class and take-home examinations based on lecture material, student participation in small-group discussion sessions, and a laboratory exam.

Prerequisites: At least one-year college-level biology and chemistry; biochemistry recommended
Term offered: I
Year 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 16-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 6401, BBSC 6402 or consent of instructor
Term offered: II
Year offered: Annually
Hours per week: Lecture 3; Conference/Discussion 2

The following are also required courses but are considered special activities:

BBSC 6101

ACADEMIC SUCCESS SKILLS AND ETHICS
This is a required core course in the Basic Biomedical Science Curriculum (BBSC). Academic success is heavily dependent on scientific communication skills. Scientific communication primarily comprise three activities that occupy about 60 to 80 percent of the work time of professional scientists: reading, writing, and speaking. This course will provide practical tips, ethics and experience in (a) reading, writing and analysis of scientific literature; (b) visual and oral presentation skills; and (c) other skills for academic success. All work will be graded as satisfactory (S) or unsatisfactory (U). The average of your grades on the preparation and analysis of papers and presentations will constitute 60 percent of your final grade. Class participation will count 40 percent of your final grade and will also be taken into consideration in determining final grades.

Prerequisites: None
Term offered: I
Year offered: Annually
Hours per week: Lecture 1

BASIC BIOMEDICAL SCIENCE CURRICULUM ◆ 29
INTRODUCTION TO BIOSTATISTICS AND EXPERIMENTAL DESIGN IN BASIC SCIENCES

This seven-week course is a required core course in the Basic Biomedical Science Curriculum (BBSC) and is an introduction to statistical thinking. Specific topics include basic summaries, probability and distributions, inference, experimental design and linear models. Grading will be based on the performance on homework, a take-home mid-term examination and an in-class examination.

Prerequisites: None
Term offered: III
Year offered: Annually
Hours per week: Lecture 3

FRONTIERS OF SCIENCE

This is a required core course in the Basic Biomedical Science Curriculum (BBSC). It 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 speakers from on- or off-campus invited guests during each of the fall and spring terms. Students chose the seminars (eight in the fall; 12 in the spring) to attend on the basis of student interest and/or program recommendations with at least one from each of the participating programs. In the Fall term, this course also orients students to the research opportunities available within the eight participating graduate programs. Each graduate program has a total of two hours of contact time with the students. Attendance is mandatory for all BBSC students. Grades will be satisfactory (S) or unsatisfactory (U) based on attendance.

Prerequisites: None
Term offered: I and II
Year offered: Annually
Hours per week: Seminar 1

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 their areas of dissertation specialization. Students in the BBSC are required to take four eight-week rotations in a minimum of two independent laboratories during their first year in the BBSC. The time commitment is approximately 18 hours/week in the lab.

Prerequisites: None
Term offered: I, II, III with no more than nine credit hours (24 weeks) in one lab
Year offered: Annually
Hours per week: 18 hours/week in the lab

ETHICS OF SCIENTIFIC RESEARCH

This course is required of all graduate students. The course will employ small-group discussion to explore ethical issues in the conduct of scientific research. Students will meet
with co-instructors from the Institute for Medical Humanities and the GSBS to discuss readings and cases dealing with the ethics of research; the ordinary practice of scientific research; and value conflicts that arise between scientists and society at large.

Prerequisites: None
Term offered: III
Year offered: Annually
Hours per week: Conference 1

**Integrative Elective Courses**

Listed within this section are 14 seven- or eight-week courses designated as electives. Students are required to take a minimum of five credit hours during their first year. The course descriptions for electives are as follows in numerical order.

**BBSC 6109**

1 CREDIT
PRINCIPLES OF MEMBRANE TRANSPORT: TRANSPORT PROCESSES IN EPITHELIA

This eight-week course deals with biological transport at an intermediate level. The course is divided into two parts. Material in the first half of the course will be introduced via lectures. These lectures will deal with the fundamental principles that underlie epithelial transport. Topics to be covered include epithelial structure and function, fluorescence techniques, epithelial polarity, molecular biology, structure-function relationships and physiology of epithelial sodium and chloride channels, sodium-substrate transporters, and epithelial bacterial interaction. The second half of the course will be student presentations of selected articles. Topics will parallel the materials introduced via lecture. Grades will be based on participation, presentation of a research paper and an open book take-home examination. The student under the guidance of a course faculty member writes the take-home question.

Prerequisites: BBSC 6401, BBSC 6402
Term offered: II
Year offered: Annually
Hours per week: Lecture 2

**BBSC 6113**

1 CREDIT
HORMONAL SIGNALING

This eight-week course deals with hormonal signaling and endocrinology at an intermediate level. After the introductory lecture providing an overview of endocrinology, each subsequent topic will consist of a lecture followed by a review of a paper or papers from the literature which illustrate or extend concepts presented in the lecture. The second and third lectures will deal with details of the two major receptor formats employed in hormonal signaling (steroid and peptide). The next two lectures will be on topics of broad applicability to hormonal signaling, development and cancer. The final lecture will cover an endocrine system-specific topic chosen by majority vote of the enrolled students. Student grades will be dependent equally upon (1) instructors’ grading of their contribution to the scientific paper presentations and discussions and (2) a final take home exam consisting of essay questions which may integrate material from the entire course.

Prerequisites: BBSC 6401, BBSC 6402, BBSC 6403
Term offered: III
Year offered: Annually
Hours per week: Lecture 1.5, Conference/Discussion .5
SMOKING CAUSED DISEASE – DISTRIBUTION, IMPACT, AND MECHANISMS

This seven-week course will be introduced primarily through class discussion of primary literature plus a few lectures. Topics will include: 1) a general introduction to epidemiological design used for assessing the health effects of tobacco smoke; 2) investigations that have documented short and long-term molecular effects of tobacco smoke on mammalian tissues and organ systems, with emphasis on cardiovascular disease; and 3) potential roles of antioxidants in the prevention of tobacco-related disease. Grades will be based upon class participation, one essay examination, and a short paper.

Prerequisites: BBSC 6401, BBSC 6402, BBSC 6403
Term offered: III
Year offered: Annually
Hours per week: Lecture 1, Conference/Discussion 1.5

MICROORGANISMS AND INFECTIOUS DISEASE

This eight-week course will explore the importance of microorganisms as both living systems and disease causing agents. Topics will include discussion of selected, bacterial, parasitic, and viral infections, and mechanisms of disease pathogenesis. It will explore the concepts of endosymbiosis (living entities needing each other) and how the new bioinformatics tools will help us to understand the genomes of disease-causing agents. It will also reveal the dynamics of populations, including spread and distribution of microorganisms, transmission, persistence, natural life cycles, and host ranges. Additionally, host-pathogen interactions will be explored, including mechanisms used by infectious organisms to gain entry, replicate, and disseminate in the host; mechanisms of tissue injury and disease caused by intracellular pathogens; establishment of latent/persistent infections by non-cytopathic viruses and protozoan parasites; and acute inflammation and septic shock associated with bacterial infections. Material will be presented by lecture and group discussion. Grades will be based on performance on two examinations, class attendance, and participation in class discussions.

Prerequisites: BBSC 6401, BBSC 6402
Term offered: II
Year offered: Annually
Hours per week: Lecture 1.5, Conference/Discussion 1.5

INTRODUCTION TO IMMUNE MECHANISMS

This eight-week course will introduce the principles of basic immunology. Course content includes 1) development and function of cellular components (e.g., T and B lymphocytes, dendritic cells, macrophages) of the immune system; 2) innate and adaptive (humoral and cell-mediated) immune responses; 3) structure and function of important membrane (e.g., antigen receptors, cytokine receptors, major histocompatibility molecules) and soluble (e.g., interleukin-2, cytokines, chemokines) molecules; and 4) mechanism of induction of immune responses (i.e., antibody production, cytotoxic and helper functions) to infectious agents, as well as defective responses (immunodeficiency) and dysregulated responses (autoimmunity). Classes will be in the form of lectures or discussion of primary literature. Grades will be based on participation (degree of preparedness for discussions) and two examinations.

Prerequisites: BBSC 6401, BBSC 6402
Term offered: II
Year offered: Annually
Hours per week: Lecture 2, Conference/Discussion 1
EXCITABILITY AND SYNPATIC TRANSMISSION

This eight-week course deals with fundamental concepts that underlie electrical excitability, conduction of electrical activity, and synaptic transmission. Topics covered include the genesis of electrochemical potentials; molecular structure and biophysical properties of voltage-gated channels; electronic spread vs. propagated electrical activity, pre-and post-synaptic effects of receptor-gated channels and G-protein coupled receptors, regulation of exocytosis, quantal analysis of transmitter release, mechanisms associated with learning and memory, and analytical techniques that include current and voltage clamp, single channel recording, and noise analysis. There will be formal lectures and discussion sessions to review lecture topics of original articles; practice exam questions may be available for review and discussion. Students will be assigned to participate in daily class discussion of lecture topics. Grades will be based on class participation and closed-book examinations.

- Prerequisites: BBSC 6401, BBSC 6402
- Term offered: II
- Year offered: Annually
- Hours per week: Lecture 3, Conference/Discussion 1

PRINCIPLES OF DRUG ACTION, PHARMACOKINETICS AND BIOTRANSFORMATION

This eight-week course is designed to teach graduate students the principles underlying the following interactions between drugs, toxins, hormones, and transmitters and living organisms, including: 1) activation and inhibition of receptors, enzymes, transporters and other targets and 2) absorption, distribution, excretion, elimination and biotransformation, with special emphasis on metabolism by the cytochromes P450. The course will be taught primarily in lecture format with class discussion of primary research articles and homework problems. Grading will be based on class participation, two written exams, a short term paper, and a 15-minute oral presentation of the term paper.

- Prerequisites: BBSC 6401, BBSC 6402
- Term offered: II
- Year offered: Annually
- Hours per week: Lecture 3, Conference/Discussion 1

SYSTEMIC PHYSIOLOGY AND TOOLS FOR TRANSLATIONAL BIOLOGY

This eight-week course introduces students to important concepts and quantitative measures of systemic physiology with a focus on the cardiovascular, pulmonary, renal and GI systems. The course is concerned with understanding organ structure and physiological function, with additional time devoted to the role of systematic physiology in translational research that advances patient care. This course is appropriate for students who are planning careers in the pharmaceutical or medical device industries as well as those seeking academic careers, as it is concerned with how to integrate basic cellular and molecular responses with organ and systemic effects. Instruction is by lecture, student presentations, and reading. Grades will be based on participation, presentations, a midterm and a final exam.

- Prerequisites: BBSC 6401, BBSC 6402
- Term offered: II
- Year offered: Annually
- Hours per week: Lecture 4.5
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 6401, BBSC 6402, BBSC 6403
Term offered: III
Year offered: Annually
Hours per week: Lecture 3; Conference/Discussion 1

BBSC 6213 2 CREDITS

GENES, ENVIRONMENT AND DISEASE

This eight-week course will address key mechanisms for the development of human disease and, more importantly, the interrelationships between genetics and environmental factors for increased risk to develop health problems. Lectures will be given to address the following major topics: 1) the role of gene mutations as causes of disease, 2) the process of mutagenesis and the roles of environmental agents in mutagenesis and related cellular responses, 3) genetic factors which influence the nature and severity of disease, 4) carcinogenesis as a model for the role of genetic factors in disease, 5) the influence of allelic variations in genes within human populations in susceptibility to disease, 6) strategies for genetic intervention and therapy, and 7) the role of germ and somatic cell mutations in reproductive disorders. The major activity in the course is a group project to conduct an in-depth review to understand the mechanisms and contribution of risk factors to a model disease. Three to five students will be supervised by faculty to work on a project such as birth defects, breast cancer, cardiovascular disease and cervical cancer. The group will make a joint oral presentation of their work. Course grade will be based on class participation, contribution to the group project, and performance in the examination.

Prerequisites: BBSC 6401, BBSC 6402, BBSC 6403
Term offered: III
Year offered: Annually
Hours per week: Lecture 3, Conference/Discussion 1

BBSC 6214 2 CREDITS

PRINCIPLES OF CNS SENSORY-MOTOR INTEGRATION

This course introduces students to fundamental organizing and operating principles utilized by a central nervous system to integrate sensory information and produce an appropriate motor output. The model system to be utilized is the central nervous system of the medicinal leech and an ensemble of identified sensory, motor and interneurons that are organized to produce a complex swimming locomotor behavior. Anatomical and physiological features of the circuitry, including electrophysiological interactions of neurons, and their applicability to nervous systems generally will be analyzed. Concepts such as “identified cells”, receptive fields, parallel and serial processing, synaptic integration, central pattern
generators, trigger cells, command cells, hierarchical cascades of circuit organization, motor control and, neural basis of behavior will be examined. The teaching method will consist of reading and discussing in detail a series of some 25 papers from the original literature (usually two papers per class session) that trace the history of the development of this system, from descriptions of single sensory and motor neurons to the full central circuitry for producing locomotion. Grading will be based on class participation and on the production of a complete circuit diagram of all the neural elements of the control system and their interactions.

- **Prerequisites:** BBSC 6207, BBSC 6401, BBSC 6402, BBSC 6403
- **Term offered:** III
- **Year offered:** Annually
- **Hours per week:** Conference/Discussion 4

### Other Courses

Listed below are eight-week courses designated as optional which students can take prior to their first year. However, they cannot be counted towards the first-year course requirements. The course descriptions are provided below:

**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:** By permission only
- **Term offered:** III
- **Year offered:** Annually
- **Hours per week:** Lecture 1.5, Conference/Discussion 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 satisfactory (S) or unsatisfactory (U) based on participation.

- **Prerequisites:** By permission only
- **Term offered:** I, III
- **Year offered:** Annually
- **Hours per week:** Lecture 1, Conference/Discussion 2
Biochemistry and Molecular Biology

http://www.bmb.utmb.edu

Faculty

Sastry, Sarita, Ph.D.

Professor

Ahmed, Mahmoud, Ph.D.
Ansari, G.A. Shakeel, Ph.D
Bolen, David W., Ph.D.
Brasier, Allan, Ph.D.
Braun, Werner, Ph.D.
Bujalowski, W.M., Ph.D.
Carney, Darrell, Ph.D.
Chung, Dai, Ph.D.
Epstein, Henry F., M.D.
Fox, Robert, Ph.D.
Fujise, Kenichi, Ph.D.
Goldblum, Randall, M.D.
Gorenstein, David, Ph.D.
Jia, Jianhang, Ph.D., Ph.D.
Kurosdy, Alexander, Ph.D.
Lee, James C., Ph.D.
Luxon, Bruce A., Ph.D.
McAdoo, David J., Ph.D.
Mitra, Sankar, Ph.D.
Papconstantinou, John, Ph.D.
Perez-Polo, J. Regino, Ph.D.
Prakash, Louise, Ph.D.
Prakash, Satya, Ph.D.
Singh, Pomila, Ph.D.
Srivastava, Satish K., Ph.D.
Thompson, E. Brad, M.D.
Ullrich, Robert L., Ph.D.
Watson, Cheryl S., Ph.D.

Associate Professor

Jeschke, Marc G., M.D., Ph.D., M.M.S.
Konkel, David A., Ph.D.
Midoro-Hiriuti, Terumi, Ph.D.
Oberhauser, Andres F., Ph.D.
O’Connor, Kathleen L., Ph.D.
Rajarathnam, Krishna, Ph.D.
Tagliatala, Giulio, Ph.D.
Watowich, Stanley J., Ph.D.
Xie, Jingwu, Ph.D.

Assistant Professor

Barral, Jose M., M.D., Ph.D.
Choi, Kyung H., Ph.D.
Hazra, Tapas K., Ph.D.
Iwahara, Junji, Ph.D.
Kumar, Raj, Ph.D.
Lin, Xi, Ph.D.
Morais, Marc C., Ph.D.
Nesic, Olivera, Ph.D.
Rabek, Jeffrey Paul, Ph.D.
Rosgen, Jorg, Ph.D.
Rowicka-Kudicka, Malgorzata, Ph.D.
Sastry, Sarita K., Ph.D.
Toliver-Kinsky, Tracy, 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 predoctoral 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 situ 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
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 interpersonal 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 HBCG, 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.

Course Number | Credit Hours
--- | ---
**YEAR 1 (Core Curriculum)**
**Term I**
BBSC 6401 | Biochemistry 4
BBSC 6402 | Cell Biology 4
BBSC 6105 | Program Orientation 1
BBSC 6195 | Frontiers of Science 1
**Term II**
BBSC 6403 | Molecular Biology and Genetics 4
BBSC 6042 | Laboratory Rotations 3-6
Integrative Systems Modules (must take at least 2) ** 2
BBSC 6195 | Frontiers of Science 1
**A TOTAL OF FOUR MODULES, AT LEAST ONE FROM EACH CLUSTER, IS REQUIRED; OTHERS MAY BE TAKEN AS ELECTIVES.**
**Term III**
BBSC 6042 | Laboratory Rotations 3-6
Integrative Systems Modules (must take at least 2) ** 1
MEHU 6101 | Ethics 1
BBSC 6122 | Statistics 1
**A TOTAL OF FOUR MODULES, AT LEAST ONE FROM EACH CLUSTER, IS REQUIRED; OTHERS MAY BE TAKEN AS ELECTIVES.**

**YEAR 2**
**Term I**
BMB 6097 | Research
BMB 6099 | Dissertation
**Core electives**
BMB 6207 | Biology of Stress 2
BMB 6208 | Genomics–Bioinformatics 2
BMB 6209 | DNA Protein and Toxicology 2
**Elective**
BMB 6315 | DNA Protein Interaction (fall even years) 3
BMB 6332 | Molecular Biophysics 3
BMB 6336 | Macromolecular Structure 3
BMB 6418 | Structure and Function of Biomolecules Biophysics of Macromolecules 4
Term II
BMB 6195 Seminar 1
HBCG 6097 Research and/or Electives 8
BMB 6099 Dissertation

Core Electives
BMB 6222 Hormone Action and Cancer Cell Biology 2
BMB 6223 Biology of Aging (spring odd years) 2
BMB 6224 Structural Biology 2

Electives
BMB 6206 Bioinformatics on the World Wide Web (annually spring) 2
BMB 6227 Inborn Errors of Metabolism (spring even years) 2
BMB 6312 Intro. To Fast Kinetics..(spring even years) 3
BMB 6218 Drug Transport in MDR Cells (spring odd years) 2
BMB 6360 Thermo of Macromolecular Assembly (spring odd years) 3
BMB 6334 Molecular Biophysics II 3
BMB 6338 Computer Modeling 3
BMB 6340 Bio-organic Mechanisms 3

Term III
BMB 6097 Research and/or Electives .9
BMB 6099 Dissertation

Electives
BMB 6220 DNA Repair and Mutagenesis (annually) 2
BMB 6316 Cell Signaling (annually) 3
BMB 6214 Gene Therapy of Solid Tumors (even years) 2 or 3
BMB 6317 Developmental Biology (even years) 3

In addition to the required courses listed in the schedule above, an additional 12 hours of elective courses must be taken by each student. The electives may be selected from those offered within the program or from any other graduate program on campus.

PHYSICAL FACILITIES
The graduate program is located primarily 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 Student Financial Aid Office. Graduate assistantships are available through the Graduate School on a competitive basis.
COURSE DESCRIPTIONS

BMB 6000 (1-6 CREDITS)
SPECIAL TOPICS IN BIOCHEMISTRY

Lectures and/or reading assignments on a variety of topics at an advanced level. This is a course designed to cover material of current interest, with assigned readings or experiments under supervision of the faculty.
Prerequisites: BBSC Core
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable

BMB 6097 (1-9 CREDITS)
RESEARCH

Work designed to introduce the student to the technique and philosophy of scientific research and to guide in the development of a research problem in the major area of concentration.
Prerequisites: BBSC Core
Term offered: I, II, III
Year offered: Annually
Hours per week: Laboratory 1-9

BMB 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 of Science degree
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable
Students registering for Thesis are expected to register for a total of 9 credit hours per term.

BMB 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 Doctor of Philosophy degree
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable
Students registering for Dissertation are expected to register for a total of 9 credit hours per term.
THE MOLECULAR BASIS OF DISEASE

Lectures will be presented by internationally recognized investigators in specific areas of molecular bases of diseases as part of the HBC&G weekly seminar series. The topics include molecular mechanisms of misfolded protein diseases, including certain neurodegenerative and metabolic diseases and diseases of aging. The two-hour discussion sessions will involve the analysis by students of selected key papers related to the lecture material. Students will be graded on presentations and participation in discussions.

Prerequisites: None
Term offered: I, II
Year offered: Annually
Hours per week: Lecture 1; Conference 2

SEMINAR

Current topics in biological chemistry.
Prerequisites: BBSC Core
Term offered: II
Year offered: Annually
Hours per week: Seminar 1

BIOINFORMATICS ON THE WORLD WIDE WEB

This course introduces molecular biologists to software tools on the World Wide Web for search, retrieval, and analysis of amino acid and nucleotide sequences. The software includes BLAST, FASTA, and Clustal W. The course also covers secondary and tertiary structure prediction of proteins, homology or comparative modeling, and methods for the analysis and validation of structures. 3-D modeling based on experimental and theoretical constraints will be explained with special reference to software including MASIA, EXDIS, DIAMOD, and FANTOM. Two sessions will be given per week. The first session will describe the scientific concepts behind the tools and the computational procedures. The second session will be an “I day” where students will learn to use these tools through hands-on sessions at modern graphic workstations. The goals are to provide a critical appreciation of bioinformatics tools and enable the student to apply them to his/her research. This is a 10-week course.

Prerequisites: None
Term offered: II
Year offered: Annually
Hours per week: Lecture 2

CELL AND GENE REGULATION IN STRESS BIOLOGY

This course considers the molecular and cellular regulatory biology of stress. A particular focus will be the functional interpretation of structure function profiles in metabolism and current paradigms used in signaling research.

Prerequisite: Permission of instructor or BBSC Core
Term offered: I
Year offered: Annually
Hours per week: Lecture 1; Conference 2
GENOMICS, PROTEOMICS, AND BIOINFORMATICS

The principles and novel techniques used in the interpretation of DNA micro arrays and protein arrays will be discussed. A particular focal point will be the functional interpretation of gene expression profiles and the statistical interpretation of data mining procedures in genomics and metabolic pathways databases.

Prerequisite: Permission of instructor or BBSC core
Term offered: I
Year offered: Annually
Hours per week: Lecture 1; Conference 2

DNA REPAIR, MUTAGENESIS, REPLICATION, AND ENVIRONMENTAL TOXICOLOGY

This course deals with various aspects of DNA repair and replication, mutagenesis, and environmental toxicology. A particular focal point will be the interrelationships among repair processes and other important cellular functions.

Prerequisite: Permission of instructor or BBSC core
Term offered: I
Year offered: Annually
Hours per week: Lecture 1; Conference 2

GENE THERAPY OF SOLID TUMORS

An advanced graduate course about the biochemical pathways of cell growth that are targeted by the various systemic treatments currently being used or in development against cancers. Students will learn about the fundamentals of cell biology as it relates to chemotherapeutic, hormonal, and other recent forms of systemic therapies. Topics include the use of monoclonal antibodies, cytotoxic T lymphocytes, tumor vaccines, recombinant interferons and cytokines, adoptive cellular therapy, immunotoxins, antibodies to growth factors, peptide hormones and receptors, antiangiogenesis factors, antisense strategies, differentiation agents, chemoprevention, and immunomodulation.

Prerequisites: BBSC Core
Term offered: II
Year offered: Annually
Hours per week: Lecture 1; Conference 1

DRUG TRANSPORT IN MULTI-DRUG RESISTANCE

Two hours per week of instruction in an informal tutorial setting covering the role of plasma membrane drug efflux pumps in multi-drug resistance (MDR) of cancer cells. Topics covered include an overview of MDR; historical aspects of its implications in cancer chemotherapy; expression, structure, and functions of drug efflux pumps using two major drug efflux pumps (MRD-1 and MRP) as models; mechanisms of xenobiotic transport; and the role of the ABC family of transporters in detoxification mechanisms. In addition, the clinical aspects of MDR and approaches to modulate MRD will be covered by invited clinical oncologists.
Prerequisites: BBSC Core
Term offered: II
Year offered: Biennially (odd years)
Hours per week: Lecture 2

**BMB 6220**  
(2 CREDITS)

**DNA REPAIR AND MUTAGENESIS**

This course offers a comprehensive understanding of the state of knowledge of mechanisms of DNA repair and mutagenesis. It is timely because of the recent information about the impact of DNA and mutagenesis in various human diseases and the role of DNA repair in aging. Each module will consist mainly of lectures by the instructors with time allotted for class discussions. Grades will be based on performance on two examinations and class participation.

- **Prerequisites:** BBSC Core and permission of instructor
- **Term offered:** III
- **Year offered:** Annual
- **Hours per week:** Lecture 2

**BMB 6222**  
(2 CREDITS)

**HORMONE ACTION AND CANCER CELL BIOLOGY**

This course provides students a clear understanding of the issues current in several major areas of hormone action, especially as related to cancer cell biology. These areas include action of nuclear hormone receptors, G-protein associated receptors and the hormones that act through them, non-G-protein associated membrane receptors and the hormones that act through them, and signaling molecules that act by way of hormone-like systems, but not usually classified strictly as hormones. In the course of examining these major systems, aspects of signaling pathways as well as ligand-receptor actions will be included.

- **Prerequisite:** Permission of instructor or BBSC core
- **Term offered:** II
- **Year offered:** Annually
- **Hours per week:** 2, 10 Week Course

**BMB 6223**  
(2 CREDITS)

**MOLECULAR, CELLULAR, AND GENETIC BASIS OF AGING**

This course encompasses the principles and novel techniques used in understanding the molecular, cellular (physiological), and genetic factors that regulate 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. Course discussion covers 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:** Permission of instructor or BBSC core
- **Term offered:** II
- **Year offered:** Annually
- **Hours per week:** Lecture 1; Conference 2
BMB 6224 (2 CREDITS)

STRUCTURAL BIOLOGY AND BIOPHYSICAL CHEMISTRY

This course deals with the role of biophysical methods, including structural biology and 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 of combining experimental approaches to obtain a full functional description.

Prerequisite: Permission of instructor or BBSC core
Term offered: II
Year offered: Annually
Hours per week: Lecture 1; Conference 2

BMB 6227 (2 CREDITS)

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: BBSC core
Term offered: II
Year offered: Biennially (even years)
Hours per week: Lecture 2

BMB 6265 (2 CREDITS)

SINGLE MOLECULE DETECTION AND MANIPULATION

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 florescence. 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 (1 h; 2/week) we will discuss two or more key papers that will be presented by the students. Course grading will consist of student presentations, student participation in group discussion.

Prerequisites: None
Term offered: III
Year offered: Annually
Hours per week: Variable

BMB 6312 (3 CREDITS)

INTRODUCTION TO FAST KINETICS

A course for advanced graduate students that introduces the theoretical and experimental aspects of transient chemical kinetic analysis of biochemical reaction mechanisms. Emphasis is placed on application of time-dependent and fast kinetic methods to study the dynamics of bimolecular interactions.
Prerequisites: BBSC curriculum, HBCG 6418, permission of instructor
Term offered: I
Year offered: Biennially (even years)
Hours per week: Lecture 3

BMB 6315 (3 CREDITS)
DNA PROTEIN INTERACTION

This unique graduate course is devoted to an in-depth discussion of the various ramifications of DNA protein interaction. Most regulatory processes and all aspects of DNA metabolism including DNA replication, repair, recombination, and transcription involve specific and non-specific interaction of DNA with protein. This course will focus on selected aspects of the molecular mechanisms of interaction of DNA with regulatory proteins and enzymes, as well as structural and accessory proteins.

Prerequisites: Permission of instructor
Term offered: I
Year offered: Biennially (even years)
Hours per week: Lecture 2; Discussion 1

BMB 6316 (3 CREDITS)
CELL SIGNALS FOR GROWTH DIFFERENTIATION

An in-depth elective course designed to give students an understanding of multiple signal pathways and to analyze the literature of cell signaling in normal and pathological cell growth, differentiation, and death (apoptosis). Following a set of lectures, students will present and discuss publications that demonstrate specific aspects of signaling pathways involved in regulation of cell proliferation, cancer, and apoptosis. Through the analysis of publications, students will be exposed to the experimental designs and techniques used to elucidate signal pathways, the role of multiple pathways in cellular regulation, and the mechanisms by which normal regulatory mechanisms are subverted during transformation and carcinogenesis. Faculty will provide written evaluations of the presentations. Grades for the course will be based upon presentations and class participation.

Prerequisites: BBSC curriculum and permission of instructor
Term offered: III
Year offered: Annually
Hours per week: Lecture 3

BMB 6317 (3 CREDITS)
DEVELOPMENTAL BIOLOGY

Cellular and molecular aspects of development from gametogenesis through cleavage in various experimental organisms are discussed. The concepts of cellular totipotency and determination will be examined in detail. Tissue interactions that initiate organogenesis and formation of specific cell types are also covered. Control of specific gene expression will be emphasized as it relates to questions of development. The course will be offered as a directed tutorial consisting of assigned background reading and reading from the current literature, which may be supplemented with lecture material as appropriate. Student performance will be monitored by regular faculty/student conferences and the final grade will be determined by the submission of a term paper.

Prerequisites: Permission of instructor
Term offered: III
Year offered: Biennially (even years)
Hours per week: Conference 3
BMB 6325  (3 CREDITS)

ADVANCED GENETICS

This course gives a comprehensive view of modern genetics including genomics, high throughput procedures and their role in analysis multiple gene function, genetic basis of microbial pathogenesis, yeast in analysis of genetically regulated biological processes, genetic-based mitochondrial biogenesis and disease, genetics of C. elegans, transgenic animals, gene targeting, gene therapy, stem cell approaches, population genetics and molecular evolution, gene mapping and linkage equilibria, triple repeat diseases and other complex gene alterations, cancer genetics, and molecular bases of prior diseases.

Prerequisites: Permission of instructor; must have reached second year
Term offered: II
Year offered: Biennially (even years)
Hours per week: Lecture 2; Conference 1

BMB 6332  (3 CREDITS)

MOLECULAR BIOPHYSICS I

Introduction to principles, methods, and approaches employed in the study of energetics, structure, and function of biological macromolecules. Topics include solution and statistical thermodynamics, kinetics, theory of ligand binding, conformational equilibria, and calorimetry. This course will introduce the student to the use of Mathematica as a tool for problem solving, simulation, and programming. This tool will be used throughout the entire curriculum.

Prerequisites: 1 semester physical chemistry, 1 year physics, 3 semesters integral calculus
Term offered: I
Year offered: Annually
Hours per week: Discussion 3

BMB 6334  (3 CREDITS)

MOLECULAR BIOPHYSICS II

Introduction to principles, methods, and approaches employed in the study of energetics, structure, and function of biological macromolecules. Topics include NMR, optical spectroscopy, transport methods, X-ray diffraction, and other scattering and diffraction methods. This course will use Mathematica as a tool for problem solving, simulation, and programming.

Prerequisites: Molecular Biophysics I
Term offered: II
Year offered: Annually
Hours per week: Lecture 3

BMB 6336  (3 CREDITS)

PHYSICAL BASIS OF 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.

Prerequisites: Permission of instructor
Term offered: I
Year offered: Annually
Hours per week: Discussion 3
BMB 6338  (3 CREDITS)

COMPUTER MODELING OF MACROMOLECULAR STRUCTURE AND FUNCTION

Introduction to computational modeling methods for protein and nucleic acid structure and function. Topics include molecular dynamics, homology modeling, and sequence and genomic analysis methods.

Prerequisites: Molecular Biophysics I
Term offered: II
Year offered: Annually
Hours per week: Discussion 3

BMB 6340  (3 CREDITS)

BIOORGANIC MECHANISMS

Introduction to the organic chemistry of biological molecules. Topics include enzyme mechanisms, analysis methods, and biomolecular synthesis and degradation.

Prerequisites: Molecular Biophysics I
Term offered: II
Year offered: Annually
Hours per week: Discussion 3

BMB 6360  (3 CREDITS)

THERMODYNAMICS OF MACROMOLECULAR ASSEMBLY

Intensive course work to provide students with basic physical principles of ligand-protein, protein-protein, and protein-nucleic acid interactions. The concept of thermodynamic linkages will be introduced and initially applied to a system of simple, small ligand binding to protein and subsequently, to multi-macromolecular systems. Students will be graded on one oral and two written open-book examinations. The main emphasis is the application of principles to a new biological system. The final written examination is in the format of a grant application.

Prerequisites: BBSC core and permission of instructor
Term offered: II
Year offered: Biennially (odd years)
Hours per week: Lecture 3
Faculty

Boehning, Darren, Ph.D.

Professor
  Ansari, Naseem H., Ph.D.
  Collins, Thomas J., Ph.D.
  Elferink, Lisa A., Ph.D.
  Epstein, Henry F., M.D.
  Hankins, Gary D., Ph.D.
  Herndon, David N., M.D.
  Hulsebosch, Claire E., Ph.D.
  Jackson, George R., M.D., Ph.D.
  Mitra, Sankar, Ph.D.
  Papconstantinou, John, Ph.D.
  Prough, Donald S., M.D.
  Resto, Vincente A., M.D., Ph.D.
  Saade, George A., M.D.
  Sarna, Sushil K., Ph.D.
  Urban, Randall J., M.D.
  Volpi, Elena, M.D., Ph.D.
  Yallampalli, Chandrasekhar, Ph.D.

Associate Professor
  Abdel-Rahman, Sherif, Ph.D.
  Bhat, Krishna, Ph.D.
  Denner, Larry, Ph.D.
  Elferink, Cornelis, Ph.D.
  Given, Randall Lyle, Ph.D.
  Hellmich, Mark Richard, Ph.D.
  König, Rolf, Ph.D.
  Neugebauer, Volker E., M.D., Ph.D.
  Rasmussen, Blake B., Ph.D.
  Savidge, Tor, Ph.D.
  Sheffield-Moore, Melinda, Ph.D.
  Taglialetela, Giulio, Ph.D.

Assistant Professor
  Barral, Jose M., M.D., Ph.D.
  Boehning, Darren, Ph.D.
  Durham, William, Ph.D.
  Finnerty, Celeste Campbell, Ph.D.
  Goharkhay, Nima, M.D., Ph.D.
  Kang, Myoung-Goo, Ph.D.
  Kayed, Rakez, Ph.D.
  Sognier, Marguerite A., Ph.D.
  Tang, Shao-Jun, 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 understanding of how cells, tissues, and organs function;

2. to provide laboratory experiences that will allow students to do independent research and contribute to the 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; radioimmunoassay; protein purification, characterization, and expression; radioenzymatic assay; recombinant DNA methods; RNA and DNA analysis; anti-sense technology; cell and tissue culture; and electrophysiology. Students take a laboratory orientation course that introduces each of the faculty and their research interests and techniques. Students rotate through at least 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 a comprehensive qualifying examination as part of the requirements for admission to candidacy. Questions test basic scientific reasoning skills. Following successful completion of the examination, each student designs a dissertation proposal, written as a grant application and presented to the faculty as a seminar. The seminar is followed by an oral examination by a five-member faculty committee, one member of which is an external reviewer. 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.

**REQUIRED COURSES**

All students are expected to take the following courses:

BASIC BIOMEDICAL SCIENCES CURRICULUM
BBSC 6402 Cell Biology
BBSC 6401 Biochemistry
BBSC 6105 Program Orientation
BBSC 6101 Academic Success Skills  
MEHU 6101 Ethics of Scientific Research  
BBSC 6403 Molecular Biology and Genetics  
BBSC 6042 Laboratory Rotations (must be taken twice)  
BBSC 6122 Statistics  
BBSC 6195 Frontiers of Science (Seminar)  
*Must take at least 5 hours of BBSC electives*

**CELL BIOLOGY CURRICULUM**
CELL 6004 Academic Skills  
CELL 6097 Research  
CELL 6099 Dissertation  
CELL 6195 Seminar (must be taken every term until candidacy)  
CELL 6503 Cell Biology of Tissues

**Additional Electives or Systems Modules**
Students must complete 6 hours of electives before admission to candidacy. Additional electives may be taken as needed to strengthen areas of weakness or to provide background for research or teaching.

**Typical Schedule**
Below is a typical schedule for students in the Cell Biology Program. Students normally take 9 to 15 semester credit hours of course work per term. Each academic year is divided into three terms starting in September, January, and May respectively.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td><strong>YEAR 1</strong></td>
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<tr>
<td><strong>Term I</strong></td>
<td></td>
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<tr>
<td>BBSC 6402</td>
<td>Cell Biology</td>
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<tr>
<td>BBSC 6401</td>
<td>Biochemistry</td>
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<tr>
<td>BBSC 6101</td>
<td>Academic Success Skills</td>
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<tr>
<td>BBSC 6105</td>
<td>Program Orientation</td>
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<td>BBSC 6195</td>
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<td><strong>Term II</strong></td>
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<tr>
<td>BBSC 6403</td>
<td>Molecular Biology and Genetics</td>
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<td>BBSC 6195</td>
<td>Frontiers of Science</td>
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<tr>
<td>BBSC 6042</td>
<td>Laboratory Rotation</td>
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<td>BBSC Electives (must take at least 2)**</td>
</tr>
<tr>
<td>**<strong>A TOTAL OF FOUR ELECTIVES, ONE FROM EACH CLUSTER, IS REQUIRED; OTHERS MAY BE TAKEN AS ELECTIVES.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Term III</strong></td>
<td></td>
</tr>
<tr>
<td>BBSC 6042</td>
<td>Lab Rotation</td>
</tr>
<tr>
<td>MEHU 6101</td>
<td>Ethics of Scientific Research</td>
</tr>
<tr>
<td></td>
<td>BBSC Electives (must take at least 2) **</td>
</tr>
</tbody>
</table>
BBSC 6122 Introduction to Biostatistics & Experimental Design 1
CELL 6503 Cell Biology of Tissues 4

**A TOTAL OF FOUR ELECTIVES, ONE FROM EACH CLUSTER, IS REQUIRED; OTHERS MAY BE TAKEN AS ELECTIVES. ELECTIVES MUST ADD UP TO A MINIMUM OF 5 HOURS.**

*Identify mentor by Sept. 1.*

**YEAR 2**

**Term I**

**Required:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELL 6008</td>
<td>Lab Rotation</td>
<td>3-8</td>
</tr>
<tr>
<td>Or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CELL 6097</td>
<td>Research</td>
<td>3-8</td>
</tr>
<tr>
<td>CELL 6195</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

**Electives:**  
Program electives as needed, 6 hours required

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELL 6102</td>
<td>Signal Response to Injury</td>
<td>1</td>
</tr>
<tr>
<td>CELL 6701</td>
<td>Gross Anatomy</td>
<td>7</td>
</tr>
<tr>
<td>CELL 6324</td>
<td>Teaching: Gross Anatomy</td>
<td>3</td>
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**Term II**

**Required:**

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELL 6097</td>
<td>Research</td>
<td>3-6</td>
</tr>
<tr>
<td>CELL 6195</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

**Electives:**  
Program electives as needed, 6 hours required

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELL 6102</td>
<td>Mechanisms of Cancer Progression</td>
<td>1</td>
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</table>

**Term III**

**Required:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CELL 6307</td>
<td>Advanced Cell Biology (Required)</td>
<td>3</td>
</tr>
<tr>
<td>CELL 6195</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CELL 6097</td>
<td>Research</td>
<td>3-8</td>
</tr>
<tr>
<td>CELL 6107</td>
<td>Advanced Academic Success Skills Part I (Required)</td>
<td>1</td>
</tr>
<tr>
<td>CELL 6108</td>
<td>Advanced Academic Success Skills Part II (Required)</td>
<td>1</td>
</tr>
</tbody>
</table>

* Other repeating electives if needed may be taken
* Dissertation Proposal due to ad-hoc proposal examination committee

**Later Years**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELL 6195</td>
<td>Seminar, each term until admission to candidacy</td>
<td>1</td>
</tr>
<tr>
<td>CELL 6097</td>
<td>Research; each term until admission to candidacy, which must occur by the end of the fall term.</td>
<td></td>
</tr>
<tr>
<td>CELL 6099</td>
<td>Dissertation; each term after admission to candidacy</td>
<td></td>
</tr>
</tbody>
</table>

**PHYSICAL FACILITIES**

The Cell Biology Program is based in the Department of Neuroscience and Cell Biology, but many program faculty have joint 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 including an aquarium, an electronics shop, photographic services, a well-developed computer network, and library.

**COURSE DESCRIPTIONS**

The course offerings are contingent upon adequate student enrollment.

CELL 6096

VARIABLE CREDIT

SPECIAL TOPICS

Study of special topics in cell biology. Topics are selected and study programs arranged on an individual basis with a staff member.

- **Prerequisites:** Permission of instructor
- **Terms offered:** I, II, III
- **Year offered:** Annually
- **Hours per week:** Variable

CELL 6107 & 6108

(1 CREDIT EACH, REQUIRED)

ADVANCED ACADEMIC SUCCESS SKILLS PART 1 & 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. In their first year, the graduate students take the Basic Academic Success Skills course in which they are taught practical tips regarding reading and analysis of scientific literature and are provided an in-depth understanding of ethical behavior and ethics in science. The current course expands on the basic course. The lecturer works with each student and in Part 1 of the course helps them to improve their presentation skills and the presentation of their dissertation proposal. In part II of the course, practical tips are taught to the students for submitting a small grant proposal based on their own research (dissertation) proposal.

- **Prerequisites:** None
- **Term offered:** I
- **Year offered:** Annually
- **Hours per week:** Lecture 1-2

CELL 6008

(1–12 CREDITS)

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 three laboratories during the term spending approximately five 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 9 hours and a maximum 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
- **Terms offered:** I, II, III
- **Year offered:** Annually
- **Hours per week:** Laboratory 3–36
CELL 6097  (1–12 CREDITS) (REQUIRED)
RESEARCH
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.

Prerequisites: None
Terms offered: I, II, III
Year offered: Annually
Hours per week: Laboratory 3-27

CELL 6098  (3-9 CREDITS) (REQUIRED)
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, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the Master of Science degree
Terms offered: I, II, III
Year offered: Annually

Students registering for Thesis are expected to register for a total of nine credit hours.

CELL 6099  (9 CREDITS) (REQUIRED)
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, needs improvement or unsatisfactory.

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

Students registering for Dissertation are expected to register for a total of nine credit hours.

CELL 6102  (1 CREDIT)
SIGNAL RESPONSE TO INJURY
The purpose of this course will be to characterize stress response to acute trauma in the nervous system at the molecular level; emphasis will be on the paradigms and molecular approaches used. The latter part of the course will focus on presentation of genomics and bioinformatics with emphasis on caveats and conceptual differences from more classical approaches. The course will be taught by one instructor. There will be a take-home exam given at the beginning of the course and due at the end of the course to serve as an instruction tool in itself apart from an evaluation tool. Graded on an A/F basis.

Prerequisite: Permission of instructor
Term Offered: I, III
Year Offered: Annually
Hours per week: Lecture 1
LABORATORY TECHNIQUES IN MOLECULAR BIOLOGY

This is a three-week hands-on laboratory course and introduces the student to techniques involved in the preparation and analysis of DNA and RNA. These include transformation of bacteria with plasmid DNA and the growth and storage of the bacterial cultures; small- and large-scale preparation of plasmids and their analysis by restriction endonuclease digestion followed by agarose gel electrophoresis; isolation of DNA fragments from agarose gels and labeling with radionuclides; RNA isolation, electrophoresis, and transfer to nitrocellulose membranes followed by hybridization with the radioactively labeled DNA (Northern Blotting); and the synthesis of cDNA from RNA by reverse transcription, its subsequent amplification by the polymerase chain reaction (RT-PCR), and the analysis of the product by acrylamide gel electrophoresis. The student will be graded both on attention to laboratory technique and on written records of experiments.

Prerequisites: None
Terms offered: I, II, III
Year offered: Annually
Hours per week: Laboratory 20

CELL 6195 (1 CREDIT) (REQUIRED)

CELL BIOLOGY SEMINAR

The objectives of this course are two-fold: 1) to expose students to a wide range of current research topics in cell biology, and 2) to allow students to organize and present seminars in their own fields of interest. Students are required to attend seminars presented by local and invited speakers on a regular basis, and to prepare and present one seminar each year until admission to candidacy. Performance will be evaluated by the program faculty. Entry-level students present seminars based on readings from the original research literature; advanced students present a research seminar based on the scientific literature and the results of their own experimental studies.

Prerequisites: Admission to program
Terms offered: I, II, III
Year offered: Annually
Hours per week: Seminar 1

INTD 6205 (2 CREDITS)

MECHANISMS OF CANCER PROGRESSION

This course will provide a basic foundation of knowledge about the molecular, cellular, and systematic mechanisms mediating the development, progression and spread of cancer. The different concepts in cancer biology will be covered in a didactic lecture/discussion format and with take-home problem sets. Course content will be based mainly on review type articles selected from the recent basic science and clinical literature. Class will be held twice weekly (2 hr per class) for 8 weeks. Each two hour classroom session will involve a student-lead discussion of the take-home problem set as well as a faculty lecture. Discussion and lecture topics will cover both the theoretical concepts and experimental methodologies.

Prerequisites: Permission of instructor
Term offered: II
Year offered: Annually
Hours per week: Lecture, 2
MATERNAL AND FETAL BIOLOGY

The course will advance the interest and knowledge in the area of maternal and fetal medicine. It is designed to: 1) teach the student to appreciate and understand the physiological processes that affect maternal and fetal well-being; 2) enable the students to understand 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 fetal programming of chronic diseases such as diabetes and cardiovascular diseases.

Prerequisites: None
Term offered: I
Year offered: Annually
Hours per week: Lecture, 2

ADVANCED CELL BIOLOGY

The objective of this course is to instruct students in advanced concepts and techniques in cell biology. The development of critical thinking skills will be emphasized. Students will be graded on two exams, a midterm (25%) and a comprehensive final examination (25%). The remaining 50% of the score will be based upon presentation of relevant research papers by the students. The final exam will cover both the first (20%) and second (80%) halves. Examinations will use short-answer format. Instructors are requested to generate two short-answer problems for each week. Each week will begin with an introductory lecture by the instructor on Monday. The class on Wednesday will be devoted to techniques in the relevant discipline, and this may be formal classroom discussion or a direct demonstration in a research laboratory. The class on Friday will be presentation by a student of a relevant paper in the discipline being discussed that week.

Prerequisites: None
Term offered: III
Year offered: Annually
Hour per week: Lecture, 3
Human Pathophysiology and Translational Medicine

http://physiology.utmb.edu/cpmb/index.htm

Faculty

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

Professors
Aronson, Judy, M.D.
Barrett, Alan Ph.D.
Calhoun, W.J., M.D.
Chonmaitree, Tasnee, M.D.
Elferink, Lisa A., Ph.D.
Epstein, Henry F., M.D.
Good, David W., Ph.D.
Herndon, David, M.D.
Huang, Li-Yen Mae, Ph.D.
Garofalo, Roberto, M.D.
Kramer, George C., Ph.D.
Lewis, Simon A., Ph.D.
Motamedi, Massoud, Ph.D.

Associate Professors
Abate, Nicola, MD
Berenson, Abby, M.D.
Esenaliev, Rinat O., Ph.D.
Hamill, Owen P., Ph.D.
Kumar, Raj, Ph.D.
Peerce, Brian E., Ph.D.
Rasmussen, Blake B., Ph.D.
Valbuena, Gustavo, M.D., Ph.D.
Vargas, Gracie, Ph.D.
Volpi, Elena, M.D., Ph.D.

Objectives of the 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. The program will involve mentoring by Multidisciplinary Translational Teams (MTTs) composed of basic science and clinical faculty as well as a core curriculum that will be designed to develop the critical skills needs to conduct translational research and elective courses to address the scientific content requirements of specific MTTs. Through this combination of core and elective educational elements, 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 therapeutic and/or diagnostic needs within their field of research, and g) collaborate effectively with academic physicians (clinicians) and other healthcare professionals to conduct effective and efficient translational research.
Program of Studies

The HPTM Program requires that all full-time students take at least 9 semester credit hours (hrs/wk) or course work in each of the three academic terms. 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, students will participate in problem-based learning and small group laboratory sessions alongside medical students in the Basic Science Core Courses of the Integrated Medical Curriculum. The foundational course for HPTM students (Pathophysiology for Translational Scientists) will be divided into semester long modules which will run for years 1 and 2 of the program. Modules I-II will be concurrent with the problem based learning (PBL) medical school courses, and will be based on topics in biomedical disciplines that are suggested by the problem cases in PBL. An interprofessional research design course will be taken by students in Term III of the first year, alongside medical students in the Translational Research Track of the Integrated Medical Curriculum. (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.) Longitudinal enrichment activities for HPTM students will expose them to the clinical environment, regulatory requirements involved in human and animal research, and other relevant topics. Students will take research rotations during the second year, alongside the Foundational Course, Modules III and IV. Students will take elective courses relevant to their specific area of research interest, and directed by members of the Multidisciplinary Translational Teams of the Institute for Translational Science. 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.

Essential Functions Required for Completion of Program

The following description details essential functions (abilities) needed to complete the Cellular Physiology and Molecular Biophysics 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.

Course Descriptions (Fall 2010)

HPTM 6010

RESEARCH ROTATIONS

The objectives of this course are to acquaint students with the research activities of individual faculty members; to allow students to become familiar with relevant techniques, methodological analysis, and scientific literature; and to assist students in choosing their areas of dissertation specialization. This course is taken in conjunction with CPMB 6253 and is taken prior to the qualifying examination.

Prerequisites: None
Terms offered: I, II, III
Year offered: Annually
Hours per week: Laboratory 6–27

HPTM 6097

RESEARCH (associated with laboratory rotation)

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. 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: None
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable
HPTM 6098 (3-9 CREDITS)

THESIS (required, master’s students only)

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, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the master’s degree
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable

Students registering for Thesis are expected to enroll for a total of 9 credit hours.

HPTM 6099 (3-9 CREDITS)

DISSERTATION (REQUIRED)

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
Year offered: Annually
Hours per week: Variable

Students registering for Dissertation are expected to enroll for a total of 9 credit hours.

HPTM 6111 (1 CREDIT)

DEPARTMENTAL SEMINAR AND JOURNAL CLUB (required)

The departmental seminar program is held on Mondays and Wednesdays and features distinguished invited speakers primarily from outside UTMB. Graduate student attendance is required at these seminars. Faculty research presentations will also be held on Mondays. Graduate students in cellular physiology and molecular biophysics are expected to attend these presentations each term offered. Grades will be determined as pass/fail on the basis of 80 percent attendance.

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

HPTM 6195 (1 CREDIT)

PROSEMINAR (required)

The purpose of this course is to familiarize students with making oral presentations in front of an audience of their peers. All cellular physiology and molecular biophysics graduate students are expected to take this proseminar course for two to four semesters, depending upon their progress. Each student in attendance will be assigned one or two research articles and coached in a presentation of the article(s) by a graduate faculty program member. The student will then present the article(s) in front of his or her peers and a few faculty using appropriate audiovisual aides. Grades will be determined by written evaluation of the presentations by other attending students and faculty.
HPTM 6232  (2 CREDITS)
SYNAPTIC TRANSMISSION (elective)

This course will describe the pre- and postsynaptic events that accompany neurotransmission of identified synaptic systems. Readings on the frog and crayfish neuromuscular junctions as well as the squid giant synapse, various vertebrate synapses, and synaptosomal preparations will be utilized. While the emphasis will be on electrophysiological techniques, ultrastructural and chemical correlates will be provided. Grades will be determined by weekly oral examination.
Prerequisites: A course in ion channels and excitability
Term offered: I, II
Year offered: Annually , fall; biennially, spring
Hours per week: Lecture 2

HPTM 6234  (2 CREDITS)
NEURAL MEMBRANE REPAIR (elective)
The short-term response of a nerve fiber to injury is to seal off the injury site from the external environment. This advanced tutorial course examines fundamental processes such as vesiculation, membrane fusion, and membrane redistribution that may be involved in the sealing process, in order to provide understanding of mechanisms underlying membrane sealing. Techniques to be discussed include differential-interference-contrast microscopy, use of free Ca\(^{2+}\)-sensitive fluorescent probes, dialyzed axons, “caged” Ca\(^{2+}\) compounds, and membrane impedance measurements. Grades will be based on several oral presentations of research papers to the class, written critiques of student presentations, and submission of a term project (annotated bibliography) on a topic of the student’s choice.
Prerequisites: A course in membrane physiology
Term offered: I
Year offered: Biennially (even years)
Hours per week: Lecture 2

HPTM 6253  (2 CREDITS)
READINGS IN PHYSIOLOGY AND BIOPHYSICS (required)

This is a reading and tutorial course that ordinarily accompanies the required research rotations. Two research rotations, with two different members of the graduate faculty in CPMB, must be completed before admission to candidacy. Therefore, each student must register on two different occasions for CPMB 6010: Research Rotations, and for CPMB 6253: Readings in Physiology and Biophysics. The course will consist of assigned readings, literature reviews, and weekly discussions with the instructor on a selected topic of mutual interest. Grades will be determined by weekly oral examination on a pass/fail basis. The research interests of the graduate faculty in CPMB are detailed in the publication “CPMB Graduate Program Information.” This course may also be taken independent of a research rotation by individual students or small groups of students.
Prerequisites: Admission to the CPMB program and/or permission of instructor
Terms offered: I, II, III
Year offered: Annually
Hours per week: Conference or Discussion 2
HPTM 6316 (3 CREDITS)

ELECTRICAL PRINCIPLES AND INSTRUMENTATION (elective)

Linear circuits and signal processing are emphasized in passive and active circuits. Operational amplifiers are discussed in detail. An introduction to digital techniques is also provided.

Prerequisites: One year of calculus and physics (including electricity and magnetism)
Term offered: I
Year offered: Biennially (odd years )
Hours per week: Lecture 3

Students are required to take two of the following three courses:

HPTM 6096 (1-9 CREDITS)

SPECIAL TOPICS IN MEMBRANE PROTEIN STRUCTURE AND FUNCTION

This advanced course, a merger and consolidation of CPMB 6220 and CPMB 6254, will cover new developments in the understanding of the structure-function relation of membrane proteins, including G-protein coupled receptors, transporters, and ion channels. The course will begin with descriptions of receptor theory as well as ion, organic solute and water transport across biological membranes at the level of facilitated diffusion, and active transport emphasizing mechanism and utilizing equations. The course will proceed toward categorizations of proteins involved at the molecular level, and then examine structure-function effects with selected biophysical methods, including examples of crystallized membrane proteins. Course grading will be based on student presentations, student participation in group discussion, and written exams.

Prerequisites: Permission of instructor
Term Offered: I
Year Offered: Annually
Hours Per Week: Lecture 2

HPTM 6220 (2 CREDITS)

ION CHANNEL STRUCTURE AND FUNCTION

This advanced course will cover new developments in the understanding of the structure-function relation of membrane proteins, particularly those that form gated membrane ion channels. New concepts of the relationship between membrane proteins and their surrounding lipid and the advantages and limitations of specific techniques (ESR, NMR, and X-crystallography) that are used to study membrane protein structure will be addressed. A major goal of this course will be to use structural models to explain specific functional properties of channels (i.e., gating and ion selectivity). The course will involve introductory lectures on basic principles combined with critical assessment and presentation by students of recent papers. Grading will be based on student participation in the group discussion, individual presentation, and written exams.

Prerequisites: Consent of instructor
Term Offered: I
Year Offered: Annually
Hours per week: Lecture 2
MEMBRANE PROTEINS: A PRIMER ON STRUCTURE AND FUNCTION

This is an advanced course on membrane transport processes and membrane proteins. The objectives are to provide a background for understanding at the molecular level the mechanisms of matter transfer and signal transduction across biological membranes. The course will focus on describing the mechanisms of ion, organic solute, and water transport across biological membranes. The course extends the examination of biological transport begun in Principles of Membrane Transport: Transport Processes in Epithelia (BBSC 6109), Biophysics of Ion Channels (CPMB 6105), and Ion Channel Structure and Function (CPMB 6220) to primary active, secondary active, and facilitated diffusion transporters at the molecular level. Specific biological phenomena that illustrate complex transporter or receptor-mediated processes will also be discussed. The teaching format will be interactive lectures. An introductory lecture will be followed by a discussion involving current research problems and methods. Course grading will be based on student presentations, discussion participation, and a final exam.

Prerequisites: Cell and molecular biology, biochemistry, or permission of instructor.
Term Offered: I
Year Offered: Annually
Hours per week: Lecture 2

HPTM 6260
IMAGING IN BIOLOGY

This is a two-credit course that will cover the basic principles of imaging. It will start with the principles of optical imaging, which will cover the basic properties of electromagnetic waves; laser/nonlaser radiation; interaction of light with molecules, cells, and tissues; fundamentals of spectroscopy and imaging; laboratory demonstrations; and paper discussions. The second section will deal with fluorescence microscopy from both the theoretical and practical point of view. There will be a series of lectures as well as practical applications including image processing and a laboratory covering light microscopy (phase and DIC) and confocal scanning microscopy. The third section will cover the fundamentals, instrumentation, application, and training in multiphoton excitation fluorescence microscopy and spectroscopy. The last segment of this course will leave the realm of optical imaging and cover the use of atomic force microscopy for imaging and single molecule manipulation. In addition to lectures, this last segment will also have demonstrations and group discussions. The final grade in this course will be determined by class participation, student presentations, and written exams.

Prerequisites: None
Term Offered: I
Year Offered: Annually
Hours per week: Lab-.75, Lecture–1.5, Conference or Discussion–.25

COURSE DESCRIPTIONS FOR THE NEW CURRICULUM, EFFECTIVE FALL 2011

HPTM 6405
GROSS ANATOMY AND RADIOLOGY

Students will participate in interprofessional small group, Problem-Based Learning activities with medical students in the Translational Research Track (recently approved by the SOM Curriculum). Small groups will be facilitated by faculty members of the ITS. Students will also participate in gross anatomy laboratory session.
HPTM 6332  
MOLECULES, CELLS, TISSUES  
Students will participate in interprofessional small group, Problem-Based Learning activities with medical students in the Translational Research Track (recently approved by the SOM Curriculum). Small groups will be facilitated by faculty members of the ITS. Students will also participate in laboratory sessions on histology.

HPTMXXX  
PATHOBIOLOGY AND HOST DEFENSE  
Students will participate in interprofessional small group, Problem-Based Learning activities with medical students in the Translational Research Track (recently approved by the SOM Curriculum). Small groups will be facilitated by faculty members of the ITS. Students will also participate in laboratory sessions concerning pathology.

HPTM 6291, HPTM 6292  
FOUNDATIONAL COURSE, PATHOPHYSIOLOGY FOR TRANSLATIONAL SCIENTISTS, MODULES I-II  
This course will serve as the foundation for all students in the HPTM curriculum, providing active student learning opportunities in a series of longitudinally integrated modules over the first two years. This will not be a traditional lecture-based course, but rather scientific content will be presented in modalities that emphasize guided inquiry modalities to promote problem solving, analytical thinking, active learning and cooperative group interactions. The PTS course will emphasize the disciplines of physiology, pathology, and pathophysiology because they are, justifiably, regarded as the bridge between the basic and clinical sciences and because these disciplines provide an integrated understanding of the human body as a multicomponent system. Course content will be presented using a combination of classroom, laboratory, and relevant authentic environments. Activity-driven approaches will emphasize discovery-based learning and student-focused processes in order to develop the skills necessary for life-long autonomous learning, discipline authentic performances and to achieve the expected competencies (i.e., the integration of knowledge, skills, and attitudes necessary for a successful translational research career). The PTS course is expected to build a contextual framework for clinical encounters, laboratory rotations, research focus-specific course work, and qualifying exam in year 2. Types of activities and enduring educational materials products could include case-based learning sessions, problem sets, journal article discussions, or laboratory exercises.

HPTMXXX  
INTERPROFESSIONAL RESEARCH DESIGN COURSE  
The Inter-professional Translational Research Design (ITRD) course will team HPTM students with UTMB medical students in the translational track in an 8 week required course in identifying a translational problem and designing translational research projects. The course will use a combination of guided inquiry and more standard workshop and didactic formats to lead students through the processes of identifying a research question, generating a hypothesis, and reviewing the literature to develop rationale for the study. Experimental design including basic statistical approaches will be discussed. Other topics such as protection of human subjects, the search for funding sources, writing IRB protocols and grant applications will be touched on. The final product of the course will be a small grant proposal on a translational topic. Students will work in small teams (2-4 students) that include at least one PhD and one
MD student. Each individual student will be required to generate their own interdisciplinary
research proposal and demonstrate participation in the research proposal generated by their
partner. Defined weekly interim assignments will lead the students towards the final research
proposal. Student progress will be discussed in classroom sessions. In addition, course
faculty will provide detailed feedback and formative assessments on an individual basis.
Faculty mentors will also provide enrichments experiences regarding technical approaches
and/or clinical relevance that will be tailored to each group’s research topic. These enrichment
sessions will include time in a laboratory observing/learning laboratory techniques and/or time
in a clinical setting. Culminating activities will include: 1) final evaluation of proposals
in a mock study section in class session and 2) presentation of research proposal in poster
format at the MSSRP poster session. The research proposal will be graded based on scientific
soundness, and evidence of interdisciplinary, interprofessional collaborative interactions.

HPTMXXXX
INTERPROFESSIONAL ENRICHMENT ACTIVITY

This enrichment activity will allow graduate students and medical students to come
back together in groups to participate in lectures, workshops, and guided inquiry sessions
concerning regulatory issues in human subjects research and animal research, experimental
animal models, comparative anatomy, introduction to the clinical laboratory environment,
clinical conferences with research correlations.

HPTM 6306
LABORATORY ROTATION AND CLINICAL ENCOUNTERS

An important component of training translational researchers is to provide exposure to the
clinical realities of human disease and/or injury. So, in addition to the traditional laboratory
rotation, HPTM students will be provide a focused opportunity to observe patients with
disease and/or injury relevant to their specific area of scientific research. HPTM students,
with guidance from their MTT mentors, will participate in clinical encounter opportunities
appropriate to their area of research interest. Students will be expected to participate in 4
clinical encounter session during the first 18 months of study. Examples of clinical encounters
for student in the infectious disease MTT include trips to Infectious disease outpatient
clinic, inpatient consult service, visits to diagnostic laboratories (microbiology, molecular
diagnostic and serology labs) in UTMB hospitals and to the UTMB Autopsy service. At the
Autopsy service, students will have an opportunity to view and participate in an autopsy,
usually working with one or more medical students. Students recruited into our Hepatitis
and Hepatocellular Cancer MTT will, in conjunction with their laboratory rotation, spend
1-2 hours/week “shadowing” either a radiation oncologist, medical oncologist, or surgical
oncologist during their normal clinical, and attend a one-hour weekly tumor board meeting to
gain insight into the multidisciplinary approaches used to treat cancer patients.

HPTM 6109
TRANSLATIONAL RESEARCH SEMINAR AND “MEET THE PROFESSOR”

This seminar series will team physicians and basic scientists to give presentations that
illustrate the bi-directional collaborative nature of translational research. The goal of this
seminar series is to demonstrate the important functions of inter-professional communication
in driving successful translational research projects. Seminars will be held one evening per
month. Students will participate in discussion with the professors after the seminar.
HPTM 6098  
**THESIS (required, master’s students only)**  
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, needs improvement or unsatisfactory.

HPTM 6099  
**DISSERTATION (required, Ph.D. students only)**  
The HPTM Program will continue the theme of inter-professional collaborations in the conduct of translational research by utilizing co-mentoring teams composed of a basic scientist and physician from the ITS 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.
Clinical Science

http://www.utmb.edu/pmch/geClinicalScience.htm

Faculty

Graduate Program Director
Karl E. Anderson, M.D.

Professors
Anderson, Karl E., M.D.
Brasier, Alan R., M.D.
Cunningham, Kathryn A., Ph.D.
Freeman, Daniel H., Jr., Ph.D.
Freeman, Jean L., Ph.D.
Freeman, Vicki S., Ph.D.
Goodwin, James S., M.D.
Gorenstein, David, Ph.D.
Grady, James J., Dr.PH.
Hankins, Gary D., M.D.
Herndon, David, M.D.
Kurosky, Alexander, Ph.D.
Lu, Lee-Jane, Ph.D.
Luxon, Bruce, Ph.D.
Marion, Rodger D., Ph.D.
Markides, Kyriakos S., Ph.D.
Mayhall, C. Glen, Ph.D.
Mossberg, Kurt A., Ph.D.
Myers, Martin G., M.D.
Okorodudu, Anthony O., Ph.D.
Ottenbacher, Kenneth J., Ph.D.
Powell, Don W., M.D.
Reifsnider, Elizabeth A., Ph.D.
Saade, George R., M.D.
Sandstead, Harold H., M.D.
Snodgrass, Wayne R., M.D., Ph.D.
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Associate Professors
Bishop, Sheryl L., Ph.D.
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Carter, Michele A., Ph.D.
Kanuth, Michelle, Ph.D.
Kuo, Yong-Fang, Ph.D.
Mendias, Nonie, R.N., Ph.D.
Niebuhr, Bruce R., Ph.D.
Ostir, Glenn, Ph.D.
Peek, M. Kristen, Ph.D.
Riall, Taylor, M.D.
Rudkin, Laura L., Ph.D.
Vaiani, Cheryl, Ph.D.
Wu, Z. Helen, Ph.D.

Assistant Professors
Arcari, Christine M., Ph.D., M.P.H.
Glenn, Jason E., Ph.D.

PROGRAM

Scientific investigations in humans are essential for understanding human biology and for advancing medicine and human health. The Graduate Program in Clinical Science (CS) 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 Graduate Program in Clinical Science leads to the Ph.D. or M.S. degree and is administered through Population Health Sciences (PHS). 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.

Approved curricular tracks within the Clinical Science Graduate Program include:

- Clinical Investigation (M.S., Ph.D.)
- Health Services Research (M.S., Ph.D.)

The Clinical Investigation curricular track emphasizes patient-oriented research, including understanding and application of basic biological sciences, laboratory methods used in clinical research, basic biostatistics and epidemiology, ethics in clinical investigation, design of clinical studies, and new drug development. Graduates are equipped to translate basic science knowledge to the development of new therapeutic and preventive approaches for disease and age-related infirmities.

The Health Services Research track emphasizes methods for assessing and improving the delivery of effective and cost efficient health care, with the aim of enhancing disease prevention, diagnosis and treatment. Training leads to proficiency in biostatistics, clinical epidemiology and survey research, health policy and management, design of observational and evaluative studies, and health care economics. Graduates understand how the organization, delivery and financing of health services influence factors such as costs, health outcomes, access to care, and patient satisfaction.

**Research Facilities**

The research environment at UTMB provides many opportunities for clinical research and support during training and career development. Clinical research resources include the General Clinical Research Center (GCRC), which has been awarded continuous NIH funding for 41 years and provides inpatient and outpatient facilities, experienced nursing staff, biostatistical and study design support, computer support, and various specialized equipment for human research. Additional research resources at UTMB include multiple Centers for Research Excellence, a Center for Aerospace Medicine and Physiology, the Institute for the Medical Humanities, Core Laboratory Facilities, and a Child Health Research Center.

**Curriculum**

The M.S. and Ph.D. curriculum plans include 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.

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 student’s mentor and advisory committee 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 (described elsewhere in this bulletin) 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, applied nutrition, metabolic studies, infectious diseases, rehabilitation studies, vaccine policy, health promotion planning, and health care policy and management.

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.

**Course Descriptions**

See Population Health Sciences (PHS) course descriptions.
Experimental Pathology

http://www.utmb.edu/pathology/education/phd_prog_experimental_pathology/default.asp

Faculty

Graduate Program Director
Stephen Higgs, B.Sc., Ph.D., F.R.E.S.

Professors
Ahmed, Ahmed, Ph.D.
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Herzog, Norbert K., Ph.D.
Higgs, Stephen, B.Sc., Ph.D., F.R.E.S.
Murphy, Fred, Ph.D.
Okorodudu, Anthony O., Ph.D.
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Soong, Lynn, M.D., Ph.D.
Tesh, Robert B., M.D.
Traber, Daniel, Ph.D.
Vaidya, Smita, Ph.D.
Walker, David H., M.D.
Weaver, Scott C., Ph.D.
Wikel, Stephen, Ph.D.

Associate Professor
Bourne, Nigel, Ph.D.
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McBride, Jere, Ph.D.
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Holbrook, Michael, Ph.D.
Ikejami, Tetsuro, D.V.M., Ph.D.
Paessler, Slobodan, D.V.M.
Thangamani, Saravan, MSc., Ph.D.
Valbuena, Gustavo, M.D., Ph.D.
Vertrees, Roger, Ph.D., C.C.P.
Wang, Tian (Tina), 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. To prepare students for the diverse careers available to Ph.D.s in the biomedical sciences.
Essential Functions Required for Completion of 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 ultra-structure, 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 biocontainment 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 U.S. to be awarded both the RCE and national biocontainment 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.
EXPERIMENTAL PATHOLOGY

Required Courses

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<th>Course</th>
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<th>Course Number</th>
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<td>I,II,III A</td>
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<td>Research in Pathology</td>
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Elective Courses

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<th>Course</th>
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<th>Course Number</th>
<th>Term/Year</th>
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<tr>
<td>Statistical Methodology</td>
<td>Freeman</td>
<td>PHS 6443</td>
<td>I A</td>
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<tr>
<td>Advanced Immunology</td>
<td>Hughes/Reyes</td>
<td>MICRO 6408</td>
<td>I A</td>
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<tr>
<td>General Virology</td>
<td>Nichols</td>
<td>MICRO 6403</td>
<td>I A</td>
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<tr>
<td>Introduction to Vaccinology</td>
<td>Milligan</td>
<td>PATH 6161</td>
<td>I A</td>
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<tr>
<td>Frontiers of Infectious Diseases</td>
<td>Higgs</td>
<td>PATH 6245</td>
<td>I,II A</td>
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<tr>
<td>Research Rotations</td>
<td>Higgs</td>
<td>PATH 6012</td>
<td>I,II,III A</td>
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<tr>
<td>Special Topics</td>
<td>Higgs</td>
<td>PATX 6000</td>
<td>I,II,III A</td>
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<tr>
<td>Biology of Arthropod Disease Vectors</td>
<td>Higgs</td>
<td>PATH 6112</td>
<td>II A</td>
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<td>Cardiovascular Toxicology</td>
<td>Boor</td>
<td>PATH 6242</td>
<td>II A</td>
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<tr>
<td>Tropical Diseases</td>
<td>Weaver</td>
<td>PATH 6318</td>
<td>II B</td>
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<tr>
<td>Principles of Biodefense</td>
<td>Peters</td>
<td>PATH 6310</td>
<td>I A</td>
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<tr>
<td>Workshop in Phylogenetics</td>
<td>Weaver</td>
<td>PATH 6 211</td>
<td>I B</td>
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<tr>
<td>Pathogenic Bacteriology</td>
<td>Pyles/Torres</td>
<td>MICRO 6315</td>
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<tr>
<td>Cell Biology of Tissues</td>
<td>Nagel</td>
<td>CELL 6503</td>
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<tr>
<td>Pathogenesis of Viral Inf. Dis.</td>
<td>Shih</td>
<td>PATH 6000-071</td>
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<tr>
<td>Pathogenesis of Bacterial Inf. Dis.</td>
<td>Yu</td>
<td>PATH 6289</td>
<td>III A</td>
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Key: I =Fall, II =Spring, III =Summer, A=Annually, B=Bi-annual

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 PATH 6266 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 may be required.

*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 daily UTMB general email announcements, the weekly “UTMB Yellow Sheet”, http://research.utmb.edu/research/yellowsheet/ysh.htm, the UTMB website, 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, year round)*

Thursday, 12 Noon, 3.324 Levin Hall. 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, whilst more senior students and post-doctoral fellows present 60-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. Graduate students are expected to attend all of 
these seminars. Written evaluations are prepared by faculty and students. The results of these 
evaluations are summarized and 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 (weekly, year round)**

Wednesday, 12 Noon, Children’s Hospital, Room 2.721. Laboratories engaged in immunology 
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.

**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 3.20 at noon 
on Mondays in the Fall and Spring semesters.

**Grand Rounds – (Weekly, Fall and Spring terms)**

Monday, 12 Noon, Shriners Burns Institute (SBI) Auditorium. 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 6245)**

(weekly, Fall and Spring terms)

Tuesday 12:00 p.m. 2.212 BSB. Local and visiting scientists are invited to present their most 
recent research in the fields of infectious disease, emerging infectious diseases, biodefense and 
tropical medicine.

**Research in Progress (Twice a month, annually)**

Wednesday, 8:30 – 9:30 a.m. 4.208 Marvin Graves. UTMB faculty, visiting scientists and post-
doctoral fellows to present their research in progress their current research in this relatively 
informal seminar setting designed to provide an interactive exchange of ideas. Topics vary. An 
e-mail will be sent out informing students of topics.

Hours per week: Lecture 3; Conference 2

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**COURSE DESCRIPTIONS**

**Required Courses**

PATH 6097 RESEARCH IN PATHOLOGY (1-9 CREDITS)

This course varies in credit according to the work performed. The student concentrates on 
a problem of his or her own choosing with faculty advise.

Prerequisite: None

Terms offered: I,II,III

Year offered: Annually

Course Coordinator: S. Higgs
PATH 6098 THESIS (3 CREDITS)

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
Term offered: I,II,III
Year offered: Annually
Course coordinator: S. Higgs

PATH 6099 DISSERTATION (3 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 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
Term offered: I,II,III
Year offered: Annually
Course Coordinator: S. Higgs

PATH 6115 EXPERIMENTAL PATHOLOGY TRAINEE WORK IN PROGRESS (1 CREDIT)

This course requires attendance at the weekly Experimental Pathology Trainee Seminars and voluntary attendance at a choice of weekly grand rounds, clinical conferences, Colloquium of Infectious Diseases, interdepartmental infectious disease conferences, immunology seminars, toxicology seminar series and other seminar offerings on campus that are related to the students research interest. Written evaluations for trainee conferences are required only in the second year (first year in the program) unless specific problems indicate that it should continue. This decision is at the discretion of the course director. Second year students are required to attend and provide written evaluations of 90% of the trainee conferences. The written evaluations must be turned in to the Pathology Education Office 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. Class grades for students required to submit written evaluations are based on the grades received on these evaluations. Third year students are required to attend at least 80% of the conferences, and those in subsequent years, are required to attend at least 75% of conferences. However, it is strongly recommended that graduate students attend all trainee seminar series, particularly those of their fellow students. Grades in the third year and beyond are based on attendance. Attendance records for the trainee workshop are maintained by the program coordinator.

Prerequisites: Consent of program director
Year offered: Annually
Hours per week: Conference 1
Terms: I,II,III
Coordinator: S. Higgs

PATH 6237 TEACHING IN PATHOLOGY (2 CREDITS)

The goals of this course are for students to gain experience in teaching graduate school and medical school courses, to learn skills and methods involved in all aspects of teaching, and to reinforce their knowledge of pathology. There are three components to this course. 1) Students will assist in several laboratory sessions in the Pathobiology and Host Defense
(PHD) core course for medical students in February. Students will also attend and evaluate lectures in that course. 2) Students will participate in a mini-course on teaching skills, and their presentation styles will be reviewed individually by faculty members. 3) Students will plan, prepare, and present a one-hour seminar course for first-year graduate students on a topic of their choosing. Grading (A-F) will be based on the student’s ability to interact effectively with small groups in the laboratory (35%), their participation in the teaching skills workshop (25%), and their ability to teach effectively in their own seminar course (40%). Experimental pathology graduate students are required to take this course once.

Prerequisites: PATH 6266, consent of instructor.
Term offered: II
Year offered: Annually
Hours per week: 2
Course coordinators: Aronson

PATH 6266 BASIC HUMAN PATHOBIOLOGY

The objective of this core course for the Experimental Pathology Program is to present the fundamentals and general mechanisms operating in human disease. This is achieved by presenting specific clinical examples, and elucidating the pathogenic mechanisms underlying these examples. Major topics could include inflammation, tissue repair and maintenance, neural injury, degeneration and repair, and developmental pathology. Grading is based on contributions to class discussion (40%) and a final examination (60%). Grading: A, B, C, F.

Term Offered: III
Year Offered: Annually
Hours per week: Lecture 1, Conference I
Course Coordinator: Hawkins

PATH 6276 BASIC HUMAN PATHOBIOLOGY – TOXICOLOGY

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: A, B, C, F.

Term Offered: III
Year Offered: Annually
Hours per week: Lecture I, Conference I
Course Coordinators: Boor

PATH 6286 BASIC HUMAN PATHOBIOLOGY – INFECTIOUS DISEASE

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. Topics that could be included in the course are exotoxin-producing bacteria, obligate intracellular parasitism, bacteria-induced immunopathology, viral persistence and pathogenesis, diseases caused by protozoans and opportunistic infections. Grading is based on contributions to class discussion (40%) and a final examination (60%). Grading: A, B, C, F.

Term Offered: III
Year Offered: Annually
Hours per week: Lecture I, Conference I
Course Coordinator: Olano
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 will be based on class participation (30%), written assignments (40%), and quality of the final application (40%).

Prerequisites: Consent of Instructor
Term offered: I
Year Offered: Annually
Course coordinator: McBride

Elective Courses

PATH 6112 THE BIOLOGY OF ARTHROPOD DISEASE VECTORS (1 CREDIT)

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. Evaluations (s/u) based on final examination and laboratory practical.

Final examination: Students will be evaluated based on multiple-choice questionnaires, short essays and the demonstration of practical knowledge.

Prerequisites: consent of instructor
Year offered: Annually
Terms offered: II
Hours per week: 3
Course coordinator: S. Higgs


PATH 6161 INTRODUCTION TO VACCINOLOGY (1 CREDIT)

Vaccines for the 21st Century is a five-week introductory course 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. The history of the development of vaccines and their impact on society.
2. The identification of pathogens & diseases for which vaccines are needed.
3. The principles of the development, availability and use of vaccines.
4. The pathophysiologic approach to developing vaccine strategies.
5. The application of traditional and new technologies to vaccine development.
6. The importance of the regulatory process to vaccine development, including "proof of principle", preclinical and clinical testing.

The course will be taught in lecture format with a small number of expert lecturers. There will be assigned reading in preparation for each session. Reading materials will be provided.
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
Term offered: I
Year offered: Annually
Course coordinator: Milligan

PATH 6195 SEMINARS IN PATHOLOGY (1 CREDIT)
(Do NOT sign up for this course if you sign up for PATH 6115)

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.

Prerequisites: None
Terms offered: I,II,III
Hours per week: Seminar 1; Grades S/U
Year offered: Annually
Course coordinator: S. Higgs

PATH 6211 WORKSHOP IN PHYLOGENETICS (2 CREDITS)

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 will be 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
Hours per week: 2
Year Offered: Bi-Annually
Course Coordinator: Weaver

PATH 6242 CARDIOVASCULAR TOXICOLOGY (2 CREDITS)

This course addresses the present state of knowledge concerning injury by exogenous chemicals to the heart and blood vessels. Examples of cardiac toxins will include those
classified as (1) arrhythmogenic, (2) necrotizing and (3) contractile. Modes of toxin action and secondary phenomena are also discussed. With regard to the vascular system and myocardium, an initial review of the structural components of blood vessels will be made prior to addressing examples of toxins that induce (1) endothelial injury and (2) medial injury. A small-group teaching approach is used, including paper review and literature review, with assigned presentations by individual students. The basis for grading is discussion in class (30%) and written and oral presentations of assigned specific topics (70%).

Pre-requisites: None
Terms offered: II
Year offered: Odd Years
Course Coordinator: Boor

PATH 6245 COLLOQUIUM OF FRONTIERS OF INFECTIOUS DISEASE & TROPICAL MEDICINE

The purpose of this weekly seminar course is to present to students the frontiers of infectious diseases and tropical medicine. Local and visiting scientists are invited to present their most recent research in the fields of infectious disease and tropical medicine. All students will be required to attend every colloquium. Students will meet with the visiting speakers after the colloquium to discuss the presentation and address relevant questions to the speaker. Grades (S/U) will be determined by evaluation of the individual student’s participation in discussions with the speakers.

Terms offered: I,II
Year Offered: Annually
Course coordinator: S. Higgs

PATH 6289 MOLECULAR MECHANISMS OF HOST-BACTERIAL INTERACTIONS

This advanced course provides in-depth examination of the molecular mechanisms of host-bacterial interactions to understand the bacterial strategies for evading or surviving the host defense systems. All topics are conceptual overviews of the principal mechanisms of bacterial pathogenesis. Topics include molecular mechanisms of bacterial adherence to host cells and bacterial signaling host cells through adhesion molecules, bacterial subversion of endocytic pathways, bacterial manipulation of the host cell cytoskeleton, bacterial secretion systems, immune evasion mechanisms and persistent infection, and bacterial genomes and reductive evolution. Emphasis is given to diseases with prototypic pathogenic mechanisms. Instruction involves lectures, class discussions and readings in contemporary or classic literature. Grading is either pass or failure. It is based on attendance (10%), class discussions and participation (20%), and one final examination (70%). The format of final exam will be for students to choose 5-6 out of 10-12 questions. Grading: A, B, C, F.

Term Offered: III
Year Offered: Annually
Hours per week: Lecture 4, Conference 1
Course Coordinator: Xue-jie Yu

PATH 6310 PRINCIPLES OF BIODEFENSE

This course provides an introduction to the principles underlying defense against bioterrorism. It also provides a basic description of the major biothreats, including microbiology, medical protection, epidemiology, and pathogenesis.

Term Offered: I
Year Offered: Annually
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.

Prerequisites: Consent of instructor
Hours per week: Lecture 1, Conference 2
Year offered: Annually
Term offered: II
Course coordinator: Peters

PATH 6096 SPECIAL TOPICS (1-3 CREDITS)

Study of special topics in Experimental Pathology. Topics are selected and study programs arranged on an individual basis with staff member.

Prerequisites: Consent of Instructor
Term offered: I,II,III
Year offered: Annually
Hours per week: Conference or discussion, 2
Course Coordinator: Staff

PATH 6012 RESEARCH ROTATIONS (1-6 CREDITS)

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; Hours per week: Conference 1; Lab, up to 20; Year offered: Annually; Terms: I,II,III; Course coordinator: S. Higgs
Master of Medical Science Degree

http://gsbs.utmb.edu/mms/requirements.htm

Faculty

Graduate Program Director
Valbuena, Gustavo, M.D., Ph.D.

Professors
Ahmed, Mahmoud S., Ph.D.
Baron, Samuel, M.D.
Freeman, Jean, Ph.D.
Hellmich, Mark Richard, Ph.D.
Papaconstantinou, John, Ph.D.
Peterson, Johnny W., Ph.D.
Schmalstieg, Frank, Ph.D.
Townsend, Courtney M., M.D.
Warren, Michael, M.D.

Assistant Professor
Valbuena, Gustavo, M.D., 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.

**Course Requirements**

Currently only two courses are required for the M.M.S. degree: a research course (MMSC 6097) and a thesis course (MMSC 6098). The student must be enrolled in one of these courses throughout his or her tenure in the M.M.S. program. In addition, all students must enroll in the MEHU 6101 course on Ethics in Research. Students are encouraged, however, to take other courses that are suggested by their supervisory committee and to participate in workshops, seminars, and other scholarly activities that will strengthen their research credentials. A minimum of 30 semester credit hours is needed for the degree to be awarded.

**Course Descriptions**

**MMSC 6097 (3–9 CREDITS)**

**RESEARCH**

Formal research directed toward the Master of Science or Doctor of Philosophy degree program. 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 candidacy for the master’s degree

Term offered: I, II, III

Year offered: Annually

Hours: Variable

**MMSC 6098 (9 CREDITS PER SEMESTER)**

**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, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the master’s degree

Term offered: I, II, III

Year offered: Annually

Hours: Variable

90 ♦ MASTER OF MEDICAL SCIENCE DEGREE
Master of Public Health Degree

http://pmch.utmb.edu/education/publichealth/publichealthdisc.aspx

Faculty

Graduate Program Director
Laura Rudkin, Ph.D.

For the remainder of the faculty listing, please refer to the Population Health Sciences Program listing

PROGRAM

The educational mission of the Public Health Program is to contribute to the protection and promotion of health in human populations by preparing medical students, residents, and fellows to practice skillful and evidence-based preventive medicine and public health. The program is administered by the Graduate Program in Population Health Sciences (PHS). Enrollment in the Public Health Program is open only to UTMB medical students, residents, and fellows and non-UTMB medical doctors in preventive medicine residencies, and degree seeking students in a UTMB doctoral level program, including M.D. and Ph.D. The public health program provides this select group of students with the knowledge, skills, and values needed to succeed in careers that bridge medicine and public health. Successful completion of the program results in the award of the Master of Public Health (MPH) Degree. A single generalist, professional track is available.

ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

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

The Department of Population Health Sciences supports 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 a career in preventive medicine. The job description for Population Health Sciences (PHS) students describes the essential functions needed to successfully complete the Population Health Sciences Program as well as the Master of Public Health (MPH) Program and prepare for entry-level practice.

If accepted into the program, 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).

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 the PHS program including those in the M.P.H. program 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 personnel 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 including those of the M.P.H. Program, 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
   g. tolerate the views of others
   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

RESEARCH FACILITIES

The MPH Program involves faculty from several clinical and basic science departments providing students access to research facilities across the campus. Adjunct faculty members in the MPH Program are primarily public health professionals who provide students research and practice opportunities in community and occupational settings. Community partners include: Galveston County Health District, St. Vincent’s Clinic, The Jesse Tree, and Frontera de Salud.

MPH faculty members have access to and experience with a wide range of population health data sets including: the National Health and Nutrition Examination Surveys (NHANES), the Hispanic Epidemiologic Study of the Elderly (H-EPESE), cancer data from the SEER...
Program, the Mexican Health and Aging Study (MHAS), Medicare data, the Health and Retirement Study (HRS), mortality data for the Department of Energy nuclear workers, and health insurance claims data on approximately 36 Million United Health enrollees. MPH faculty members also have expertise working with data from clinical records, emergency room visits, and the correctional health care system. MPH students have access to computers for word processing, statistical analysis, internet services, email, and other functions.

**CURRICULUM**

The MPH degree plan includes a core set of requirements, but can be tailored to meet individual student’s interests and career goals. Medical students earn the MPH as part of a five-year dual degree plan. Medical residents and fellows can complete the curriculum in four academic terms of full-time study or may opt to complete the degree over two or more years of part-time study.

Degree requirements include:
- A minimum 42 credit hours
- Courses in the core knowledge areas of public health
  - Biostatistics
  - Epidemiology
  - Environmental Health
  - Health Policy
  - Social and Behavioral Sciences
- Completion of a capstone (applied) or thesis (research) report
- Completion of a mentored public health practice experience
- An ethics of science course
- Elective courses

The curricular plan includes courses in the core disciplines of public health and topics relevant to blending the practice of preventive medicine and public health. Methods for delivery of course content consist of course readings and requirements, lectures, group discussions, visiting speakers, and tours of public health facilities. The curricular plan also incorporates integrative applied learning experiences in the form of the capstone project and report and the practice experience.

Students select elective courses from among the diverse offerings of the Graduate Program in Population Health Sciences (PHS) or from other Graduate School programs. Among the electives available within PHS are advanced courses in biostatistics and epidemiology and special topics courses relevant to public health and preventive medicine. Among the PHS course offerings are: vaccine policy, infectious disease epidemiology, social epidemiology, occupational medicine, aging and health, rehabilitation studies, and outcomes research.

**COURSES**

Please refer to the Population Health Sciences course listing.
Medical Humanities Graduate Program

http://www.utmb.edu/imh/GraduateProgram

Faculty

Graduate Program Director
Anne Hudson Jones, Ph.D.

Professors
Brody, Howard A., M.D., Ph.D.
Carson, Ronald A., Ph.D.
Jones, Anne Hudson Ph.D.
Vanderpool, Harold Y., Ph.D.
Vaiani, Cheryl J. Ellis, Ph.D.
Winslade, William J., J.D., Ph.D.

Associate Professors
Avery, Eric N., M.D.
Carter, Michele A., Ph.D.

Assistant Professor
Clark, Mark, Ph.D.
Delancey, Dayle, Ph.D.
Glenn, Jason E., Ph.D.
Hermer, Laura, J.D., L.L.M.
Smith, Kirk L., M.D., Ph.D.

PROGRAM RATIONALE

In 1988, the graduate program at the Institute for the Medical Humanities (IMH) was authorized to offer the nation’s first Ph.D. degree in the medical humanities. Eighteen years later, we are still one of the very few programs in the United States to offer advanced degrees (M.A., Ph.D., M.D.-Ph.D., J.D.-Ph.D.) in the medical humanities. Thirty-seven students have graduated since 1988, and 23 degree-seeking students are currently enrolled. We have enjoyed the freedom and creativity inherent in developing a new interdisciplinary 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 institute? 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 IMH 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 IMH 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 Medical Humanities Graduate Program offers graduate work for students pursuing an M.A. or a Ph.D. in the medical humanities. IMH also coordinates programs of study leading to M.D.-Ph.D. or J.D.-Ph.D. degrees. Course work is available for University of Texas Medical Branch (UTMB) graduate students in other programs. Ph.D. students in the medical humanities are expected to acquire a general knowledge of the humanist tradition; become acquainted with the methods and literature of the humanities as these relate to medicine; develop competence in one or more humanities disciplines and apply this competence to the investigation of a particular problem; transform this investigation into a dissertation that represents significant and original research; and 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 Medical Humanities Graduate Program.

1. IMH graduate students must be able to produce scholarly typewritten research papers based on seminars and research, qualifying examinations, and theses or dissertations within a reasonable time frame.
2. IMH graduate students must be able to physically attend IMH courses in our library and at other locations on campus.
3. IMH graduate students must be able to meet with professors in their offices and to attend biweekly seminars and journal club meetings.
4. IMH graduate students must be capable of effectively reading, comprehending, visualizing, and interpreting texts and visual materials—printed, archival, and electronic.
5. IMH graduate students must be able to effectively listen to, interpret, comprehend, and respond to lecturers, case conferences, and other forms of oral instruction.
6. IMH graduate students must be able to effectively read, interpret, and carry out oral and written instructions with reasonable proficiency in the English language.
7. IMH 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. IMH 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 Medical Humanities Graduate Program are expected to satisfy all the basic requirements for admission to a degree program in UTMB’s Graduate School of Biomedical Sciences:

- 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 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.
- Adequate subject preparation for the proposed graduate major.

Preference will be given to applicants with an advanced degree in bioethics, history, law, literature, philosophy, or religion; 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 Institute faculty are encouraged. Demonstrated reading competence in at least one foreign language is strongly encouraged and will be required for students doing comparative or international research. Completed applications must be received by February 1. Applications are considered in March and April; admission is for the following fall term.

**FINANCIAL SUPPORT POLICY**

The faculty of IMH will make annual awards of available financial support (graduate assistantships and scholarships) on a 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.

IMH graduate students receiving support should understand that funding decisions are made one year at a time; funding is contingent on their progress in the program and on available resources; and the duration of funding will not 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.

**PHYSICAL FACILITIES**

The Institute for the Medical Humanities is well integrated into educational, clinical, and research activities at UTMB. Our linkages to the schools of Medicine, Nursing, and Allied Health Sciences provide many opportunities for learning, collaborating, and teaching in clinical care and research. Within the Institute, a study space is set aside for student use.
The Medical Humanities 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 Institute faculty for their respective disciplinary work. It now contains adequate reading material for basic courses in history, law, literature, philosophy, and religion, as these relate to medicine. In addition to the Moody Medical Library, library resources in Galveston for papers, theses, or dissertations include the Rosenberg Library, the Texas A&M at Galveston Library, and the Galveston College Library. Graduate students in the medical humanities also have access, through the Houston Area Research Library Consortium (HARLiC), to the more than eight million volumes in the Houston Academy of Medicine—Texas Medical Center Library, Houston Public Library, Rice University Library, Texas A&M University Library, and University of Houston Library.

**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.

All students in the Medical Humanities Graduate Program are required to take and demonstrate proficiency in the following four core courses:

- Humanism and the Humanities
- Humanism and the Medical Humanities
- Clinical Ethics Practicum
- Ethics of Scientific Research

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

- Advanced Practicum
- Art Practicum
- Bioethics and the Law
- Clinical Ethics
- Ethics and Regulation in Clinical Research
- Ethics of Health Policy
- Foundations of Bioethics
- Introduction to Literature and Medicine
- Narratives of Illness
- Philosophical Ethics
- Religion, Medicine, and Culture
- Special Topics
- Topics in the Medical Humanities

Students will be assigned an advisor when they enter the program and are encouraged to choose new advisor(s) 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, between three and five years of full-time work are required for the Ph.D. degree. The M.A. degree usually requires two years of full-time work. Additional courses at
other universities (e.g., Rice University, University of Houston, and The University of Texas at Austin) may be required or accepted. Students pursuing both an M.D. and a Ph.D. in the medical humanities may apply to the M.D.-Ph.D. program.

Every student is required to submit a two-page 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 21, the graduate program director will request that the dean place the student on academic probation. 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, criticisms, etc. The report will be used in the 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 in areas of specialization to prepare for the qualifying examination and dissertation proposal. Subjects not treated in regular courses may be pursued under Topics in the Medical Humanities or special topics courses. Students will elect major and minor areas of specialization, which are administered by area coordinators in collaboration with the faculty advisors.

Areas and coordinators are as follows:

- Health Care Ethics (Dr. Michele A. Carter)
- Health Law and Policy (Dr. Laura Hermer)
- History of Medicine (Dr. Jason E. Glenn)
- Literature and Narrative Studies in Health Care (Dr. Anne Hudson Jones)
- Religion and Medicine (Dr. Mark Clark)

Major areas of specialization require fifteen hours; minor areas require nine hours. 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. Each student’s particular array of courses will be determined in collaboration with the area coordinator, advisor, and graduate program director.

**PH.D. QUALIFYING EXAMINATION**

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: humanism, the humanities, and medical humanities; a major area of specialization; and a minor area of specialization. Preparation for the examinations will involve constructing and mastering, (with supervision of the advisor, area of specialization coordinators, and medical humanities faculty) 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.

The student’s committee chair will return the written examination, usually within three weeks. After the written examination has been returned, the advisor will schedule the qualifying oral examination. The oral examination, which will be announced and open to all members of the Institute faculty, will test the student’s skills in dealing with concrete practical issues in medical humanities, research, education, community health, or clinical ethics. 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.
COMPLETING THE DISSERTATION

Within six months of the qualifying oral examination, students will submit a written dissertation proposal to the dissertation advisor. 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 Graduate School. Students will also present a 90 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. 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.

COURSE DESCRIPTIONS

Required Courses

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 (60 percent) and class participation (40 percent).

Prerequisite: None
Term offered: III
Year offered: Annually
Hours per week: 15 contact hours in 3 days

MEHU 6375  
HUMANISM AND THE HUMANITIES

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 the historical exploration of humanism and the 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 percent) and three essays about course readings (25 percent each).

Prerequisite: None
Term offered: II
Year offered: Biennially (even years)
Hours per week: Seminar 3

MEHU 6378 (3 CREDITS)
HUMANISM AND THE MEDICAL HUMANITIES

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 will be based on class participation (25 percent) and three short papers (25 percent 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
Term offered: III
Year offered: Biennially (even years)
Hours per week: Lecture 3

MEHU 6382 (3 CREDITS)
CLINICAL ETHICS PRACTICUM

This course is designed to provide an opportunity for graduate students in the IMH to learn about the culture of clinical medicine by engaging them in health care encounters and relationships that typify medical practice. Students will be introduced to basic concepts of clinical ethics through observation of the patient-doctor relationship in various practice sites. The student, with guidance, will select a pre-approved clinical site or sites (i.e., clinical practice, medical ICU, hospice) and observe and interact with the care team, on a weekly basis, for three hours. Further objectives of the course will be dependent on individual student needs but 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 as 20 percent from attendance and participation, 40 percent from discussions of readings and clinical experiences, and 40 percent from the project.

Prerequisite: Students must contact the instructor for prior approval at least one month before the course begins.
Term offered: I,II, III
Year offered: Annually
Hours per week: Conference or discussion 2, clinical 3
Electives

MEHU 6283  (2 CREDITS)
ART PRACTICUM

A hands on, studio-based introduction to the visual arts and medical humanities. After an introduction to papermaking and printmaking techniques, students will develop a project which will be produced during the class period. In addition to learning techniques for presenting visual information, the students will develop an expanded appreciation for the visual arts’ unique contribution to medical humanities. Students will be evaluated as follows: 1) attendance; 2) class participation; and 3) the completion of independent projects which are reviewed during the course and presented as the class final.

Prerequisite: Students must contact the instructor for prior approval at least one month before the course begins.
Term offered: II, III
Year offered: Annually
Hours per week: Lab 3, conference or discussion 1

MEHU 6304  (3 CREDITS)
BIOETHICS AND THE LAW

This seminar will bring together perspectives from bioethics and law on selected topics in health care. To develop these perspectives in seminars and research projects, students will explore a broad range of philosophical, political, social, and economic topics and issues that bear on such matters as the formulation of health policies; classic cases; controversies about informed consent and respect for persons; beginning and end-of-life decisions; the physician-patient relationship; the legal regulation of medical practice; and specific topics such as organ transplantation, privacy and confidentiality, and access to health care. Lectures, readings, and discussions. Students are evaluated on the basis of their participation in class discussion (25 percent) and on the basis of their written work including research papers and conceptual analysis of textual materials (75 percent).

Prerequisite: None
Term offered: II
Year offered: Biennially (even years)
Hours per week: Seminar 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 percent) and on the basis of their written work including research papers and conceptual analysis of textual materials (75 percent).

Prerequisite: None
Term offered: I
Year offered: Biennially (even years)
Hours per week: Seminar, 3
MEHU 6308 (3 CREDITS)

TOPICS IN THE MEDICAL HUMANITIES

Readings, tutorial studies, or written papers dealing with topics in the medical humanities, depending on the needs of the student. This course may be taken more than one time for credit with the consent of the instructor and the graduate program director.

Prerequisite: Consent of the instructor and the graduate program director.
Terms offered: I, II, III
Year offered: Annually
Hours per week: Seminar 3

MEHU 6310 (3 CREDITS)

ETHICS AND REGULATIONS IN CLINICAL RESEARCH

This course will cover the processes of conducting human-subjects research studies, the ethical principles upon which contemporary human-subjects research is founded, the complex federal regulations that govern such research, the standard guidelines for conducting human-subjects research, and the history of developments in research ethics and research regulations. The format will be weekly meetings with lectures, class discussion, and group exercises. Students will complete “real-world” assignments, such as analyzing a protocol from an IRB perspective, writing an IRB submission, completing case report forms with sample patient data, and writing and assembling a sample regulatory packet such as an IND or NDA. Students also will participate in group exercises such as operating as an IRB or Data Safety and Monitoring Board. Grading will be based on class discussion and participation (40 percent) and written analyses and reports (60 percent).

Prerequisite: None
Term offered: I
Year offered: Biennially (even years)
Hours per week: Seminar 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. There are three graded assignments: a critical essay (30 percent), an argument/case analysis (30 percent), and an Ethics Grand Rounds presentation (20 percent). Specific details of these assignments will be provided. All students are expected to complete all reading assignments before each seminar session and to participate in seminar discussions (20 percent).

Prerequisite: Permission of instructor
Term Offered: II
Year offered: Biennially (odd years)
Hours per week: Seminars 3

MEHU 6317 (3 CREDITS)

ADVANCED PRACTICUM IN HEALTH CARE 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 intradisciplinary 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. 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.

Prerequisites: MEHU 6382, MEHU 6315, and permission of the instructor
Terms offered: I, II, III
Year offered: Annually
Hours per week: Conference 2, Clinical 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 percent), two assigned essays about course readings (20 percent each), and a final course paper (40 percent).

Prerequisite: None
Term offered: II
Year offered: Biennially (odd years)
Hours per week: Seminar 3

MEHU 6364 (3 CREDITS)
RELIGION, MEDICINE, AND CULTURE

An investigation of the characteristics and interrelationships of medicine and religion in cultural contexts. Discussions include overviews of sickness, health, and medicine in several religious traditions of the world, with a focus on Judaism and Christianity. Topics include the intersection of religion and medicine with respect to suffering, healing, taboos, mental health, ethics, and dying. Course grades will be determined by class participation (40 percent), oral presentation of a selected research topic (10 percent), and a final research paper (5 percent).

Prerequisite: None
Term offered: II
Year offered: Biennially (even years)
Hours per week: Seminar 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 percent), two assigned essays about course readings (20 percent each), and a final course paper (40 percent).

Prerequisite: None
Term offered: III
Year offered: Biennially (even years)
Hours per week: Seminar 3

MEHU 6370

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: None
Term offered: I
Year offered: Biennially (odd years)
Hours per week: Seminar 3

MEHU 6377

ETHICS OF HEALTH POLICY

The objectives of this course are to introduce students to the social and political context of health care allocation in the U.S.; to engage students in a conversation about justice in the distribution of health care resources; and to examine health care issues raised by social inequality. The basis of the discussion will be important texts by philosophers, economists, and political theorists. Course grading will be based on three essays (30 percent each) and class participation (10 percent).

Prerequisite: Consent of instructor
Term offered: III
Year offered: Biennially (odd years)
Hours per week: Seminar 3

MEHU 6096

SPECIAL TOPICS

This course deals with various special topics in medical humanities. It will consist of readings, tutorial studies, or written papers in specific areas unrelated to the student’s thesis or dissertation project, depending upon the needs of the student. The MEHX 6000 Special Topics course is designed to allow in depth analysis of topics which are not covered in other MEHU courses. It requires a specific title which appears on students’ official transcripts. Students must have approval from the designated professor before registration begins.

Prerequisite: Permission of instructor
Terms offered: I, II, III
Year offered: Annually
Hours per week: Conference or Seminar 3
MEHU 6097  
**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 review, 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.

Prerequisite: Consent of student’s advisor and the graduate program director

Terms offered: I, II, III

Year offered: Annually

Hours per week: Conference 3-9

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**Post-Candidacy Courses**

MEHU 6098  
**THESIS**

Formal preparation and completion of the thesis for the Master of Arts 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.

Prerequisite: Admission to candidacy for the master’s degree and consent of the advisor and the graduate program director

Terms offered: I, II, III

Year offered: Annually

Hours per week: Conference 3-9

MEHU 6099  
**DISSERTATION**

Formal 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.

Prerequisite: Admission to candidacy for the Ph.D. degree and consent of the advisor and the graduate program director

Terms offered: I, II, III

Year offered: Annually

Hours per week: Conference 3-9

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**Concurrent J.D.-Ph.D. in Medical Humanities**

UTMB’s Institute for the Medical Humanities 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 Institute for the Medical Humanities 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.

**Health Law Courses**

The following courses are 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: BIOETHICS AND QUALITY OF CARE**

Is an introductory health law course focusing on bioethics and the mechanisms for assuring quality of health care. Bioethics topics include death and dying, reproductive technologies, organ donation/transplantation, and public health. The course also surveys the major mechanisms ensuring the quality of health care, including medical malpractice and professional licensure.

**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

http://microbiology.utmb.edu/gradprog/gradprog.htm

Faculty

Graduate Program Director
Rolf Konig, Ph.D.

Professors
Aronson, Judith F., M.D.
Baron, Samuel, M.D.
Barrett, Alan D., D.T., Ph.D.
Chan, The-Sheng, M.D., Ph.D.
Chopra, Ashok, Ph.D.
Christadoss, Premkumar, M.D.
Cloyd, Miles W., Ph.D.
Coppenhaver, Dorian H., Ph.D.
Estes, Don Mark, Ph.D.
Garofalo, Roberto P., M.D.
Grant, Andrew, M.D.
Herzog, Norbert K, Ph.D.
Houston, Clifford W., Ph.D.
Hughes, Thomas K., Ph.D.
Klimpel, Gary R., Ph.D.
LeDuc, James W., Ph.D.
Makino, Shinji, D.V.M., Ph.D.
Niesel, David, Ph.D.
Peters, Clarence J., M.D.
Peterson, Johnny W., Ph.D.
Pierangel, Silvia, Ph.D.
Rajaraman, Srinivasan, M.D.
Rastellini, Christina, M.D.
Reyes, Victor E., Ph.D.
Roberts, Norbert, M.D.
Sherwood, Edward R., M.D., Ph.D.
Smith, Eric M., Ph.D.
Soong, Lynn, M.D., Ph.D.
Tesh, Robert B., M.D.
Thomas, Kziazek, Ph.D.
Walker, David H., M.D.
Watson, David Alan, Ph.D.

Weaver, Scott, Ph.D.
White, Arthur Clinton Jr., M.D.
Whorton, Elbert B., Ph.D.

Associate Professors
Bourne, Nigel, Ph.D.
Casola, Antonella, M.D.
Cong, Yingzi, Ph.D.
Davey, Robert A., Ph.D.
Eaves-Pyles, Tonya D., Ph.D.
Fulhorst, Charles F., D.V.M.
Garg, Nisha, Ph.D.
Hoffman, Erich, Ph.D.
Konig, Rolf, Ph.D.
Lett-Brown, Michael, Ph.D.
McBride, Jere W., Ph.D.
McNeary, Terry Ann, M.D.
Milligan, Gregg N., Ph.D.
Motin, Vladimir L., Ph.D.
Nichols, Joan E., Ph.D.
Pyles, Richard B., Ph.D.
Tseng, Chein-Te Kent, Ph.D.
Yi, MinKyung, Ph.D.

Assistant Professors
Beasley, David W. C., Ph.D.
Bouyer, Donald H., Ph.D.
Dann, Sara M., Ph.D.
Endsley, Janice Jones, Ph.D.
Holbrook, Michael, Ph.D.
Paessler, Slobodan, D.V.M.
Smith, Kirk L., M.D., Ph.D.
Sun, Jiaren, M.D., Ph.D.
Toliver-Kinsky, Tracy, Ph.D.
Torres, Alfredo G., Ph.D.
Wang, Tian (Tina), 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.

**Programs 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.

COURSE DESCRIPTIONS

The course offerings are contingent upon adequate student enrollment.

MICR 6096 (1-3 CREDITS)
SPECIAL TOPICS
Tutorial study in a specialized field of microbiology to be determined by the faculty member and the individual student. The course consists of laboratory work and conferences.
Prerequisites: BBSC First Year Curriculum
Terms offered: I, II, III
Year offered: Annually
Hours per week: Conference or Discussion 1-3

MICR 6097 (1-9 CREDITS)
RESEARCH
Formal research directed toward 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
Term offered: I, II, III
Year 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, needs improvement or unsatisfactory.
Prerequisites: Admission to candidacy for the master’s degree
Terms offered: I, II, III
Year offered: Annually
Hours per week: Variable

Students registering for Thesis are expected to register for a total of 9 credit hours.
MICR 6099  (3-9 CREDITS)

DISSETATION

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
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable

Students registering for Dissertation are expected to register for a total of 9 credit hours.

MICR 6255  (3 CREDITS)

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
Term offered: III
Year offered: Annually
Hours per week: 2

MICR 6315  (3 CREDITS)

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
Term offered: III
Year offered: Annually
Hours per week: Lecture 2; Conference or discussion 1

MICR 6403  (4 CREDITS)

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 performance on written examinations.

Prerequisites: BBSC First Year Curriculum
Term offered: I
Year offered: Annually
Hours per week: Lecture 3; Conference 1

MICR 6408 (4 CREDITS)
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
Term offered: I
Year offered: Annually
Hours per week: Lecture 3; Conference or discussion 1
Neuroscience

http://www2.utmb.edu/neuroscience

Faculty

Graduate Program Director
Volker Neugebauer, M.D., Ph.D.

Professors
Blankenship, James E., Ph.D.
Boulton, Michael, Ph.D.
Christadoss, Premkumar, M.D.
Chung, Jin Mo, Ph.D.
Chung, Kyungsoon, Ph.D.
Collins, Thomas J., Ph.D.
Cunningham, Kathryn A., Ph.D.
Dewitt, Douglas S., Ph.D.
Elferink, Lisa A., Ph.D.
Epstein, Henry F., M.D.
Huang, Li-Yen Mae, Ph.D.
Hulsebosch, Claire E., Ph.D.
Jackson, George R., M.D., Ph.D.
Johnson, Kenneth M., Ph.D.
Liu, Danxia, Ph.D.
Meyer, Walter J., M.D.
Miller, Brian T., Ph.D.
Nagle, Gregg T., Ph.D.
Perez-Polo, J. Regino, Ph.D.
Prough, Donald S., M.D.
Schmalstieg, Manning J., Ph.D.
Willis, William Jr., M.D., Ph.D.

Associate Professor
Bhat, Krishna, Ph.D.
Brodwick, Malcolm S., Ph.D.
Hamil, Owen P., Ph.D.
Neugebauer, Volker E., M.D., Ph.D.
Smith, Janice, M.D., M.P.H.
Taglialatela, Giulio, Ph.D.
Wu, Ping, M.D., Ph.D.

Assistant Professor
Barral, Jose M., M.D., Ph.D.
Boehning, Darren, Ph.D.
Kang, Myoung-Goo, Ph.D.
Kayed, Rakez, Ph.D.
Laezza, Fernanda, Ph.D.
Lin, Qing, M.D.
Makishima, Tomoko, M.D., Ph.D.
Moron-Concepcion, Jose A., Ph.D.
Obermann, Wolfgang M.J., Ph.D.
Tang, Shao-Jun, Ph.D.
Zou, Zhihua, Ph.D.

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 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.

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 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 EDUCATIONAL 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.-degree 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.

CURRICULAR SCHEDULE

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<th>Course Number</th>
<th>Credit Hours</th>
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<td><strong>Term I</strong></td>
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<tr>
<td>BBSC 6401</td>
<td>Biochemistry................................................. 4</td>
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<td>BBSC 6402</td>
<td>Cell Biology.................................................. 4</td>
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<td>BBSC 6101</td>
<td>Academic Success Skills and Ethics ....................... 1</td>
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<td>BBSC 6301</td>
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<tr>
<td>BBSC 6195</td>
<td>Frontiers of Science ......................................... 1</td>
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<tr>
<td><strong>Recommended:</strong></td>
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<tr>
<td>BBSC 6126</td>
<td>Neuronal Transmission......................................... 1</td>
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<tr>
<td>BBSC 6208</td>
<td>Principles of Drug Action, Pharmacokinetics and Biotransformation .... 2</td>
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<tr>
<td>BBSC 6218</td>
<td>Neuroscience &amp; Human Behavior............................. 2</td>
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<tr>
<td><strong>Term III</strong></td>
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<td><strong>Required:</strong></td>
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<tr>
<td>MEHU 6101</td>
<td>Ethics of Scientific Research (3-day course)............... 1</td>
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<tr>
<td>BBSC 6122</td>
<td>Introduction to Biostatistics &amp; Experimental Design in Basic Sciences...... 1</td>
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<tr>
<td></td>
<td>[1st 8 weeks]</td>
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<tr>
<td>BBSC 6301</td>
<td>Laboratory Rotation [1st and 2nd 8 weeks]................... 3</td>
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<tr>
<td>NEUR 6195</td>
<td>Seminar.................................................................... 1</td>
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<td>BBSC 6214</td>
<td>Principles of CNS Sensory-Motor Integration............... 2</td>
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<td>BBSC 6207</td>
<td>Neuronal Excitability......................................... 2</td>
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<tr>
<td><strong>Electives:</strong></td>
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<tr>
<td>NEUR 6202</td>
<td>Biochemical and Molecular Neuroscience........................ 2</td>
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</tbody>
</table>
NEUR 6181-6185  Neurobiology of Disease I-V ................................................................. 1
NEUR 6240  History of Neuroscience .................................................................................. 2
NEUR 6103  Critical Readings in Spinal Cord Injury ......................................................... 1

*Four eight-week lab rotations are required; at least two of these rotations must be in different laboratories.

**Term I**

**Required:**
- NEUR 6403  Integrative Neuroscience ........................................................................ 4
- NEUR 6042  Laboratory Rotation ................................................................................. 3-8
- NEUR 6195  Seminar ..................................................................................................... 1

**Electives:**
- NEUR 6203  Advanced Electrophysiology-Potentials and Channel Physiology .......... 2
- PHTO 6223  Advanced Topics in Neuropharmacology ................................................. 2
- NEUR 6225  Critical Readings in Neuronal Cell Death ................................................. 2
- NEUR 6103  Critical Readings in Spinal Cord Injury; .................................................... 1
  typically offered every term but can only be taken once for credit
- CELL 6321  Protein Structure and Function Underlying Synaptic Plasticity ............. 3
- NEUR 6181-6185  Neurobiology of Disease I-V; ............................................................. 1
  one of these courses is typically offered every term
- INTD 6140  Developmental Neurobiology ................................................................. 1

**Term II**

**Required:**
- NEUR 6042  Laboratory Rotation ............................................................................... 3-6
- NEUR 6195  Seminar .................................................................................................... 1

**Electives:**
- NEUR 6325  Behavioral Neuroscience ........................................................................ 3
- NEUR 6103  Critical Readings in Spinal Cord Injury; .................................................... 1
  typically offered every term but can only be taken once for credit
- NEUR 6210  Ion Channels .............................................................................................. 2
- NEUR 6220  Teaching in Neuroscience ......................................................................... 2
- NEUR 6181-6185  Neurobiology of Disease I-V; ............................................................. 1
  one of these courses is typically offered every term

**Term III**

**Required:**
- Qualifying Exam (beginning of term)
- NEUR 6195  Seminar .................................................................................................... 1
- NEUR 6042  Laboratory Rotation .................................................................................. 3-8
  Or
- NEUR 6097  Research ................................................................................................. 3-8

**Electives:**
- NEUR 6240  History of Neuroscience; may be taken in Term III of Year 1 .............. 2
  if schedule permits

**Other repeating electives, such as NEUR 6103 or NEUR 6181-5 may be taken**

**Later Years**
- NEUR 6195  Seminar .................................................................................................... 1
NEUR 6097  Research (each term until admission to candidacy, which must occur before Term III of the 3rd year) ...........................................1-8
NEUR 6099  Dissertation (each term after Admission to Candidacy).........................................................................................9

Electives:
NEUR 6220  Teaching in Neuroscience (last 9 wks, Term II, 2nd or 3rd year) .................................................................2
NEUR 6103  Spinal Cord Injury: critical reading ..................................................1
NEUR 6201  History of Neuroscience ..............................................................2
NEUR 6503  Neuroscience and Human Behavior (NHB) (last 9 wks, Term I, 2nd year) ..................................................5
NEUX 6000  Special Topics ........................................................................1-3

**COURSE DESCRIPTIONS**

NEUR 6096  (1–3 CREDITS)

SPECIAL TOPICS

Study of special topics in neuroscience. Topics are selected and study programs arranged on an individual basis with staff members.

Prerequisites: Permission of instructor

Term offered:  I, II, III
Year offered:  Annually
Hours per week:  Variable, format to be arranged

NEUR 6042  (3–8 CREDITS)

LABORATORY ROTATIONS

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 two different laboratories (i.e., do two different rotations), and must complete the two rotations before the end of the first BBSC year. Grading is A, B, C, F, and based on participation in lab discussions and experiments.

Prerequisites:  Admission to program; permission of instructor and program director

Terms offered:  I, II, III
Year offered:  Annually
Hours per week:  Laboratory 9–24 (variable)

NEUR 6097  (1–8 CREDITS)

RESEARCH

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. This course is only available to students who have passed the written qualifying exam and typically cannot be taken for more than three consecutive terms.
Prerequisites: Admission to the neuroscience program
Term Offered: I, II, III
Year Offered: Annually
Hours per week: Variable

NEUR 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, needs improvement or unsatisfactory.
Prerequisites: Admission to candidacy for the Ph.D. degree
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable
Students registering for Dissertation are expected to register for a total of 9 credit hours per term.

NEUR 6103 (1 CREDIT)

SPINAL CORD INJURY: A COURSE IN CRITICAL READING

The course objective will be to examine and critique current manuscripts that present data addressing cellular and molecular mechanisms of spinal cord injury. Readings will be selected by the course director or by mutual agreement of students and director. All enrolled students will be asked to summarize each article into one or two written sentences (40 percent of grade). In addition, each student will present three manuscripts and identify the hypothesis to be tested, followed by oral critiques on the experimental design, the data collected, the interpretation of the data, and whether or not the stated hypothesis was supported (60 percent of grade).
Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Conference or Discussion 1

NEUR 6181 (1 CREDIT)

NEUROBIOLOGY OF DISEASE I

This course will explore the nature and basic mechanisms of neurobiological diseases related to dementias and drug abuse. 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. 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 Neurobiology of Disease 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 course or consent of the instructor
Term offered: I
Year offered: Biennially, even years
Hours per week: Conference or discussion, 1
NEUR 6182  (1 CREDIT)
NEUROBIOLOGY OF DISEASE II

This course will explore the nature and basic mechanisms of neurobiological diseases related to spinal cord injury. 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 injury models and 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. 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 Neurobiology of Disease 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 course or consent of the instructor
Term offered: II
Year offered: Biennially, even years
Hours per week: Conference or discussion, 1

NEUR 6183  (1 CREDIT)
NEUROBIOLOGY OF DISEASE III

This course will explore the nature and basic mechanisms of neurobiological diseases related to muscle and to the phenomenon of 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. 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 Neurobiology of Disease 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 course or consent of the instructor
Term offered: III
Year offered: Biennially, even years
Hours per week: Conference or discussion, 1

NEUR 6184  (1 CREDIT)
NEUROBIOLOGY OF DISEASE IV

This course will explore the nature and basic mechanisms of neurobiological diseases related to sleep disorders, disorders/diseases involving the auditory/vestibular and olfactory systems, anxiety-related disorders, and genetic disorders related to locomotion. 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-lead 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. This sequence of Neurobiology of Disease (NOD) courses is designed for students in the Neurobiology of Disease 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 course or consent of the instructor

**Hours per week:** Conference or discussion, 1

**NEUR 6185**

**NEUROBIOLOGY OF DISEASE V**

This course will explore the nature of the processes underlying the development of the nervous system and the mechanisms responsible for neuronal plasticity. Emphasis will be placed on how derangements among these processes result in human neurological disease. Additional courses in this sequence will address various other diseases of the nervous system. The course will meet once per week and will consist of faculty-led discussions of recent literature related to these entities. An introductory lecture will typically initiate each topic and successive classes will consist of student-generated discussion of assigned published papers. 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 of the Neuroscience Graduate Program, for MD-PhD students in Neuroscience, and for any other graduate student interested in neurobiological processes and diseases, from their clinical manifestations to the basic science underpinnings of their etiology and expression.

**Prerequisite:** Graduate level course or consent of the instructor

**Hours per week:** Conference or discussion, 1

**NEUR 6195**

**SEMINAR**

The objectives of this course are to expose the students to a wide range of current topics in neuroscience, and to provide the students with experience in organizing and presenting seminars. Exposure to current topics in neuroscience will be accomplished by requiring 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. Their performance will be evaluated by the program advisory committee and 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, and F, based on performance and continued attendance at other seminars.

**Prerequisites:** None

**Terms offered:** I, II, III

**Year offered:** Annually

**Hours per week:** Seminar 1
NEUR 6202  (2 CREDITS)

BIOCHEMICAL AND MOLECULAR NEUROSCIENCE

The biochemical and molecular basis of neuronal and glial function at the molecular and cellular levels will be introduced in this course. Through lectures and readings in texts and original literature, the following topics will be covered: cellular phenotypes of the nervous system; axon transport and neural repair; neuronal guidance; transmitter release; developmental neuroscience; amino acid metabolism and transport; oxidative processes; neuroimmunology; and neuroinflammation, neurodegeneration, gene delivery, and genomics. Grades will be determined based on a midterm and a final exam.

Prerequisites: Standard first-year BBSC Curriculum or permission of instructor
Term offered: III
Year offered: Annually
Hours per week: Lecture 2

NEUR 6203  (2 CREDITS)

ADVANCED ELECTROPHYSIOLOGY: POTENTIAL AND CHANNEL PHYSIOLOGY

This eight-week annual course begins at the start of the fall term. Course content will include theory, instrumentation, methodologies and experimental applications of intracellular (sharp microelectrodes) whole-cell patch current- and voltage-clamp, and single-channel patch-clamp analysis of gated channels. There will be three hours of lecture in each of the first two weeks. In each of the successive five weeks, students will spend nine hours each week in a different laboratory, observing and participating in experiments utilizing these techniques as they apply to slice preparations of brain and spinal cord, to dissociated cells, or to channel expression in oocytes or cultured cells. Grading will be based on either a written examination or a research paper.

Prerequisites: BBSC 6207 or permission of instructor
Term offered: I
Year offered: Annually
Hours per week: Laboratory 1; Lecture 1

NEUR 6220  (2 CREDITS)

TEACHING IN NEUROSCIENCE

The objectives of this course are to provide students with an opportunity to gain experience in teaching while enhancing their knowledge of neuroscience. Students will participate in teaching and discussion in the laboratories of the Neuroscience and Human Behavior course (NEUR 6503) or the Systems Neuroscience course (NEUR 6403) offered to graduate and/or medical students. Students have two one-hour discussion sessions 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 per week. Students will be expected to review material in a lab group session, 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 percent), ability to present reviews to class clearly (40 percent), ability to interact effectively with small groups in lab (20 percent), and participation in preparatory sessions and demonstrations (20 percent).

Prerequisites: NEUR 6503, NEUR 6403, or permission of instructor
Term offered: II
Year offered: Annually
Hours per week: Conference or Discussion 1; Laboratory 4
CURRENT TOPICS IN NEURONAL CELL DEATH

The objective of this elective course is to introduce students to the molecular basis of neuronal cell death in disease through a combination of lectures and current literature. The first 5 classes will examine the molecular basis of excitotoxicity and ischemic cell death. The remaining 11 classes will examine the mechanisms mediating neurodegeneration in Alzheimer’s, Huntington’s, and Parkinson’s diseases. Students will be graded on class participation (50%) and presentation of relevant research papers (50%). The development of critical thinking skills will be emphasized. Each class will begin with an introductory lecture by the instructor, and then a paper presented by a student. Class will meet once a week for two hours.

Prerequisites: None
Term offered: I
Year offered: Annually
Hours per week: 2

NEUR 6210
ION CHANNEL STRUCTURE AND FUNCTION

This course focuses on the role of membrane ion channels in signaling in excitable and nonexcitable cells. Over the last 20 years fast gated membrane ion channels have been shown to be critical in axonal and synaptic transmission, various sensory transductions as well as basic cellular functions including cell proliferation, volume regulation and migration. The objective of this course is to become familiar with the basic mechanism that determine ion channel selectivity, gating and energy transduction. The course will be comprehensive and cover the many variety of channel classes. The activities will focus on addressing different controversies that presently exist in the channel field. The grading criteria will be focused on the ability of the student to judge and critically discuss different sides of the controversies.

Prerequisites: None
Term offered: II
Year offered: Annually
Hours per week: Lecture, 2; Conference and discussion, 0.5;

NEUR 6325
BEHAVIORAL NEUROSCIENCE

Lectures and discussion in this required course will cover ecological, organismal, circuit, and cellular levels of fixed and plastic behaviors of both invertebrates and vertebrates. A conceptual framework will be developed for understanding the “why” and “how” of the evolution, development, causation, and function of behavior. Mechanisms will be described for obtaining environmental information; for integrating and coordinating this information; and for locomotion, feeding, reproduction, and defense. Grades will be based on two essay examinations (mid-term 35 percent, final 35 percent), one take-home conceptual framework essay question (15 percent), and classroom participation (15 percent).

Prerequisites: None
Term offered: II
Year offered: Annually
Hours per week: Lecture 3
**NEUR 6403** (4 CREDITS)

**INTEGRATIVE NEUROSCIENCE**

This course will form a basis for understanding the anatomical and functional organization of the nervous system. Topics of study will include the organization and physiology of major sensory systems, motor systems, and the limbic system. The format will be devoted to three small-group discussion sessions and one three-hour laboratory session each week. Discussions will cover assigned readings from a comprehensive neuroscience text and focus on critical features of the systems under study: organizational principles, functional anatomy and physiological characteristics of the system; similarities and differences between systems; and integration among systems. Grades will be based on class participation, and on midterm, final (written), and lab examinations.

**Prerequisites:** Standard first-year BBSC curriculum or permission of instructor

**Term offered:** I

**Year offered:** Annually

**Hours per week:** Discussion 3; Lab 3

**NEUR 6503** (5 CREDITS)

**NEUROSCIENCE AND HUMAN BEHAVIOR**

The objectives of this elective course are to provide an opportunity for students to learn the basic principles of neuroanatomy and neurophysiology, to learn basic anatomy and functional organization of the human central nervous system, and to introduce the biochemical and physiological processes underlying nerve cell function and behavior. The content includes the major pathways and structures of the CNS; basic electrophysiology of nerve cells and the function of major CNS components such as motor system, sensory systems, cortical organization and function, and integrative centers; and the effects of disease or injury on nervous system function. Performance is evaluated by written exams, laboratory practical exams, and performance in small-group problem-solving sessions.

**Prerequisites:** None

**Term offered:** II

**Year offered:** Annually

**Hours per week:** Lecture 3; Conference and discussion 2; Laboratory 2

**INTD 6140** (1 CREDIT)

**DEVELOPMENTAL NEUROBIOLOGY**

The diverse functions of our nervous system, which range from sensory perception and motor coordination to motivation and memory, depend on the precise interconnections of several millions of neurons. These connections are made during embryonic and postnatal development, and are constantly being modified by learning, memory and experience. This elective course considers molecular control of neural specification, formation of neuronal connections, construction of neural systems, and the contributions of experience to shaping brain structure and function. We will focus on factors that control the diversity and survival of neurons, guide axons, and regulate the formation of synapses, and will conclude with two forms of neurodevelopmental diseases. Discussion of primary literature is the main emphasis. Grades will be based on class participation and a written review.

**Prerequisite:** None

**Term offered:** II

**Year offered:** Annually

**Hours per week:** 1 Conference and discussion
Nursing Doctoral Program

http://www.son.utmb.edu

Faculty

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

Professors
Anderson, Elizabeth (Betts), Ph.D.
Drew, Judith C., R.N., Ph.D.
Fiandt, Katherine, Ph.D.
Heliker, Diane M., R.N., Ph.D.
Hill, Alice S., R.N., Ph.D., F.A.A.N.
Reifsnider, Elizabeth, R.N., Ph.D.
Watson, Pamela, R.N., Sc.D.

Associate Professor
An, Kyungeh, R.N., Ph.D.
Brycynski, Karen A., R.N., D.N.Sc.
Davila, Yolanda R., Ph.D.
Martin, Darlene (Cheyenne) Aulds, R.N., Ph.D.
Mendias, Elnora P., R.N., Ph.D.
O’Keefe, Mary, R.N., Ph.D., J.D.
Phillips, Carolyn A., R.N., Ph.D.
Richard, Patricia L., R.N., Ph.D.
Rounds, Linda R., R.N., Ph.D.
Ruiz, Roberta, R.N.C., W.H.C.N.P., Ph.D.
Sandor, M. Kay, R.N., Ph.D., L.P.C., A.H.N.-B.C.

Assistant Professor
Nguyen, Hoang T., 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 nursing and related disciplines;
• 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 health care environments of the world.

**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).

**Required Courses**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>GNRS 6341</td>
<td>History and Philosophy of Science in Nursing</td>
<td>3</td>
</tr>
<tr>
<td>GNRS 6342</td>
<td>Theories in Nursing</td>
<td>3</td>
</tr>
<tr>
<td>GNRS 6343</td>
<td>Critical Analysis of Concepts in Nursing</td>
<td>3</td>
</tr>
<tr>
<td>GNRS 6344</td>
<td>Univariate Statistics</td>
<td>3</td>
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</table>
GNRS 6345  The Study of Health Promotion, Human Response, and Healing in Nursing Science  3  
GNRS 6346  Quantitative Research Methods  3  
GNRS 6347  Ethics in Health Care and Research  3  
GNRS 6348  Qualitative Research Methods  3  
GNRS 6349  Multivariate Analysis  3  
GNRS 6350  Clinical Investigation in Nursing  3  
GNRS 6351  Qualitative Data Management  3  
GNRS 6352  Survey of Instrumentation Methods  3  
GNRS 6353  Health Policy Development  3  
GNRS 6354  International Nursing Leadership  3  
GNRS 6309  Research Practicum  3  
GNRS 6340  Doctoral Research Seminar  3  
MEHU 6101  Ethics of Science  1  
Electives ( 9 credits required, additional credits may be earned)  9  
GNRS 6099  Dissertation ( 6-credit minimum required)  
See course description  6  
Program total  64  

**COURSE DESCRIPTIONS**

**GNRS 6096**  
(1-3 CREDITS)

**SPECIAL TOPICS**

Advanced level study dealing with a variety of topics relating to the role of nursing in healing processes. This is a course designed to cover material of current or special interests.

**Prerequisites:** Graduate standing and permission of instructor  
**Term offered:** I, II, III  
**Year offered:** Annually  
**Hours per week:** Conference 1-3  

**GNRS 6039**  
(1-4 CREDITS)

**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  
**Year offered:** Annually  
**Hours per week:** Laboratory 3-12
RESEARCH

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
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable

DISSETATION

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
Year offered: Annually
Hours per week: Variable

Students registering for Dissertation are expected to register for a total of 9 credit hours.

SUFFERING: SPIRITUAL AND CULTURAL PERSPECTIVES

This interdisciplinary research elective will investigate the phenomena of human suffering: culturally, personally, and within health care settings. It will explore how suffering has been and can be addressed and alleviated by caregivers and enable students to discover a promising area of research. Systematic formal evaluation of students’ achievement of course goals will be conducted.

Seminar 15 percent
In-class writing assignments 25 percent
Formal presentations 25 percent
Final research paper 35 percent

Prerequisites: Admission to Nursing Ph.D. program/GSBS Graduate program or consent of instructor
Terms offered: I
Year offered: Annually
Hours per week: Seminar 3

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.

Prerequisites: Admission to candidacy for the Nursing Ph.D. Program
Term offered: I,II,III
Year offered: Annually
Hours per week: Seminar 3
GNRS 6341
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
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

GNRS 6342
THEORIES IN NURSING

This course provides an introduction to the nature of scientific inquiry and theoretical conceptualizations of the discipline of nursing. The origins and strategies for theory development are examined with particular emphasis on the methods and processes of theory construction, testing, and deliberative application for knowledge development. Theoretical explanations that guide nursing research and practice will be explored in relationship to the four metaparadigm concepts: person, health, environment, and nursing. A synthesized practice model will be developed to provide the basis for the student’s program of scholarship. Evaluation of student progress is based on seminar participation, formal paper, and presentations.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

GNRS 6343
CRITICAL ANALYSIS OF CONCEPTS IN NURSING

This course focuses on approaches used to explore and evaluate constructs related to student-selected areas of study. Concepts will be critically evaluated within the context of published research reports. A major component of the course is development and submission of a concept analysis manuscript to a professional journal. Evaluation of student progress and mastery is based on writing assignments, literature search, manuscript/concept analysis, media presentation, and final.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

GNRS 6344
UNIVARIATE STATISTICS

This is an introductory course in statistical analysis. Basic widely used analyses will be covered. The purpose of statistics is to summarize numerical data. Weekly computer assignments will be used to demonstrate how various statistical methods work, how to understand statistical results, and how to use statistical software. The course goals are to gain a working vocabulary of important statistical methods, to create some functional computing skills, and to improve confidence in dealing with numbers. Evaluation of student progress is based on class participation, midterm, and final exams.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: II, III
Year offered: Annually
Hours per week: Lecture 3

GNRS 6345
(3 CREDITS)
THE STUDY OF HEALTH PROMOTION, HUMAN RESPONSE, AND HEALING IN NURSING SCIENCE
This course emphasizes existing and evolving research focused on health promotion, human response, and healing. The analysis, critical evaluation, and interpretation of research in these areas provides students with the foundation to explore original ideas for the purpose of generating nursing knowledge. Research exemplars will be presented and discussed. Students will delineate areas of research consistent with the course focus. Evaluation of student progress is based on term papers, class presentations, and class participation.
Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: II, III
Year offered: Annually
Hours per week: Lecture 3

GNRS 6346
(3 CREDITS)
QUANTITATIVE RESEARCH METHODS
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
Term offered: II, III
Year offered: Annually
Hours per week: Lecture 3

GNRS 6347
(3 CREDITS)
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
Term offered: III
Year 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, illness, and healing 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 healing contexts, experiences, and meanings. Theoretical and practical issues are critically analyzed in the context of knowledge development, diffusion, utilization, and evaluation. Evaluation of student progress is based on research questions, presenter, proposal, and presentation.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6341, 6342

Term offered: I
Year offered: Annually
Hours per week: Lecture 3

MULTIVARIATE ANALYSIS

This is an introductory course in multivariate analysis. Several of the most widely used multivariate tools are considered and practiced on the computer. The overall goal is to develop an understanding and appreciation of various multivariate techniques available to behavioral researchers. Evaluation of student progress is based on preparation and participation in class, midterm examination, and final examination.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6344 or equivalent statistics course

Term offered: I
Year offered: Annually
Hours per week: Lecture 3

CLINICAL INVESTIGATION 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 6345

Term offered: I
Year offered: Annually
Hours per week: Lecture 3

QUALITATIVE DATA MANAGEMENT

This course introduces students to a variety of analytical strategies used by qualitative researchers to transform and interpret data. Strategies are discussed and critiqued from a variety of perspectives including the philosophical foundations of selected qualitative approaches and the forms of data collected during a study. Through practical experiences, students will demonstrate the skills required to collect and explore qualitative data, make
informed decisions about which analytic strategy to use, articulate the thinking that supports data analyses, report qualitative findings and interpretations, and engage in discussions of trustworthiness. Theoretical and practical issues relevant to the contributions made by qualitative research to nursing’s knowledge of human response, health promotion, and healing are discussed. A sampling of computer software programs that support data analysis are studied and critiqued. Evaluation of student progress is based on exam, project, and poster presentation.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor; GNRS 6348
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

GNRS 6352 (3 CREDITS)
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
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

GNRS 6353 (3 CREDITS)
HEALTH POLICY DEVELOPMENT

This course explores the dimensions of health policy development, evaluation, and change relative to specific problems in health promotion, human response, and healing. The basis for policy analysis includes economics, political science, health services research, social inquiry, and the health care system. The role and importance of ethics in the policy arena will be included. Evaluation of student progress is based on presentation and class assignments.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: II
Year offered: Annually
Hours per week: Lecture 3

GNRS 6354 (3 CREDITS)
INTERNATIONAL NURSING LEADERSHIP

This course examines the concept of nursing leadership within the context of current political, social, ethical, cultural, and economic realities. Focus is upon selected initiatives emphasizing how nurse leaders promote health, primary health care, and international cooperation. Theories of leadership will be reviewed for their utility in framing nursing initiatives. Selected countries and cultures will be explored for their models of nursing leadership in health care and research. Evaluation of student progress is based on seminar presentation, exploration of issue, opinion paper, and oral presentation.

Prerequisites: Admission to the Nursing Ph.D. Program or permission of instructor
Term offered: III
Year offered: Annually
Hours per week: Lecture 3
Pharmacology and Toxicology

http://www.utmb.edu/phtox/

Faculty

Graduate Program Director
Kenneth M. Johnson, Ph.D.

Professors
Ahmed, Mahmoud S., Ph.D.
Cheng, Xiaodong, Ph.D.
Chonmaitree, Tasnee, M.D.
Cooper, Cary W., Ph.D.
Cunningham, Kathryn A., Ph.D.
Garofalo, Roberto P., M.D.
Johnson, Kenneth M., Ph.D.
Snodgrass, Wayne R., Ph.D.

Associate Professors
Elferink, Cornelis, Ph.D.
Falzon, Miriam, Ph.D.
Xie, Jingwu, Ph.D.

Assistant Professor
Green, Thomas A., Ph.D.
Laezza, Fernanda, Ph.D.
Moron-Concepcion, Jose A., Ph.D.
Rytting, Erik, 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, two-credit-hour courses. The choice of these is up to the student, but the program in pharmacology and toxicology requires that 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 related to medical pharmacology and toxicology and a minimum of 4 credit hours of electives in a subspeciality area that will prepare them 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 relevant and important research question. 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 methodology 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. 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. 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 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

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 pharmacology and other basic biomedical sciences. The ultimate goal of the graduate program in pharmacology and toxicology is to provide training for students to become productive, independent research scientists. This training results from 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.

Research currently under way in the department provides opportunities for addressing pharmacology research questions at a wide variety of experimental levels ranging from whole animal responses to specific drugs and toxins, to the structural and molecular basis of gene
expression of specific receptors 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?

A complete list of current research is available from the departmental website (http://www.utmb.edu/phtox/).

Pharmacology and Toxicology Ph.D. Degree Requirements

1. Successful completion of the 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 a comprehensive examination in Pharmacology and Toxicology, usually taken in the second half of the second year of their graduate program.

Entrance to candidacy requires both successful completion of the comprehensive examination (usually in May of the second year) and defense of the dissertation proposal, stemming from independent, original 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.

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 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 operant and non-operant behavior.

**COURSE DESCRIPTIONS**

Students must register for at least 9 hours per semester. The course offerings are contingent upon adequate student enrollment.

**PHTO 6096** (1-9 CREDITS)

**ADVANCED TOPICS IN PHARMACOLOGY**

Tutorial study with a selected instructor or group of instructors on specialized topics in pharmacology, toxicology, and autonomic pharmacology. Reading and discussion of original literature in the field. In addition, lectures, conferences, and computer-assisted teaching may be employed. This course is recommended both for pharmacology students and for students in other fields.

- **Prerequisites:** Permission of instructor
- **Term offered:** I, II, III
- **Year offered:** Annually
- **Hours per week:** Arranged with instructor

**PHTO 6022** (1–8 CREDITS)

**LABORATORY 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
- **Year 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).
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, needs improvement or unsatisfactory.

Prerequisites: Admission to candidacy for the master’s degree
Term offered: I, II, III
Year offered: Annually
Hours per week: Variable

Students registering for Thesis are expected to register for a total of 9 credit hours per term.

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, needs improvement or unsatisfactory.

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

Students registering for Dissertation are expected to register for a total of 9 credit hours per term.

INTRODUCTION TO RESEARCH

This course is designed to introduce students to the goals and methods of research in pharmacology and toxicology. It provides an introduction to the principles of laboratory experimentation, an overview of techniques and approaches used in pharmacological research, and a brief presentation of the research being conducted in the Department of Pharmacology and Toxicology. Each week a faculty member will present at the first weekly session a general topic, such as laboratory record-keeping or literature searching; or a method, such as gel electrophoresis or electrophysiological recording; and will discuss the importance of the topic to research in pharmacology. There will be a wide range of subjects including computer technology, methods for studying drug metabolism, molecular biology and proteomics, and the use of animals in research. In the second session each week, the faculty member’s field of research will be introduced and the relevance of that week’s methodological topic to the research will be discussed. Classes are expected to be small and grading will be based on participation in discussion.

Prerequisite: None
Term offered: I
Year offered: Annually
Hours per week: Discussion 1
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.

Prerequisites: None
Term Offered: I, II
Year Offered: Annually
Hours Per Week: Conference or Discussion 1

SEMINAR IN PHARMACOLOGY

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: Permission of instructor
Term offered: I, II, III
Year offered: Annually
Hours per week: Seminar 1

AUTONOMIC, CARDIOVASCULAR, AND ENDOCRINE PHARMACOLOGY

Drugs acting on the autonomic nervous system, heart, blood vessels, and kidneys will be discussed in terms of their mechanisms and uses. Physiology of the systems involved will also be discussed. This course will be graded on the basis of two exams.

Prerequisites: Permission of instructor
Term offered: III
Year offered: Annually
Hours per week: Lecture 4

CNS PHARMACOLOGY

This course is intended to provide an overview of drugs which are used or misused because of their actions on the central nervous system. The course covers mechanisms of action of major drug classes in terms of their interactions with neurotransmitter systems and with neuronal excitability. Drugs used for therapy in psychiatric conditions such as schizophrenia, depression, and anxiety will be discussed, as will drugs of abuse, anesthetics, hypnotics, analgesics, and several other drug classes. Each drug class will be presented in terms of prototype drugs within the class with mention of currently used agents, but exhaustive lists of available drugs will not be presented. Medically important adverse effects within each drug class will also be presented.

Prerequisites: Permission of instructor
Term offered: I
Year offered: Annually
Hours per week: Lecture 4
CHEMOTHERAPY AND TOXICOLOGY

This lecture course will present principles of chemotherapy and of toxicology, and will survey the therapeutic and toxic effects of antibacterial, antiviral, and antiparasitic agents, as well as drugs for cancer chemotherapy. It will also survey selected topics in human toxicology. Emphasis will be on mechanisms of action and groups of drugs will be represented by prototype drugs rather than comprehensive lists of available agents. Each student will also give one brief presentation, expanding on one of the lecture topics. Grading will be based on a midterm and a final written examination as well as on the presentations.

Prerequisites: None
Term offered: II
Year offered: Annually
Hours per week: Lecture 3; Conference or Discussion 1

FUNDAMENTALS OF ORGANIC SYNTHESIS

Course presents methods in organic synthesis through discussion of the physical bases of organic reactions. Specific examples of current total synthesis will be presented. The course grade will be based on two exams, midterm and final, and a written paper.

Prerequisites: Undergraduate organic chemistry
Term offered: I
Year offered: Annually
Hours per week: Lecture 3; Conference or Discussion 1

SYNTHETIC METHODS TO BIOMOLECULES

Modern methods for the synthesis of biomolecules will be covered. These topics will include amino acid synthesis, solid phase peptide synthesis, solid phase nucleotide synthesis and modern methods in carbohydrate chemistry. Methods for the synthesis of molecular libraries will also be covered. The course grade will be based on two exams, a midterm and final.

Prerequisites: Undergraduate organic chemistry
Term offered: II
Year offered: Annually
Hours per week: Lecture 3; Conference or Discussion 1

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
Term offered: I
Year offered: Annually
Hours per week: Lecture 4; Conference or Discussion 1; Laboratory 6
Population Health Sciences

http://www.utmb.edu/pmch/GraduateEducation.htm

Faculty

Graduate Program Director
Laura L. Rudkin, Ph.D.

Professors
Abreu, Beatriz C., Ph.D., M.P.H.
Alter, Miriam J, Ph.D.
Anderson, Karl E, Ph.D.
Buford, William L., Ph.D.
Bunce, Harvey III, Ph.D.
Davis, Jeffrey R., M.D.
Eschbach, Karl, Ph.D.
Fraser, John Jr., M.D., J.D., M.P.H.
Freeman, Daniel H. Jr., Ph.D.
Freeman, Jean L., Ph.D.
Freeman, Vicki S., Ph.D.
Goodwin, James S., M.D.
Grady, James J., Dr.PH.
Jennings, Richard T., M.D.
Jernigan, Clarence, M.D., M.P.H.
Lederman, Regina P., Ph.D.
LeDuc, James, Ph.D.
Lu, Lee-Jane, Ph.D.
Marion, Rodger D., Ph.D.
Markides, Kyriakos S., Ph.D.
Mayhall, C. Glen, Ph.D.
Mossberg, Kurt A.,
Myers, Martin G., M.D.
Ottenbacher, Kenneth J., Ph.D.
Protas, Elizabeth J., Ph.D.
Ramanujam, V.M. Sadagopa, Ph.D.
Rassin, David K., Ph.D.
Reifsnider, Elizabeth A., Ph.D.
Sandstead, Harold H., M.D.
Schmalstieg, Elizabeth, P.T., Ph.D., F.A.C.S.M.
Ward, Jonathan B. Jr., Ph.D.
Weller, Susan C., Ph.D.
Wilkinson, Gregg S., Ph.D.
Wong, Rebeca, Ph.D.

Associate Professors
Abdel-Rahman, Sherif Z., Ph.D.
Ameredes, Bill T., Ph.D.
Avery, A. Nelson, M.D.
Baillargeon, Jacques G., Ph.D.
Baker, Christine P., Ed.D.
Bishop, Sheryl L., Ph.D.
Carroll, Richard M., Ph.D.
Guidry, H. Mark, M.D., M.P.H.
Kanuth, Michelle, Ph.D.
Kuo, Yong-Fang, Ph.D.
Niebuhr, Bruce R., Ph.D.
Ostir, Glenn V., Ph.D.
Paddon-Jones, Douglas, Ph.D.
Peek, M. Kristen, Ph.D.
Petronella, Sharon A., Ph.D.
Rasmussen, Blake B., Ph.D.
Riall, Taylor, M.D.
Rudkin, Laura L., Ph.D.
Shokar, Navikiran, M.D., M.P.H.
Smith, Janice, M.D., M.P.H.
Vanderploeg, James, M.D., M.P.H.
Wooten, Kevin C., Ph.D.
Wu, Z. Helen, Ph.D.

Assistant Professors
Ammenheuser, Marinel, Ph.D.
Arcari, Christine M., Ph.D., M.P.H.
Arceneaux, Cassandra, M.D., M.P.H.
Berges, Ivonne Marie, Ph.D.
Borsheim, Elisabeth, Ph.D.
Carmical, J. Russ, Ph.D.
El-Zein, Randa, M.D., Ph.D.
Graham, James E., Ph.D.
Murray, Kristy, D.V.M., Ph.D.
Nolen, Alexandra, Ph.D., M.P.H.
Smith, Kirk, M.D., Ph.D.
Spratt, Heidi, Ph.D.
Tan, Alai, Ph.D.
Preventive Medicine And Community Health Program

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 Program prepares students to conduct, communicate, and apply research aimed at the protection and promotion of population health.

The PHS Graduate 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. Curricula within the Program share 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 and in unique occupational or patient groups.

Approved curricular tracks within the PHS Graduate Program are:

- Biostatistics (M.S.)
- Environmental Toxicology (M.S., Ph.D.)
- Human Nutrition (M.S., Ph.D.)
- Rehabilitation Sciences (M.S., Ph.D.)
- Sociomedical Sciences (M.S., Ph.D.)
- Space Life Sciences (M.S., Ph.D.)

The Biostatistics Curriculum educates students in the statistical analysis of biomedical data. The curriculum offers the M.S. degree and prepares technically proficient biostatisticians to assist investigators with the design and analysis of experiments and observational studies.

The Curriculum in Environmental Toxicology trains students in the principles of toxicology, genetics, mutagenesis, mechanisms of estrogen, and oxidant-mediated toxicity. Graduates are prepared to assess workplace and community exposure to mutagens, carcinogens, air pollutants, and dietary factors and to evaluate gene-environment interactions that modify susceptibility to harmful effects of chemicals.

The Curriculum in Human Nutrition trains students to investigate the relationships between diet and nutritional status and physiological and biochemical processes in humans at the cellular level and in the whole body. Research expertise is available in drug-nutrient interactions, lipids, trace metals and minerals, nutritional toxicology, and cancer chemoprevention.

The Rehabilitation Sciences Curriculum is designed to provide graduates with the conceptual foundation and research skills necessary to advance knowledge in areas related to disability, rehabilitation, and recovery from illness or injury. Research opportunities exist in clinical research, population and epidemiological research, and the scientific study of muscle and metabolism related to rehabilitation and recovery.

The Curriculum in Sociomedical Sciences prepares graduates to apply the theories and methods of the social and behavioral sciences to the study of health determinants and outcomes and access to and utilization of health care. Specific areas of research expertise include aging, health disparities, culture and health, psychosocial stress, and social epidemiology.

The Space Life Sciences Curriculum focuses on providing students with an understanding of biological, physiological, and psychological adaptations to the microgravity environment of space and the approaches used for developing effective countermeasures that will allow astronauts to live and work in space. Basic science and operational research opportunities provide students with a solid theoretical and methodological foundation to conduct clinical and biomedical research relevant to space exploration.
ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

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

The Department of Population Health Sciences supports 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 a career in preventive medicine. The job description for Population Health Sciences (PHS) students describes the essential functions needed to successfully complete the Population Health Sciences Program as well as the Master of Public Health (MPH) Program and prepare for entry-level practice.

If accepted into the program, 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 the PHS program including those in the M.P.H. program 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 personal 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 including those of the M.P.H. Program, 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
g. tolerate the views of others
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

RESEARCH FACILITIES

Facilities associated with the individual areas of specialization are available to all PHS students. Environmental toxicology laboratories cover 5,500 square feet and include a molecular, cellular, and mammalian mutagenesis unit; a cytogenetics laboratory; a microbiology facility; a tissue and cell culture suite; and facilities for analytical chemistry. The Environmental Toxicology Laboratory, a core facility of the Sealy Center for Environmental Health and Medicine, is in the same building as the PHS Program. It provides a modern facility in which toxic chemicals may be delivered to small laboratory animals by inhalation, affording important opportunities for environmental health research. Nutrition research laboratories cover 4,500 square feet of laboratory space and include state-of-the-art instrumentation for spectrofluorimetry; atomic absorption spectrophotometry; inductively coupled plasma mass spectrometry; HPLC; and facilities for tissue culture, animal studies, and preparation of specialized diets. The NIH-supported General Clinical Research Center, which includes a whole-body counter, is accessible for human studies. The Metabolism Division of the Shriners pediatric burns hospital adjacent to the UTMB campus makes available a variety of mass spectrometry and specialized computing facilities, as well as experimental facilities for studying metabolic processes in animals for those students specializing in mathematical modeling of metabolic processes. Sociomedical science students have, in addition to contact with core faculty in that division, access to faculty in the Institute for the Medical Humanities, the Center on Aging, and Texas Department of Criminal Justice Hospitals on the UTMB campus. Students also interact with faculty from the Division of Epidemiology and Biostatistics. Several large data sets are also available for analysis through the Office of Biostatistics, including data from the SEER Program, the National Health HANES Surveys and Hispanic HANES Surveys, and the Vital Statistics of the United States. Through the Department of Population Health Sciences students have access to computers on the local area network for word-processing, statistical analysis, and other functions, as well as access through the UTMB computer network to full Internet services including e-mail, the World Wide Web, Hispanic HANES Surveys, and mortality data for DOE nuclear workers.

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 interested in laboratory science research enter PHS through the Basic Biomedical Science Curriculum (BBSC) of the Graduate School. The BBSC Curriculum is described elsewhere in this publication. Completion of the one-year BBSC Curriculum is required for all students in Environmental Toxicology and
Human Nutrition and for select students in Rehabilitation Sciences and Space Life Sciences.

Degree requirements include:

- A minimum of 36 credit hours (M.S.)
- Core courses in population health sciences
  - Biostatistics
  - Epidemiology
  - Prevention and Public Health
  - Research Design and Methods
  - PHS Seminar
- Curricular track and elective courses
- An Ethics of Science course (MEHU 6101)
- 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 Curriculum Coordinators for each track 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.

**COURSE DESCRIPTIONS**

All course offerings are contingent upon adequate student enrollment.

**PHS 6096**

(1-3 CREDITS)

**SPECIAL TOPICS**

This course deals with various special topics in population health sciences. It will consist of readings, tutorial studies, or written papers in specific areas unrelated to the student’s thesis or dissertation project, depending upon the needs of the student.

- Prerequisites: None
- Terms offered: I, II, III
- Year offered: Annually
- Hours per week: Variable
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
Year 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
Year offered: Annually
Hours per week: Laboratory 9

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
Year 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
PHS 6077  
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
Year offered: Annually
Hours per week: Conference or Discussion 2-8

PHS 6097  
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
Year offered: Annually
Hours per week: Variable

PHS 6098  
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
Year offered: Annually
Hours per week: Variable

Students registering for Thesis are expected to register for a total of 9 credit hours each term.

PHS 6099  
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
Students registering for dissertation are expected to register for a total of 9 credit hours each term.

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

Term offered: II
Year 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
Year 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
Term offered: I, II, III
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
Term offered: II
Year offered: Annually
Hours per week: Lecture 2; Conference 1 (5 weeks)

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
Year 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
Year 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, mid-term and final proposals, and presentation.

Prerequisites: None
Term Offered: II
Year Offered: Annually
Hours per week: Lecture 2

PHS 6220

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
Term offered: II
Year offered: Annually
Hours per week: Lecture 2

PHS 6223

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
Term offered: I
Year offered: Annually
Hours per week: Lecture 2

PHS 6227

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
Term offered: III
Year 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
Term offered: II
Year 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
Year offered: Annually
Hours per week: Conference or 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 stake holders; 7. The development and implementation of immunization policy. The student will be evaluated based on class participation and a final examination.
Prerequisites: None
Term offered: II
Year 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
Term offered: II
Year 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
Year 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
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

Term offered: III

Year 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

Term offered: I

Year offered: Annually

Hours: 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)
Term Offered: III
Year 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
Term offered: II
Year offered: Annually
Hours per week: Lecture 3

PHS 6326  (3 CREDITS)
COMMUNITY HEALTH PRACTICE II

This course provides an indepth 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
Term offered: II
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
Term offered: I
Year offered: Annually
Hours per week: Lecture 2; Conference/Discussion 1

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
Term offered: II
Year offered: Annually
Hours per week: Lecture 2

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
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

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
Term offered: II
Year offered: Biennially (odd years)
Hours per week: Lecture 3

PHS 6340
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
Term offered: I
Year offered: Annually
Hours per week: Lecture 3

PHS 6341
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
Term offered: I, III
Year offered: Biennially (odd years)
Hours per week: Lecture 3

PHS 6344
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
Term offered: II
Year offered: Annually
Hours per week: Lecture 3

PHS 6348
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

**Term offered:** I

**Year 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

**Term offered:** I, II, III

**Year 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

**Term offered:** II

**Year offered:** Annually

**Hours per week:** Lecture 1; Conference or 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

**Term offered:** I

**Year offered:** Annually

**Hours per week:** Conference or Discussion 3

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**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

**Term offered:** II

**Year offered:** Annually

**Hours per week:** Conference or Discussion 3

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**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

**Term offered:** I

**Year offered:** Annually

**Hours per week:** Seminar 3

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**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

**Term offered:** I

**Year offered:** Biennially (odd years)

**Hours per week:** Conference or Discussion 3

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**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
Term offered: I
Year offered: Annually
Hours per week: Conference or 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
Term offered: I
Year offered: Biennially (odd years)
Hours per week: Conference or Discussion 3

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
Term offered: I
Year offered: Annually
Hours per week: Conference or 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
Term offered: III
Year 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
Term offered: I, II
Year 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
Term offered: I
Year 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
Term offered: I
Year 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
Term offered: II
Year offered: Annually
Hours per week: Lecture 3
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
Term offered: II
Year 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
Term offered: III
Year 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
Term offered: III
Year offered: Biennially (odd years)
Hours per week: Lecture 3
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
- Term offered: II
- Year offered: Annually
- Hours per week: Combined lecture and discussion 4

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
- Term offered: I
- Year 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 6402 (Cell Biology), or equivalent
- Term offered: Term I
- Year offered: Annually
- Hours: Lecture 3; Conference or Discussion 1
M.D.-Ph.D. Combined Degree Program

http://www.utmb.edu/mdphd

Graduate Program Director
Edward Sherwood, M.D., Ph.D.

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 a Combined M.D.-Ph.D. 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. degree program in addition to those listed in the School of Medicine Bulletin.

**Observation**

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.

**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:

(Option to enroll in a research rotation in summer prior to first year.)

**Year 1:** Medical school course work in mornings. Graduate school course work in the afternoons.

**Summer after Year 1:** Graduate school courses and research rotation.

**Year 2:** Medical school course work in the afternoons. Graduate school course work will be substituted for clinical practice opportunities in the mornings. A third research rotation is an option. USMLE Part 1 is taken at the end of this year.

**Year 3:** Begin dissertation research. Graduate preliminary exams are taken during this year.

**Years 4 and 5:** Uninterrupted dissertation research.

**Year 6:** Continue dissertation research. The Practice of Medicine course (five hours per week) which was not taken in the second year is taken along with thesis research.

**Years 6 and 7:** Clinical (third-year) clerkships (11 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 starting at $27,000. 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 Biomedical Sciences**

- Biochemistry and Molecular Biology
- Cell Biology
- Experimental Pathology
- Humanpathophysiology and Translational Medicine
• Microbiology and Immunology
• Neuroscience
• Pharmacology and Toxicology
• Population Health Science

M.D.-Ph.D. Program in Medical Humanities

In addition to the M.D.-Ph.D. in biomedical sciences, 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.

M.D.-Ph.D. Program in Biomedical Engineering

UTMB participates in the M.D.-Ph.D. degree program in Biomedical Engineering in cooperation with The University of Texas at Austin. Students accepted into this program spend their first two years in medical school at UTMB followed by three years of Ph.D. course and research work at UT Austin, culminating with the Ph.D. degree in Biomedical Engineering conferred by UT Austin. The Ph.D. studies are followed by 18 months of clinical rotations at UTMB, at which time the M.D. degree is conferred by UTMB.

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.

To obtain additional information about UTMB and the M.D.-Ph.D. program, please contact:
Ana McAfee
M.D.-Ph.D. Combined Degree Program
301 University Boulevard
Galveston, TX 77555-1041
md-phd.prog@utmb.edu
(409) 772-5446

M.D.-Ph.D. COURSES

These courses are designed to be taken by students enrolled in the M.D.-Ph.D. Combined Degree Program.

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. Registration for this seminar series is mandatory for all M.D.-Ph.D. students in medical school. Grading is based on attendance and participation and is determined on a pass/fail basis.
Prerequisites: Enrollment as a student in the M.D.-Ph.D. Program.
Term offered: I, II
Year offered: Annually
Hours per week: Conference 1

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. Students will be graded on class performance.
Prerequisite: Prior or concurrent enrollment in Neuroscience and Human Behavior (IMC 1220)
Term offered: II
Year offered: Annually
Hours per week: Conference or Discussion 2

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 meet twice weekly to 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)
Term offered: I
Year offered: Annually
Hours per week: Seminar 4
Post-Baccalaureate Research Training Certificate

http://www.gsbs.utmb.edu/prep/prep.asp

Certificate Director
David Niesel, Ph.D.

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 Scientific Ethics (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

BBSC 6217    Laboratory Biosafety
BBSC 6195    Frontiers of Science
BBSC 6104    Critical Reading of the Scientific Literature
MEHU 6101    Scientific Ethics
BBSC 6103    Introduction to the Study of Biological Systems

ESSENTIAL FUNCTIONS REQUIRED FOR COMPLETION OF PROGRAM

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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.

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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**

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Program Director
Dorian Coppenhaver, Ph.D.

Program Coordinator
Jo Bremer, M.A.

Faculty
The entire faculty of the GSBS participates in the Postdoctoral Certificate program.

The Graduate School of Biomedical Sciences (GSBS) offers advanced training for postdoctoral scientists at UTMB. Courses in this program will training in core competencies and specialized training 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 many (most) non-academic career tracks.

Four certificates will be available. The first, core, certificate is Critical Research Skills. Secondary certificates will be available in focused career areas: Management Skills, Teaching and Mentoring, and Translational Research. Each certificate consists of 12 SCH and can 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 both their laboratory duties and learning.

Each certificate consists of one to three core (required) courses, a series of recommended electives, and a spectrum of specialized elective courses. To promote maximum flexibility and individualized career preparation, elective courses can be applied to any of the four certificates. In addition, a base course (Mentored Research) is available to all postdoctoral students, consisting of focused research and supervision in their area of concentration.

**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.

COURSE DESCRIPTIONS

CTPS 6001  (1 CREDIT)
MENTORED RESEARCH FOR POSTDOCTORAL SCHOLARS

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
Term offered:  I, II, III (Fall Spring Summer)
Year offered:  Annually
Hours per week:  Mentoring 1-4

CTPS 6101  (1 CREDIT)
RESEARCH SEMINAR

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
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 1

CTPS 6102 (1 CREDIT)

JOURNAL CLUB

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 judgemental of the other participants and their ideas.
• Identify important journal articles that deserve discussion, and may prompt novel ideas about the topic.

Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 1

CTPS 6103 (1 CREDIT)

MENTORING AND 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.
• Conducted a self assessment, using the National Postdoctoral Association table of Core Competencies as a guide.
• Surveyed career development opportunities, e.g., certificate training, meetings and conferences, with their mentors.
• Written an Individual Development Plan (IDP), following guidelines established by the Science Policy Committee of the Federation of American Societies for Experimental Biology (FASEB), which both sign.
• Begun to implement the plan.

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 a completed and signed IDP returned 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
Term offered: I, II, III
Year offered: Annually
Hours per week: Mentoring 1
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
Term offered: I, II
Year offered: Annually
Hours per week: Lecture 2

RESEARCH OUTPUT: PUBLICATION TOOLS AND QUALITY METRICS

This course is designed to help postdoctoral scholars and advanced graduate students with managing references using bibliographic management software and to inform them about the different metrics used to determine research impact. After completing the course, participants will be able to:

- Identify 3 major indicators of research impact.
- Utilize the Moody Medical 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.”

Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 1, plus online practice and application

LIBRARY SEARCH TOOLS

This course is designed to prepare postdoctoral scholars and advanced graduate students with the basic search skills in library resources to help with efficient and effective information retrieval and management. Participants will be introduced to the following library tools:

- PubMed
- MyNCBI: Creating Alerts and Customizing PubMed
- Electronic Journals: Tips and Tricks
- Web of Science: Searching for Information and Cited References
- Who’s Citing You? Searching for Cited References
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:

- Understand 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)
- Explain the composition and functions of the Institutional Animal Care and Use Committee (IACUC), including IACUC protocol submission procedure and the committee’s review process
- Write an IACUC protocol suitable for submission to the IACUC
- Know how to complete the Vertebrate Animal Section of grant applications
- Be familiar with the Animal Resource Center policies and procedures
- Understand the role of the Institutional Official in an Animal Care and Use Program.
- Recognize how the Post Approval Monitoring program is a resource for animal research

Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 1, plus online practice and application

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.
- Safely handle chemicals in the lab.
- 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.
- Develop hazardous waste disposal procedures, including segregating different types of lab materials.
- 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.
- Identify and understand the consequences of documentation errors.

Prerequisites: None
Term offered: II, III
Year offered: Annually
Hours per week: Lecture 1.5
• Apply the principles of equipment validation.
• 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
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 4, plus online training and application

CTPS 6109

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
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 3

CTPS 6110

PREPARING FOR PROPOSALS & PROJECTS

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 online search program, InfoEd, 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
Term offered: II, III
Year offered: Annually
Hours per week: Lecture 2

CTPS 6111

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.
CTPS 6201  (2 CREDITS)

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
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 4

CTPS 6202  (2 CREDITS)

TEACHING PRACTICUM - LABORATORY

This course is designed to prepare postdoctoral scholars to help teach proper laboratory skills 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. 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.

Before co-facilitating in a laboratory, each postdoctoral scholar must attend the facilitating workshop provided by the Office of Educational Development each term. Postdoctoral scholars also must attend faculty facilitating meetings to learn the focus of the material to be covered in the lab sessions.

Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 4

CTPS 6203  (2 CREDIT)

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.

Prerequisites: None
Term offered: I, II, III
Year offered: Annually
Hours per week: Lecture 2

CTPS 6301 (3 CREDITS)
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
Term offered: I
Year offered: 2012, Semi-Annually
Hours per week: Lecture 3

CTPS 6302 (3 CREDITS)
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
Term offered: II
Year offered: 2011, Semi-Annually
Hours per week: Lecture 3
Helpful Phone Numbers and Addresses

Alumni Field House
215 Holiday Drive, Route 1103
(409) 772-1304

Bookstore
1.106 Mary Moody Library Bldg., Route 0936
(409) 772-1939

Dormitories and Apartments
110 Vinsant Hall, Route 0865
(409) 772-1898

Family Medicine
University Hospital Clinics Building,
4th Floor, Route 1120
(409) 772-2166

Moody Medical Library
9th & Market Street, Route 1035
(409) 772-2371

Office of Student Life
2.134 Lee Hage Jamail Student Center,
Route 1316
(409) 772-1996

Enrollment Services
Lee Hage Jamail Student Center, 2nd Floor,
Route 1305
(409) 772-1215

Parking
2.206 Administration Bldg., Route 0118
(409) 772-1581

Pastoral Care
1.220 John Sealy Towers Hospital,
Route 0201
(409) 772-3909

Student Health Services
University Hospital Clinics Bldg., 6th Floor,
Route 1369
(409) 747-9508

Student Services
2.114 Lee Hage Jamail Student Center,
Route 1316
(409) 747-9055

University Police
1.114 Administration Bldg, Route 0101
(409) 772-0650
Emergency
(409) 772-1111

For additional information, contact the individual school:

School of Nursing
The University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1029
(409) 772-1181
http://www.son.utmb.edu

School of Medicine
The University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-0133
(409) 772-2671
http://www.som.utmb.edu

School of Health Professions
The University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1028
(409) 772-3001
http://www.sahs.utmb.edu

Graduate School of Biomedical Sciences
The University of Texas Medical Branch
301 University Blvd.
Galveston, TX 77555-1050
(409) 772-2665
http://www.gsbs.utmb.edu
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