Catalog
Academic Year 2018-2019

Baylor College of Medicine's Mission, Vision and Values

College's Mission

Baylor College of Medicine is a health sciences university that creates knowledge and applies science and discoveries to further education, healthcare and community service locally and globally.

College's Vision

Improving health through science, scholarship and innovation

College's Values

Respect
- Value others and treat them with courtesy, politeness and kindness
- Promote and support diversity, inclusion and equity
- Encourage civil dialogue that considers diverse opinions and ideas

Integrity
- Interact with honesty, consistency and transparency
- Operate in ways that demonstrate ethical behaviors
- Foster personal accountability to build trust

Innovation
- Cultivate creative ideas and unique talents across the organization
- Embrace a culture of continuous improvement
- Inspire the creation and application of new knowledge

Teamwork
- Sustain a culture that values collaboration
- Communicate openly to enhance understanding
- Establish effective partnerships

Excellence
- Promote the highest standards of safety, quality and service
- Strive to excel in every aspect of our mission
- Support an environment that inspires the best from our people

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Baylor College of Medicine is committed to a safe and supportive learning and working environment for its learners, faculty and staff. College policy prohibits discrimination on the basis of race, color, age, religion, gender, gender identity or expression, sexual orientation, national origin, veteran status, disability or genetic information. Harassment based on any of these classifications is a form of discrimination and also violates College policy (02.2.25, 02.2.26) and will not be tolerated. In some circumstances, such discriminatory harassment also may violate federal, state or local law.

Baylor College of Medicine fosters diversity among its students, trainees, faculty and staff as a prerequisite to accomplishing our institutional mission, and setting standards for excellence in training healthcare providers and biomedical scientists, promoting scientific innovation, and providing patient-centered care.

Diversity, respect, and inclusiveness create an environment at Baylor that is conducive to academic excellence, and strengthens our institution by increasing talent, encouraging creativity, and ensuring a broader perspective. Diversity helps position Baylor to reduce disparities in health and healthcare access and to better address the needs of the community we serve. Baylor is committed to recruiting and retaining outstanding students, trainees, faculty and staff from diverse backgrounds by providing a welcoming, supportive learning environment for all members of the Baylor community.

Catalog
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GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

Catalog
Academic Year 2018-2019

Our Mission

The Graduate School of Biomedical Sciences at Baylor College of Medicine (BCM) is dedicated to providing a rigorous and stimulating research and training environment for qualified PhD. and Masters level candidates in the biomedical sciences. Outstanding PhD, Masters and MD./PhD. students provide the intellectual capital needed to advance the research and educational mission of the college and to provide a new generation of scientific leaders. The faculty is committed to excellence in interdisciplinary research training for students whose intellectual contributions will continue to fill the reservoir of fundamental knowledge needed to conquer disease and promote health and wellbeing for all people.

Description of Program

The Graduate School of Biomedical Science (GSBS) offers Doctor of Philosophy (Ph.D.) degrees in twelve distinct specialties in biomedical sciences, as well as Master of Science (M.S.) & Ph.D. degrees in a Clinical Scientist Training Program. The GSBS also partners with the School of Medicine on a dual-degree Medical Scientist Training Program (M.D./Ph.D.). A certificate of added qualification is available in clinical investigation.

Students and faculty will adhere to the policies, procedures, and guidelines referenced within this Catalog.

Course Catalogs include an overview of BCM's health sciences mission and values (e.g., preamble), student handbooks (which detail expectations of students and obligations of the institution), course descriptions, and degree requirements for each academic year that are generated by, and specific to, each BCM school and its corresponding academic program(s).

Five years of archived catalogs are available online at www.bcm.edu/registrar

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POLICY HANDBOOK

Graduate School of Biomedical Sciences

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Revised: 11/13/96; 01/13/97; 08/01/97; 08/29/97; 10/30/97; 04/15/98; 06/12/98; 06/23/99; 11/11/99; 02/04/00; 06/23/00; 08/30/01; 11/16/01; 01/25/02; 04/26/02, 06/26/02; 11/15/02; 04/22/03; 11/21/03; 01/14/04; 03/13/04; 08/24/04; 06/14/05; 08/15/06; 04/13/06; 06/15/06; 11/02/06; 04/05/07; 06/14/07; 11/08/07; 02/07/08; 06/16/08; 08/03/09; 08/02/10; 08/01/11; 02/29/12; 07/30/12; 09/04/12; 01/16/13; 07/14/14; 08/21/14; 01/29/15; 04/08/15; 06/18/15, 8/24/2015, 8/27/2015, 08/01/16, 07/30/18

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While every effort has been made to verify the accuracy of information in this publication, BCM reserves the freedom to change without notice admission and degree regulations, tuition, fees, and any other information published herein. This publication is not to be regarded as a contract.

ARTICLE 1. ADMINISTRATION

1.1 The Graduate School of Biomedical Sciences

Training leading to the PhD degree in the biomedical sciences is an integral component of BCM. The Graduate School of Biomedical Sciences is a division within the College whose activities complement and are closely coordinated with those of the School of Medicine.

1.1.1 Mission Statement

The Graduate School of Biomedical Sciences at Baylor College of Medicine (BCM) is dedicated to providing a rigorous and stimulating research and training environment for qualified PhD. and Masters level candidates in the biomedical sciences. Outstanding PhD, Masters and MD./PhD. students provide the intellectual capital needed to advance the research and educational mission of the college and to provide a new generation of scientific leaders. The faculty is committed to excellence in interdisciplinary research training for students whose intellectual contributions will continue to fill the reservoir of fundamental knowledge needed to conquer disease and promote health and well-being for all people.

1.1.2 Accreditation

Baylor College of Medicine is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award masters and doctorate degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, GA 30033-4097 or call (404)679-4500 for questions about the accreditation of Baylor College of Medicine.

1.2 Dean (Revised 08/01/11)

The Dean of the Graduate School is the administrative head of the Graduate School. The Dean, and only the Dean, may make exceptions to any of the policies of the Graduate School. Any exception to policy will be brought to the attention of the Graduate Executive Council at its next meeting. All actions of Graduate School Committees are recommendations. They may be implemented after approval by the Dean. Usually this is done by the Dean's approval of Committee minutes. The recommendations will become policy only after the Dean has presented the recommendations to the Graduate Executive Council for approval. The Dean will: 1) coordinate the activities of other deans and assist in the development of new initiatives; 2) chair the Policy Committee; 3) serve as the representative of the Graduate School to the Academic Council; and 4) chair the Executive Council.

1.3 Senior Associate Dean for Graduate Education and Academic Program Development (New 8/24/15)

The Sr. Associate Dean for Graduate Education and Academic Program Development provides collaborative leadership ensuring integrity, quality and student success around a range of activities including Program development, curriculum, outcomes assessment, Programmatic accreditation and faculty development. This role involves active engagement in policy implementation and compliance, strategic planning and day to day problem solving. This position requires ongoing communication with graduate school staff, Program directors, graduate school teaching faculty, mentors and the Dean. The Sr.

Associate Dean will: 1) Support Program directors and faculty course directors in the implementation of activities associated with new and revised Program curriculum 2) Act on behalf of the Dean in the Dean's absence on matters related to the graduate school and its Programs etc.

1.4 Assistant Dean for Curriculum (New 08/01/11)

The Assistant Dean for Curriculum is appointed by the Dean of the Graduate School to assist in all matters pertaining to the curriculum. The Assistant Dean for Curriculum will: 1) serve as *ex officio* member of the Curriculum Committee; 2) maintain, evaluate and develop the core curriculum in consultation with the Curriculum Committee, Program Directors, faculty and students; and 3) monitor promotions and serve as *ex officio* member of the Promotions Committee.

1.5 Assistant Dean for Postdoctoral Research and Career Development

(New 08/01/11)

The Assistant Dean for Postdoctoral Research and Career Development is appointed by the Dean of the Graduate School to assist in all matters pertaining to the appointment and career development of research postdoctoral trainees. The Assistant Dean for Postdoctoral Research and Career Development will: 1) oversee the Office of Postdoctoral Research and the appointments and policies for research postdoctorals; 2) manage and evaluate the career development course for research postdoctorals and graduate students, including the development of new topics; and 3) serve as the Graduate School administrative contact for the Postdoctoral Association.

1.6 Faculty (Revised 04/26/02)

The Graduate Faculty shall consist of those full-time faculty members of BCM or its Graduate Programs who play an active role in the education and training of graduate students through teaching, supervision of research, and other supporting activities, including recruitment, evaluation and Committee participation.

1.6.1 Criteria for Appointment to the Graduate Faculty (Revised 04/26/02, 03/31/04, 07/30/12, 04/06/18)

All full-time faculty of BCM or its Graduate Programs are eligible for consideration for appointment to the Graduate Faculty. An appointee must hold the PhD or M.D degree (or its foreign equivalent) and be appointed to the Graduate Faculty with membership in one or more Graduate Programs. Requests for appointment to the Graduate Faculty and to the faculty of an individual Program are made by a Graduate Program Director. Following satisfactory review by the Graduate Faculty Membership Committee, appointment to the Graduate Faculty is made by the Dean. Application for initial appointment to the Graduate Faculty must be accompanied by a recommendation from the Program Director and a current CV (not biosketch). Application of a current member of the Graduate Faculty for membership in an additional Graduate Program must be accompanied by a recommendation from the Program Director. Programs may set additional requirements (*e.g.*, formal primary or secondary appointment in a Department) for Program membership. Qualified faculty who hold primary p0ositions at other academic institutions may be appointed to the Graduate Faculty and hold membership in Graduate Programs. The request for appointment to the Graduate Faculty denotes the faculty's consent to abide by the

policies established by the Graduate School and the Graduate Program. Appointment to the Graduate Faculty and membership in a Graduate Program comes with reasonable expectations of service to the Graduate School and Graduate Program as outlined in Section 1.8.2.

1.6.2 Duties of the Graduate Faculty (Revised 04/26/02)

In addition to the duties defined by the College for its full-time faculty, Graduate Faculty members are expected to perform specialized duties unique to graduate training. Foremost among these is participation in ongoing basic research in biomedical science, principally providing research opportunities to PhD. trainees. Other duties include teaching and extramural service activities. Teaching experience may include a number of activities in addition to formal classroom participation, such as participating in research seminars, serving as a member of student TACs within the Graduate School or as a preceptor for student journal clubs and discussion groups, and participating in Program and school-wide academic Committees. Faculty participation in community activities shall be undertaken as directed by the Department or Program Chair. Summer research training outreach activities for secondary school and university students are acknowledged valuable responsibilities of full-time faculty of the College and constitute evidence of continued community service. Assignments of these activities are reviewed annually by each Graduate Program unit to insure equitable distribution of responsibilities and to insure excellence of academic purpose and training.

1.6.3 Major Advisor (also see 9.2.1) (Revised 04/26/02)

Membership in the Graduate Faculty is a requirement for service as a Major Advisor. In addition, the faculty member must show evidence of being an established principal investigator with sources of research support, undertaking an independent Program in basic biomedical research. The Major Advisor is required to assume financial responsibility for the student at stipend levels set by the Graduate School and health insurance during his/her tenure in the faculty member's laboratory. It is the duty of the Major Advisor to maintain and guide the student's satisfactory steady progress toward the degree and to ensure that the student becomes a well-educated, productive research scientist. The Major Advisor must demonstrate that sufficient research and stipend and health insurance financial resources are available on an annual basis. The Advisor must notify the Program Director in advance of funds termination which may jeopardize the continued participation of a student in the laboratory.

1.7 Programs and Departments (Revised 08/01/16)

Faculty within an academic unit such as a Department or Division may assemble a plan for the purpose of recruiting and training graduate students in teaching and research leading to the PhD. degree. In addition, specialized autonomous training units (called Programs) may be formed by faculty from multiple academic units for the purpose of offering training in a scholarly discipline of common interest not already represented by preexisting units. Training units must propose a detailed plan for classroom research and seminar instruction which comply with the academic policies and procedures of the Graduate School. A training unit receives approval from the Executive Council upon the recommendation of the Curriculum Committee. Creation of new programs must comply with the BCM \\it-ess-tier2a\bcm-gsbs-database$\ElectronicHandbook\2016.08.01.HandbookAY16-17.doc Academic Program Approval Policy (Section 30.1.02).

1.7.1 Program Director

The Program director is a full-time faculty member appointed by the Department Chairperson (if a departmental Program), or appointed by the Steering Committee (if an interdisciplinary Program) with the approval of the Dean, and is a member of the Graduate Executive Council. The Program director has oversight of the PhD training unit and coordinates the Graduate Program in his/her department or division with the aid of a Program Committee. This responsibility implies that the Program director represents the department and the students by: 1) Assisting the Admissions Committee in processing applications to the Graduate School; 2) Acting as advisor to graduate students until the student's Thesis Advisory Committee (TAC) is appointed; 3) Assisting the Graduate School in recording the student's progress toward the degree and recommending to the Promotions Committee transfer of credit and unusual course loads; 4) Making recommendations to the Dean regarding establishment of TACs, scheduling and administering of Qualifying Examinations, defense of dissertations, leaves of absence, withdrawals, and awarding the degree; 5) Transmitting administrative forms directly to the Graduate School office; and 6) Transmitting information from the Graduate School office to the graduate students.

1.8 Student Membership in Programs

A full-time graduate student is a member of either two or three academic entities, depending upon his or her level of progression to the PhD degree.

1.8.1 Membership in the Graduate School of Biomedical Sciences

Upon enrollment, a student becomes a member of the Graduate School of Biomedical Sciences and is subject to the rules defined herein. Continued enrollment shall require satisfactory performance. Dismissal shall be done only by the Dean, upon recommendation of the Promotions Committee and appropriate appeal procedures as described in this Policy Book.

1.8.2 Membership in a Departmental or Interdisciplinary PhD Program

Entry into a PhD Program, either Departmental or Interdisciplinary, shall make the student a member of that entity as well. The Program may impose additional policies and performance criteria which strengthen or modify the overall policies of the Graduate School, but those policies may not diminish nor eliminate any academic requirements. Membership in a PhD Program and continuation of any established financial support shall continue provided that the student is in good academic standing and is making satisfactory academic progress toward the degree. The latter criteria include punctual performance of administrative tasks such as choosing a mentor, appointing a TAC, choosing a scientific research project acceptable to that Committee, and completing required academic documents (such as status reports, Committee meetings and the dissertation) within specified time limits as defined in the policy handbooks of the Graduate School and the Program.

Dismissal from the Program shall be done by the Program Director, following review of the student’s past and current performance by a Committee appointed by the Program Director. The members of that Committee shall include at least one member of the student’s TAC. A faculty member who has a conflict of interest in the matter shall not serve. The Committee shall have at its disposal in making its decision (1) a report from the student’s TAC recommending dismissal for causes described in their

report, (2) copies of all Graduate School transcripts of the student and of all progress reports turned in to the Graduate School by that student and (3) any additional research or academic documents it deems necessary for the proper conduct of the inquiry.

If the student wishes to continue enrollment in the Graduate School, the Program is obligated to provide a period of no more than 8 weeks with full stipend and insurance support for the student to transfer to another Program, unless that period of support has previously been granted to the student for the purpose of finding another laboratory.

1.8.3 Membership in a Major Advisor's laboratory (Revised 03/31/04, 08/01/11)

A student shall choose a Major Advisor by mutual agreement, and inform the Program and the Graduate School of this selection. Membership in a laboratory is a privilege; during the student's traineeship time in that laboratory the student and mentor are expected to conduct science and scholarship according to high ethical principles as defined for faculty members in the BCM Faculty Handbook, and the Research Ethics standards defined in the College's Administrative Guide. Continued membership in the mentor's laboratory shall be assumed, unless unforeseen circumstances occur. Those circumstances include (1) loss of funding by the faculty member for the conduct of the research; (2) academic or scientific misconduct by the student or advisor, causing dissolution of the bond of trust between student and faculty member; or (3) other disagreements which break that bond of trust.

Mentors and their students should work to construct a mutually agreeable set of expectations for the relationship. However, in the case that a mentor or student wishes to terminate the student's membership in the mentor's lab, the initiating party (student or mentor) must contact the Program Director. In the case that the Program Director is the student's mentor, the Program co-director or a member of the Program's Graduate Education Committee (GEC) shall fulfill the role of the Program Director. The Program Director will review the circumstances in individual private meetings with both the mentor and student to ensure that the differences between the student and mentor cannot be resolved. The Program Director, at his/her discretion, may utilize the thesis Committee as a resource or to request a joint meeting between the two parties. The Request to Leave Laboratory Form will be completed and signed by the Program Director, co-signed by the mentor, student and the student's Committee and sent to the Graduate School for approval. The effective date for leaving the laboratory will be the effective date indicated on the form. The request to leave a laboratory must also contain a signed agreement between the mentor and student concerning the student's authorship status on any publications resulting from the student's work while in the laboratory. Decisions regarding authorship should be made in accord with the Authorship Policy of the College and in the spirit of the Authorship Policy of the Graduate School (9.12). After leaving the mentor's laboratory, the Program Director shall assume the temporary duties of advisor, and shall intercede actively to assist the student in finding a new Major Advisor. If the action is initiated by the mentor, the mentor must provide the student at least 4 weeks of stipend and insurance support following the official notice of termination of membership in the laboratory. Terminating the membership of a student in a laboratory does not constitute discharge from the Program. If the student wishes to continue enrollment, the Program is obligated to provide an additional period of no more than 8 weeks with full stipend

and insurance support for the student to find another laboratory or to transfer Programs.

1.9 Student Interest Groups (New 07/30/12, Revised 8/24/15, 08/01/16)

Official student interest groups may be designated by the Dean upon the request of the Graduate Student Council or Postdoctoral Association. The designation as a recognized trainee interest group entitles the group to develop a BCM web page and to use BCM and its logo in publicizing their activities. Interest groups must abide by all college policies concerning use of the BCM name, logo, and internet/social media.

BCM students or student groups may from time to time invite outside speakers to address BCM functions. Outside speakers must be approved in advance by the Dean or designee. The names and credentials of proposed speakers, purpose of the presentation, and proposals for any costs such as travel, expenses, and honoraria, must be presented to the Dean or designee for review and approval at least three weeks prior to the event. All outside speakers will be required to meet the professional standards expected of BCM faculty, with evidence based presentations when applicable and complete disclosure of funding and conflict of interest.

Students are required to comply with BCM Fundraising Policies (Section 17.1.03) and Student/Trainee Fundraising Project policy (Section 17.1.07).

1.10 Evaluation (Revised 08/30/12)

To improve our academic Programs, an internal self-evaluation of individual Graduate Programs and the graduate school as a whole will occur annually. The evaluation will consist of an academic planning and evaluation document that sets Program learning objectives and outcome measurements for the coming year along with an analysis of the previous year's plan and student learning outcomes. Each Program will be provided with a standard set of outcome measurements including student performance in the first-year curriculum, qualifying exam performance, student retention, and publications.

Individual teaching evaluations by students enrolled in each didactic course offered by the graduate school will be conducted at the end of each term. The evaluations of the course and individual instructors will be provided to the course director to help formulate changes in the course for next year. Each instructor will be provided with a copy of the overall course evaluation and their own teaching evaluations. Teaching evaluations will be considered by the Curriculum Committee during its periodic evaluation of the curriculum (section 2.43), and every five years, in preparation for an external review, the Curriculum Committee will evaluate the curriculum of each Program along with the utilization of the core curriculum with respect to content and quality.

Every five years, an external evaluation Committee composed of scientists involved in graduate education will be appointed by the President of the College to conduct a comprehensive evaluation of the graduate school as a whole along with individual Graduate Programs.

ARTICLE 2. STANDING COMMITTEES (Revised 01/16/04, 08/23/04, 07/14/14)

The standing Committees of the Graduate School are also standing Committees of the College. Members are appointed by the Board of Trustees based upon recommendations by the President

and Dean of the Graduate School. The Committees include the Graduate Executive Council, Admissions, Appeals, Curriculum, Promotions, Policy and Student Council. Each of the standing Committees, with the exception of Admissions, Policy and Student Council, are composed of one representative from each Graduate Program, and two Student Council representatives. Students serving on any Graduate School Committee must have the approval of their mentor and Program director and must be in good academic standing. *Ex officio* members may be included on any Committee with the approval of the Dean and/or be invited to attend meetings as guests of the Executive Council. A simple majority of the members of a Committee constitutes a quorum. Only duly appointed members may vote; proxy members may vote with authorization from the Program. Students serve for a period of one two-year term. Recommendations by the standing Committees will be forwarded to the Dean for final decision.

2.1 Graduate Executive Council (Revised 08/01/11, 07/14/14)

The Executive Council voting membership is composed of the Dean (who chairs the Council), Assistant and Associate Deans, Graduate Program Directors, Director of the MD/PhD Program, Chairpersons of the Graduate School standing Committees, President and Vice President of the Student Council, President and Vice President of the Postdoctoral Association, and Chair of the Graduate Program Administrators Group. Meetings are held once per term (approximately every 10 weeks). This Committee is responsible for academic affairs and policies of the Graduate School, and together with the Dean, this Committee advises the President of the College on Graduate School matters. The Executive Council broadly and actively considers the policies of the Graduate School. Standing Committees of the Graduate School report to the Executive Council for ratification of decisions. The Executive Council may, on its own initiative, consider matters of interest to the Graduate School.

2.2 Admissions Committee (Revised 07/14/14, 06/18/15)

The Admissions Committee is composed of at least six faculty members appointed by the Dean and two Student Council representatives. The chair and vice-chair are appointed by the Dean and the vice-chair is expected to become the chair. Faculty members may not be Graduate Program directors, departmental chairpersons or division heads. Faculty members of this Committee serve for three years, and may be recommended for re-appointed by the Dean. Student members serve for one two-year term with staggering starting years. The Admissions Committee considers applications from all Graduate Programs and recommends acceptance of qualified applicants to the Dean.

2.2.1 Admission Committee Conflict of Interest (New 01/29/15, 06/18/15)

Decisions by any BCM Admissions Committee regarding student applicants must be free from intimidation and not influenced by any political, financial or other outside factors. Members of the Committee must immediately report a real or perceived conflict of interest to the Assoc./Asst. Deans of Admissions and/or a faculty Chair(s) of the Admissions Committee.

Purpose: A conflict of interest is determined to exist, without limitation, in instances where the Committee member is:

1. Related to the applicant; or
2. Is or has been in a significant teaching or social relationship with the applicant or applicant's family; or
3. Has a personal financial interest in the applicant.

If a Committee member meets any of these criteria, the Committee member must recuse him/herself from participation in any evaluation, discussion or deliberation of such applicant.

A Committee member must report a real/perceived conflict of interest immediately upon learning of the identity of the applicant creating the real/perceived conflict of interest. In the event of doubt as to the existence of a conflict of interest, the Committee member should err on the side of reporting relevant facts to the Assoc./Asst. Deans of Admissions and/or faculty Chair(s) of the admissions Committee. Any Committee member may raise the issue of a real/perceived conflict of interest with respect to an applicant and any other Committee member. Failure to report a real or perceived conflict of interest may result in the

Committee member's removal from the admissions Committee. The Assoc./Asst. Dean of Admissions shall make the determination of the existence of a real/perceived conflict of interest after reviewing relevant facts. This decision is final with no option for appeal.

Annual Statement: Each Committee member shall complete and return to the Deans of the school or the Dean's designee annually, and prior to participating in the applicant review process, a conflict of interest acknowledgement. Failure to complete and return the acknowledgement form in a timely manner is grounds for removal from the Admissions Committee.

2.3 Appeals Committee (New 07/14/14)

The Appeals Committee, chaired by the Dean, consists of one member nominated from each Graduate Program, and two Student Council representatives. Members may not be members of the Promotions Committee. Faculty members serve for a three-year term, and may be recommended for re-appointed by the Dean. Student members serve for one two-year term with staggering starting years. Members of the Appeals Committee will be excused from considering appeals from students to whom they serve as thesis or research mentor. The Dean will select one student to serve as an ad hoc member of the Appeals Committee. One member of the Promotions Committee will by appointed by the Dean to serve as an ex officio member of the Appeals Committee. The Appeals Committee reviews appeals of students that do not agree with Promotion Committee decisions.

2.4 Curriculum Committee (Revised 08/03/09, 09/04/12, 07/14/14)

The Curriculum Committee is composed of a representative from each Program, and two Student Council representatives. The chair and vice-chair are appointed by the Dean and the vice-chair is expected to become the chair. Faculty members serve for one 3-year term, but may be recommended for reappointment by the Dean. Student members serve for one 2-year term with staggering starting years. The Curriculum Committee considers proposals for new Graduate Programs and new courses, reviews the curriculum every five years, and evaluates content and quality of current courses. Course duplication and overlap are also considered by this Committee. The Curriculum Committee ensures that any course not offered during two consecutive periods is removed from the general catalog. Re-institution of a course requires approval of this Committee.

2.5 Promotions Committee (Revised 07/14/14)

The Promotions Committee is composed of a representative of each Program, and two Student Council representatives. The chair and vice-chair are appointed by the Dean and the vice-chair is expected to become the chair. Faculty members serve for one 3-year term, and may be recommended for re-appointed by the Dean. Student members serve for one 2-year term with staggering starting years. The Promotions Committee is responsible for recommending policies concerning requirements of promotion, probation, dismissal, and graduation to the Policy Committee. This Committee ensures that all Programs issue a course grade at the end of each term, regardless of overall course length and enforces policies concerning deficient academic progress and grades that result in academic warning, probation or dismissal. The Committee reviews the records of all students and evaluates course credits presented for transfer. Decisions of the Promotions Committee are reported to individual students, Program directors, the chairperson of the student's TAC, the Dean, and the Executive Council.

2.6 Policy Committee (Revised 07/30/12, 07/14/14, 8/27/15, 8/01/16)

Policy Committee members are recommended for appointment by the Dean of the GSBS, who also serves as the chair of this Committee. The Policy Committee is composed of representatives from the Admissions, Curriculum and Promotions Committees, other faculty appointed by the Dean, a representative Program Administrator and the President and Vice-President of the Student Council. The Committee considers new policies or revisions to existing policies, and recommends new policies or policy changes to the GSBS Executive Council. GSBS Policies are developed in accordance with the BCM Policy Development and Approval Policy (Section 01.1.01).

2.7 Student Council (Revised 07/14/14)

The Student Council is composed of a president (or co-presidents) and a vice-president elected from the graduate student body at large, one student from each Graduate Program, a representative of the first year class, and a representative of the MD/PhD Program. Council members serve for one 2-year term with elections occurring in the fifth term of each year. The Council is autonomously elected by and is exclusively responsible to the graduate student body. The Student Council president and vice-president are voting members of the Executive Council and the Policy Committee. Two Student council members also serve as voting members of the Promotions, Curriculum and Admissions Committees. The Council provides a forum for discussion of problems or ideas relating to life as a Baylor graduate student. They serve as a liaison between the student body, the GSBS administration and other Baylor student bodies to maintain open communication and to promote understanding. The Council organizes and hosts the annual Graduate Student Research Symposium and assists the Dean with the planning of orientation for incoming students. Minutes of all Council meetings are recorded and distributed to the Dean.

ARTICLE 3. ADMISSION

3.1 Academic Requirements (Revised 01/25/02, 06/21/02)

An applicant must hold a bachelor's or more advanced degree or be in the final stages of a Program leading to a bachelor's degree or equivalent. An official transcript verifying the degree will be required at matriculation. The following undergraduate courses are recommended but not required: Biology, Organic Chemistry, Biochemistry, Mathematics (calculus preferred) and Physics. Most applicants have an overall grade point average greater than 3.0 (where 4.0 = A), with grades of B or better in courses relevant to his/her field of study. Questions about specific aspects of the curriculum or recommended undergraduate courses should be addressed to the specific Program to which the applicant is applying.

The Graduate Record Examination (GRE) is required. An advanced (subject) test in one of the natural sciences is strongly recommended. Scores from the GRE must be sent directly from the testing service to the Graduate School. Applicants are advised to take the GRE early enough in the academic year to have scores reported in support of their applications.

Foreign applicants must meet all of the requirements stated above. In addition, the Test of English as a Foreign Language (TOEFL) is required. If the TOEFL is not taken, foreign students must demonstrate proficiency in spoken and written English.

3.2 Non-Discrimination Policy (Revised 04/22/03)

BCM and the Graduate School of Biomedical Sciences admits students of any race, sex, sexual orientation. Color, national ethnic origin, disability or age to all the right, privileges, Programs, and activities generally accorded or made available to students at the school. It does not discriminate on the basis of race, sex, sexual orientation, color, national or ethnic origin, disability or age, in administration of its educational policies, admissions policies, scholarship and loan Programs, and other school school-administered Programs.

3.3 Student Disability Policy (New 8/27/15, 08/01/16)

BCM provides equal educational access for qualified students with disabilities in accordance with state and federal laws including the Americans with Disabilities Act of 1990, as amended in 2008, and Section 504 of the Rehabilitation Act of 1973 and the BCM Student Disability Policy (Section 23.1.07).

3.4 Acceptance of Admissions Offers (Revised 04/22/03)

The BCM Graduate School of Biomedical Sciences is a member of the Council of Graduate Schools (CGS). According to the bylaws of the CGS, applicants have no obligation to accept an offer before April 15. While the BCM Graduate Programs can encourage accepted applicants to commit to an offer prior to April 15 to aid the Program in establishing the optimal entering class, the student does not have to declare before that date. The provisions of the CGS state: "Students are under no obligation to respond to offers of financial support prior to April 15; earlier deadlines for acceptance of such offers violate the intent of this Resolution. In those instances in which a student accepts an offer before April 15, and subsequently desires to withdraw that acceptance, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer. It is further agreed by the institutions and organization subscribing to this Resolution that a copy of the Resolution should accompany every scholarship, fellowship, traineeship, and assistantship offer."

Applications for Admission to the Graduate School should be addressed to the Graduate School, BCM, One Baylor Plaza, Houston, TX 77030. (Deleted last sentence)

3.8/24/20155 Reinstatement of Admission (New 04/13/06)

Students who withdraw or are dismissed for academic reasons, or who receive a terminal M.S. degree from BCM Graduate School of Biomedical Sciences must reapply for admissions before they may be reinstated as a student. A student who is dismissed on the basis of misconduct is ineligible to reapply.

3.6 Retention of Admissions Records (New 04/13/06)

In accordance with Federal Policy (IRS), the Graduate School of Biomedical Sciences will retain admissions records for a period of three years for all applicants. The admissions records of matriculated applicants (excluding letters of recommendation) will become a part of the student's permanent file maintained by the Registrar.

ARTICLE 4. FINANCIAL REGULATIONS

4.1 Tuition

Tuition for a full-time course of study for one school year (5 terms, minimum of 12 credit hours per term) is set by the Board of Trustees. All students will be charged full tuition during their entire graduate school career. Students who are enrolled for less than the entire academic year are charged on a proportional basis.

4.2 Financial Assistance (Revised 11/15/02, 08/01/16)

All students receive an annual stipend while enrolled as full time students in the Graduate School. The amount of the stipend and any individual exceptions are established by the Executive Council and Dean. The stipend is continued as long as the student is making progress toward the degree. The BCM Financial Responsibilities, Financial Aid Eligibility, and Satisfactory Academic Progress Requirements for Students policy (Section 23.1.02) outlines academic standards for financial aid eligibility. The Office of Student Financial Aid considers all applications for loans with the exception of the Emergency Loan Fund. Emergency Loans may be obtained through the Graduate School office.

4.3 Outside Employment

The first obligation of students is to their graduate studies. Students should arrange their financial affairs so that employment during the academic session should not be necessary. However, if the need arises, they should consult their Graduate Program director.

4.4 Financial Responsibility (Revised 08/02/10)

Graduate students are expected to conduct their financial affairs in such a manner that their personal accounts and outstanding loans through the Graduate School remain current. Student fees (other than student health insurance, tuition and facilities fee) are the responsibility of the graduate student and must be paid by September 1 and February 1. For non-payment of student fees (by the published deadlines) the student is charged a late fee by Student Account Services and a hold is placed on the student record blocking on-line registration, the posting of grades and production of transcripts. Payment of student health insurance is the responsibility of the BCM organizational unit (Org Unit) that pays the student's stipend. Non-payment of the student health insurance does cause a hold to be placed on the student record however no late fine is imposed. Charges for tuition and the Facilities fee are cleared from the student account when scholarships are applied automatically. The Graduate School processes scholarships at the beginning of each semester (in July and January). The Dean can, at his/her discretion, discontinue tuition scholarships and/or refuse registration in those instances where there is no progress toward reducing the indebtedness.

ARTICLE 5. REGISTRATION

5.1 Academic Year

The academic year is approximately August 1 to July 31, and terms are designated First, Second, Third, Fourth, and Fifth (one term = 8 weeks' instruction plus one exam week). All students begin their studies in August unless circumstances justify special permission in writing from the Graduate Program director for beginning at another date. The request should be made in writing, by the student, to the specific Program director who, in turn, notifies the Graduate School office. All requests for office-cycle admissions must be approved by the Dean.

5.2 Deadline for Registration (Revised 08/23/04)

The student will be billed a $25.00 late registration fee when registering after the stated deadline. If a student failed to register before two weeks into the term, they may be administratively withdrawn from the Graduate School.

5.3 Program of Courses

5.3.1 Course Schedule

The Graduate Program director approves a student's course schedule each term by signing the registration form. After appointment of the Major Advisor, approval is indicated by the signature of the Program director and the Major Advisor.

5.3.2 Research Rotation Requirement (New 06/15/06)

Research rotations begin to teach students how researchers approach biological problems. A rotation is expected to provide an introduction to the laboratory's research goals as well as instruction in basic laboratory skills. Rotations also familiarize the students with different laboratories in their Graduate Program and facilitate the ultimate selection of a thesis advisor. A typical research rotation lasts a whole term, but students may split a rotation in consultation with the Program director. The Graduate Program determines the number of credits earned in each rotation.

In order to maximize the benefits of the research rotations, students are required to complete a minimum of three research rotations in different laboratories (or three full terms in the case of split rotations). Students and faculty are encouraged to discuss the potential for joining a laboratory during or after the rotation. However, students need the opportunity to explore various laboratories without pressure. Therefore, faculty will make no commitment and will not request commitment for a student prior to completion of three rotation terms. Official appointment of a thesis advisor can be approved only after the completion of three rotation terms. The three-rotation requirement is managed and monitored by the individual Graduate Programs, not GSBS.

Exceptions:

- Students may choose to work at BCM during the summer before matriculation and count the summer research as one rotation, pending approval by the Graduate Program director. Permanent employment at BCM prior to matriculation (e.g. as a research technician) cannot be counted as a rotation.

- MD/PhD students who participate in research during their initial MD training period may count their experience as one rotation pending approval by the Graduate Program director and in consultation with the MD/PhD Program director.
- Students who transfer to BCM with their advisor after joining his/her laboratory in another institution are exempt from the three-rotation requirement but are encouraged to familiarize themselves with the work done in other laboratories in their Program.
- Students may appeal the three-rotation requirement to their Graduate Program GEC and Program director.

5.4 Course Load

All students must be enrolled for at least 12 hours of credit each term. Students who have been admitted for candidacy and who have a TAC in place, will be automatically registered by their Program administrator for 12 hours of dissertation each term. A student wishing to take more than 17 term hours per term must obtain written permission from their Major Advisor, and have the approval of the Dean.

5.5 Course Changes (Revised 8/27/15, 08/01/16)

Throughout the first two weeks of a class, registration may be changed with the approval of the Graduate Program director and the Major Advisor and notification of the Graduate School office. These changes are not reflected on the transcript. During the third and fourth weeks of the class, a student may withdraw from a course with the approval of the Graduate Program director and the Major Advisor and notification of the Graduate School office. Withdrawal is designated on the transcript by the symbol WD.

Withdrawal after the fourth week, but prior to exam date, must be approved by the Dean of the Graduate School. The notation on the Transcript will be WD. If the Dean does not give permission to withdraw, the notation will be I (incomplete) or F (Failing) depending on the student's performance to the date of withdrawal. The institutional Course Repeat Policy (BCM Policy Section 23.1.09) outlines how repeated coursework is listed on student transcripts.

5.6 Dissertation Registration

A graduate student may not register for dissertation until a TAC has been appointed, the Qualifying Examination has been successfully Passed, and the Program has proposed the student for candidacy.

5.7 Retroactive Credit

Credit cannot be given retroactively for a course in which a student was not officially enrolled.

5.8 Inter-Program Transfer (Revised 01/13/97, 07/29/13)

Once a student has committed to a specific Program, it is expected that the course of study will be pursued to completion. In exceptional circumstances, students may transfer from one Graduate Program to another upon approval by the director of each of the Programs concerned and by the Dean; however, it is the student's responsibility to present compelling reasons for such a transfer. Before a transfer request can be initiated, all parties must be certain that the resident Program has not been able to address the concerns of the student.

Neither Program will approve such a transfer without consultation between the directors of both Programs. Students are encouraged to consult with the Graduate School administration if they feel that conditions have arisen necessitating an inter-Program transfer, and may appeal disapproval by their current Program to the Dean, who will have the final authority for approval. Any transfer will be noted on the student's permanent record upon submission of "Interdepartmental Transfer" form. If the student has been admitted to candidacy prior to transfer, the new Program may require that the student complete all requirements for admission to candidacy in the new Program.

5.9 Audit Students (Revised 11/08/07)

BCM graduate students are allowed to attend any courses offered by the graduate school for no credit and without examination if the instructor approves. No registration is required for informally auditing courses and no indication will appear on the student's transcript. If a student wishes to formally AUDIT a BCM graduate school course, the student must register for a formal AUDIT and obtain permission of their Program director and the course director. Registration is completed by using the Add/Drop Form. For the course to be listed on the student's transcript (without any credit hours awarded toward graduation), the student must submit to the graduate school a course syllabus (dates, lecture titles and lecturer name only) in which the student's attends at 70% or more of the classes is documented by the lecturer's signature for each lecture attended. An AUDIT student may not take examinations. If the student Fails to submit an attendance document by end last day of the term, they will be withdrawn from the course and it will not appear on their transcript.

Other individuals may audit Graduate School courses under the following conditions: The individual is a full-time student of an institution with which BCM has a reciprocal agreement, or a member of the BCM faculty or staff. Should the auditor be a BCM employee, written consent is required from the faculty employer, the course instructor and the Graduate Program Director. Upon recommendation of the instructor, transcripts will bear the course name and will be marked AUDIT. No more than 15 term hours of audit may be accumulated by anyone other than a full-time student.

5.10 Special Students (Revised 01/16/04)

Baylor associated personnel who hold a Bachelor's or higher degree but who are not students may, with permission, register as Special Students for courses offered by the Graduate School and its Programs. Special Students may not take courses through the reciprocal agreement with another institution. Written consent is required from the faculty employer, the course instructor and the graduate school. A special student may register for a maximum of 15 term hours of credit. Any credit hours for which grades of C or F are received count toward the 15-hour limit. Petitions for exception should be directed to the Dean of the Graduate School. The performance of special students is subject to review by the Promotions Committee and a grade of C or lower may be grounds for the graduate school to refuse permission for enrollment in subsequent courses. For courses with limited enrollment, priority will be given to BCM graduate students.

5.11 Inter-Institutional Student Registration - Reciprocal Agreements (Revised 06/15/06, 07/30/12)

In addition to full-time students accepted in the PhD and MD/PhD Programs, matriculated full-time students in a school with which BCM has a reciprocal agreement (Rice University,

Texas A&M University, University of Houston, The University of Texas Graduate School of Biomedical Sciences, and The University of Texas School of Medicine may take courses for credit or may audit courses without going through formal admissions procedures or paying tuition. The established BCM procedures for registration must be followed. BCM graduate students may take graduate level courses at reciprocating institutions under the same conditions. BCM students can register for inter-institutional courses only when the course is approved by the student's Program, offered at the host institution for graduate credit, and when a comparable course is not offered at BCM. During the registration process (Inter-institutional registration form), the Graduate School will evaluate the effectiveness of inter-institutional courses in supplementing the BCM curriculum and in meeting the overall goals of the student's Program. Registration must be approved by the student's Program, the BCM GSBS, the host institution and the host instructor. BCM students must comply with all of the requirements of the institution offering the course (*e.g.*, background checks, immunizations, etc.)

5.12 Floating Holidays and Term Breaks (New 08/01/11)

Courses, exams, or other required activities will not be scheduled on the four BCM floating holidays (Good Friday, Christmas Eve, Day after Thanksgiving, President's Day) or during graduate school term breaks. For research students, including research rotations, arrangements for floating holidays or other time off should be made with the PI.

ARTICLE 6. ACADEMIC REGULATIONS

6.1 The Grading System and Assigning Credit (Revised 04/15/98, 04/26/02, 2/29/2011, 08/01/16)

6.1.1 The Grading System (Revised 04/15/98, 04/26/02)

Grade	Description
A	Honors Work
B	Passing Work
P	Passing Work
C	Marginal Work
MP	**Marginal Pass-Research Courses Only**
I	Temporary Incomplete Work
F	Failing Work

A grade of C or F does not confer credit toward Graduate School degree requirements. MP only applies to research related courses (Special Projects, Research Rotation and Dissertation). Incomplete (I) is to be used only to represent incomplete work; no other use of the grade is to be accepted. The grade may be carried no longer than three terms. After the third elapsed term, the I automatically becomes an F. For all courses that are graded without objective examination (e.g., graded on attendance) only grades of P (Pass), F (Fail) or I (incomplete) can be used. These include but are not limited to Readings (courses numbered 548) and Seminar (courses numbered 466). Grades of P (Pass), MP (marginal Pass) or F (Fail) are to be used for Special Projects (courses numbered 435), Research Rotations (courses numbered 549) and Dissertation (courses numbered 550). In all courses (School of Medicine and Graduate School), all students must be graded on

the identical criteria. If a Program wishes additional criteria for its students in a required course, such criteria should not be reflected in the recorded grade.

Please refer to the institutional Course Repeat Policy (Section 23.1.09) for criteria for calculating repeats in coursework.

6.1.2 Assigning Academic Credit (2/29/12, Revised 8/27/15, 8/01/16)

The academic calendar of the Graduate School is divided into five academic terms. Each term is of 8 weeks duration followed by one week of exams. Terms 1 and 2 are offered in the fall (August-December), terms 3 and 4 occur in the Spring (January-May) and Term 5 occurs in the Summer (May-July). Credits for coursework (term hours) are awarded on the basis of the Carnegie Unit. A term unit of credit is equal to one hour of lecture, seminar or small group discussion time per week or three hours of laboratory research activity per week. One term credit hour is equivalent to 0.5 semester credit hours. If the calculation of credit hours using the convention specified above is a non-integral number, the credit hours will be rounded to the closest integer. Please refer to the institutional Credit Hour Policy (BCM Policy 23.1.11) for additional guidance on how academic credit is awarded and for overall guidance on the number of credits required for each BCM degree.

6.2 Grade Changes (Revised 08/23/04, 8/27/15, 08/01/16)

Grades submitted by the faculty become final on the official date that grades are due each term. Grade changes for other than numerical error are discouraged. If an exam is re-evaluated, all students' answers to the affected sections of the exam are subject to review. Grade alterations affecting one student only, must be justified on the basis of a mathematical or related error. Requests to change final grades must be submitted in writing by the course Director, with the approval of the Program director, to the Promotions Committee. The request must specifically state the reason for the change. If student concerns regarding final grade are not resolved through discussion with the course director, students may choose to proceed with a formal grade appeal. Guidance for the appeal process, inclusive of timeline, is outlined in the BCM Student Grievances Policy (Section 23.1.08).

6.3 Student Evaluation (Revised 06/15/06)

Students are encouraged to complete evaluation-of-course/instructor forms at the end of each term, including courses taken at other institutions through inter-institutional agreements (see article 5.11). The Graduate School office shall distribute these forms for each service course to each student engaged in classroom-based course work. Completed forms are to be returned to the Graduate School, before the end of the subsequent term, where they will be collated and sent to the respective course directors.

6.4 Transcripts

All grades and academic actions will be permanently recorded on the transcript. Students may be provided with unofficial copies of transcripts. Official copies will be released only by written request of the student to the Registrar's office.

6.5 Unsatisfactory Academic Progress (Revised 04/26/02, 08/23/04, 08/03/09, 07/30/12; 07/29/13, 07/14/14, 08/01/16, 04/06/18)

Students are considered to be making good academic progress unless they have been placed on Academic Warning, Academic Probation or recommended for dismissal. Graduate students are expected to maintain satisfactory progress toward the degree. One or more

credit hours with the grade of C, MP, F, or I makes a student subject to review by the Promotions Committee. The Promotions Committee will take one of the following actions: 1) Place the student on Academic Warning; 2) Place the student on Academic Probation; 3) Recommend the student for dismissal to the Dean; 4) Other action deemed appropriate by the Promotions Committee.

In the case of a grade of MP or F in a research-related course, the student's TAC and Program Director will be notified as soon as possible by the Graduate School. If a TAC has not been established, the Program Director will be notified. The Program Director or designee will meet with the student and mentor. A plan of remediation, signed by student, mentor, program director and TAC (if appropriate) must be submitted to the Graduate School within two (2) weeks of the preceding term's grade submission deadline. Before assigning a grade of F in a research-related course, the mentor must notify the Program director of the reason(s) for the grade, documenting that the student has been given written warning of their unsatisfactory performance and potential remedies.

A student must be making good academic progress when granted permission to write and at graduation for either the MS or PhD degrees.

6.6 Academic Warning (Revised 04/13/06, 11/08/07, 07/14/14)

Any student who receives one to three credit hours of C, or one instance of MP (in a research-related course), will be placed on Academic Warning by the Promotions Committee. The Promotions Committee will notify the student, in writing, of its decision. To be removed from Academic Warning, the student must retake the required course within one year and obtain a grade of B (P in a research-related course) or better, and must also complete two terms with no grades lower than B (or P in a research-related course). A student who Fails to comply with the specific conditions of the Academic Warning may be placed on Academic Probation by the Promotions Committee. A student who satisfies the conditions of the Academic Warning will be removed from Academic Warning upon review by the Promotions Committee.

6.7 Academic Probation (Revised 06/21/02, 04/13/06, 11/02/06, 11/08/07, 07/14/14)

Any student who accumulates four or more credit hours of C, or receives one or more credit hours of F, or two (cumulative) grades of MP in research-related courses, will be placed on Academic Probation by the Promotions Committee. A student who fails their first attempt at their Qualifying Examination will be placed on Academic Probation. The Promotions Committee will notify the student, in writing, of its decision. When a student is placed on probation or when a student on probation accumulates additional grades of C or lower, a plan of remediation must be submitted to the Promotions Committee by the student's Program. To be removed from Academic Probation the student must: (1) retake required course(s) within one year and obtain a grade of B or better (P in a research-related course), or their second qualifying exam, and (2) complete two terms with no grades lower than B (P in a research-related course).

A student who fails to comply with the specific conditions of his/her probation will be recommended to the Dean for dismissal from the Graduate School. A student who satisfies the conditions of probation will be removed from Academic Probation upon review by the Promotions Committee.

6.8 Dismissal (Revised 06/23/00, 11/16/01, 04/13/06)

6.8.1 Dismissal due to poor academic performance (Revised 11/11/99, 11/16/01, 07/29/13, 07/14/14)

A student who receives a grade of C or lower in nine or more term hours of courses, three (cumulative) grades of MP in a research-related course or 9 or more hours of a grade of F in a research-related course will be recommended for dismissal from the Graduate School after grade verification by the Promotions Committee and Dean. A student who fails to pass their first qualifying examination may be recommended for dismissal to the Dean by the Promotions Committee (see Section 9.8.1). A student who fails to pass their second qualifying examination will be recommended for dismissal to the Dean by the Promotions Committee (see Section 9.8.1). The Dean will notify the student, in writing, of the decision for dismissal. If the dismissal is upheld on appeal, Dismissal is entered on the permanent transcript, along with the student's academic status at the time of dismissal. Outstanding grades of I at the time of dismissal will remain incomplete.

The student will have the right to appeal the dismissal as outlined in Section 6.10, and must notify the Dean of the intent to appeal, in writing, within one week of receipt of notification of the dismissal action.

6.8.2 Dismissal for nonacademic reasons (Revised 08/29/97, 11/16/01, 06/14/05, 02/07/08, 07/14/14)

A student also may be dismissed for non-academic reasons that seriously violate the expectations of professional behavior (Section 6.11). After investigation of any allegations, any finding of non-professional conduct will be forwarded to the Promotions Committee for review and action. After its review, the Promotions Committee may recommend appropriate sanctions or penalties, including a recommendation for dismissal for non-academic reasons to the Dean. The Dean will notify the student, in writing, of the Promotions Committee's recommendation. If the Promotions Committee recommends dismissal, the student will have the right to appeal, the dismissal as outlined in Section 6.10. The request to appeal a dismissal decision must be made in writing to the Dean within one week of receiving notification of the dismissal action.

6.9 Withdrawals

6.9.1 Request to Withdraw (New 01/16/04, Revised: 06/14/05, 04.13.06, 08/03/09, 07/29/13, 07/14/14)

A student may withdraw from the Graduate School at any time, but to do so, the student must submit to the Dean a completed "Request to Withdraw/Clearance Form" signed by the program director for approval. The student's academic status at the time of the withdrawal will be reflected on the transcript. If the request to withdraw is approved by the Graduate School after the student has completed all the course requirements, including the final examination if applicable, the transcript will reflect the grade earned. Outstanding grades of I at the time of withdrawal will be changed to WD (Withdrawn).

A student charged in a misconduct issue may withdraw; however, if the allegations are substantiated by an investigation, and the Promotions Committee subsequently recommends dismissal, the transcript shall be amended to show that the student was dismissed for reasons of misconduct.

6.9.2 Administrative Withdrawal (New 01/20/04, Revised 11/02/06)

Students who Fail to register during a term without specifically requesting leave or permission to withdraw, shall be withdrawn administratively. Transcripts will bear the notation "Administratively Withdrawn". All payments and benefits, including the tuition waiver, will cease upon administrative withdrawal.

6.10 Appeal of Promotions Committee Decisions (Revised 11/16/01, 07/14/14)

A student who disagrees with a Promotions Committee decision may appeal that judgment in writing to the Dean within **one week** of being notified of the decision.

6.10.1 Appeal Process (Revised 11/16/01; 'Review by the Promotions Committee' removed on 07/14/14; 'Composition of the Appeals Committee' moved to Article 2 on 07/14/14)

6.10.1.1 Review by the Appeals Committee (Revised 11/16/01, 07/29/13, 07/14/14)

A student who disagrees with the Promotions Committee may appeal the decision in writing to the Dean within one week of being notified of the Promotions Committee's decision. The appeal request must state the basis of the appeal (Section 6.10.1.2). The Dean will notify the Appeals Committee of the Graduate School to review the Promotions Committee decision within two weeks of receiving a written request.

6.10.1.2 Appeals Committee Process (Revised 11/16/01, 07/14/14)

The Appeals Committee will meet within two weeks of the Dean receiving the written appeal. The student may ask to meet with the Committee and may bring a faculty member of their choice as an advocate. The Appeals Committee may request to speak with persons that may have information pertinent to the appeal.

The Appeals Committee will review the appeal request with regards to: 1) whether Graduate School policies as outlined in this manual were followed, 2) the appropriateness of the evaluation of any information provided by the student, faculty or Program to the Promotions Committee, or 3) any other relevant information that was not available to the Promotions Committee.

Recommendations the Appeals Committee should reflect the decision of the majority of Committee members on the issues above. Based on recommendations of the Appeals Committee, the Dean will make the final decision regarding the appeal. If the recommendation of dismissal or other decision by the Promotion Committee is overturned by the Appeals Committee, the Dean, together with the Appeals Committee, must recommend a remediation plan for the student.

6.10.1.3 Responsibility of the Student's Graduate Program During the Appeals Process

During the appeals process(es), the student will retain his/her financial and research support from the student's Graduate Program, and will maintain academic enrollment.

6.11 Professional Conduct (New 02/07/08)

Students are expected to perform their duties in a professional manner and abide by all the policies of the College, the Graduate School, and their Programs. Any conduct not in keeping with the ethical or professional standards of BCM is defined as professional misconduct. This includes, but is not limited to, actions of academic misconduct that occur in the context of meeting academic requirements (courses and Qualifying Examinations), scientific misconduct as defined by the College, violation of College policies, and acts of a criminal nature.

6.11.1 Academic Misconduct (New 02/07/08, 07/29/13)

Academic misconduct is defined as dishonesty (cheating, plagiarism, etc.) that occurs in conjunction with academic requirements such as courses or Qualifying Examinations. Allegations of academic misconduct should be made in writing to the Dean. In cases of alleged academic misconduct, the Dean will, within one week, appoint an Investigative Committee consisting of three faculty members and two students to investigate the allegations and report their findings and recommendations to the Promotions Committee (Section 6.8.2). The student has a right to receive a copy of the written allegations of academic misconduct provided to the Investigative Committee and to respond to the Committee orally or in writing concerning any allegations if he or she chooses. The student may bring a faculty member of their choosing to serve as an advocate.

6.11.2 Scientific Misconduct (New 02/07/08)

Scientific misconduct is defined as "fabrication, falsification, plagiarism or other acts that deviate from commonly accepted practices within the scientific community for proposing, conducting or reporting research" (US Public Health Service Regulations).

Allegations of scientific misconduct should be reported to the College officer in charge of investigating these allegations using the policies defined by the College. Once the College process has reached a conclusion and any appeals have concluded, any finding of scientific misconduct will be sent to the Promotions Committee for their review and action (section 6.8.2)

6.11.3 Violation of College Policies (New 02/07/08, Revised 8/27/2015, 08/01/16)

Graduate Students are expected to abide by all College policies that apply to them, including the policies set by the Graduate School, their Program and the College. The College policies include, but are not limited to, those pertaining to:

Human Resources (BCM Policy Section 02)

Information Technology Acceptable Use Policy (BCM Policy Section 12.02.01)

Use of Copyrighted Material (BCM Policy Section 20.8.03)

Diversity Policy (BCM Policy Section 02.2.40)

Gift Acceptance and Processing Policy (BCM Policy Section 17.02.01)

Environmental Safety:
http://intranet.bcm.tmc.edu/index.cfm?fuseaction=home.showpage&tmp=research/enviro_safety/main

Office of Research (Human and Animal Subject Research):
http://intranet.bcm.tmc.edu/apps/research/oor/

Allegations of the violation of College policies by graduate students will be initially dealt with by the normal processes for handing such allegations within the College. When other College entities deal with professional misconduct allegations involving graduate students, the Graduate School Dean should be informed of these allegations if in keeping with confidentiality requirements. Under extraordinary circumstances, where there may be concerns about well-being of the student or others, the Dean may suspend the student while awaiting a final resolution of the allegation by the College.

If an allegation is substantiated, the Dean will inform the student, their Program director, and mentor in writing of the responsibilities of students to follow College and Program Policy and may recommend the matter to the Graduate School Promotions Committee if it is judged to be sufficiently serious to serve as grounds for dismissal (section 6.8.2).

6.11.4 Criminal Acts (New 02/07/08)

The Dean may recommend review of the status of a graduate student convicted of a criminal offense. If the criminal act is judged to be of a serious nature, the Dean may forward the case to the Promotions Committee for their review and recommendation concerning dismissal (section 6.8.2).

6.12 Participation in Extracurricular Activities (New 08/23/04, Revised 08/01/16)

Student who participate in extracurricular activities sponsored by the College requiring a significant time commitment including mentoring, recruiting, teaching assistantships, externships, etc. must be making good academic progress and have the permission of their mentor and Program director.

6.13 Student Written Grievance Policy (New 08/15/05, Revised 07/30/12, 01/29/15, 8/27/15, 08/01/16)

A grievance is a complaint arising out of any alleged unauthorized or unjustified act or decision by a member of the faculty, member of the administration, or member of the staff which in any way adversely affects the status, rights, or privileges of a member of the student body. A complaint is considered a written grievance whether it is filed on paper, online or on the phone. The burden of proof shall rest with the complainant.

Student complaints or grievances should initially be addressed, if possible, by the student discussing the problem with the individual (student, faculty, staff) most closely related to the area of the grievance. Following that, the student should contact the individual's Supervisor, Program Director, Departmental Chair, Associate or Assistant Dean and the Dean in the Graduate School of Biomedical Sciences. If the problem is not resolved, the student may file a formal written grievance with the Dean of the Graduate School of Biomedical Sciences using the Student Grievance form. If the problem is not resolved the student is encouraged to contact the Integrity Hotline (855-764-7292) to file a written grievance with the Office of the Provost. The Integrity Hotline may also be accessed

through www.bcm.ethicspoint.com. Additional information is located in the BCM Student Grievances Policy (Section 23.1.08).

6.14 BCM Statement of Student Rights (New 8/27/15)

BCM is committed to creating an environment for students that is conducive to academic success and academic freedom commensurate with all applicable laws and regulations. As students are not only members of the Baylor academic community but are also members of society as a whole, Baylor works to ensure that all rights, protections, and guarantees that students are assured as citizens of society are also provided to them within Baylor.

Baylor College of Medicine's Statement of Student Rights aligns with the College's mission as a health sciences university that creates knowledge and applies science and discoveries to further education, healthcare and community service locally and globally. These rights embody our values of respect, integrity, innovation, teamwork, and excellence, our vision to improve health through science, scholarship and innovation and our adherence to the Institutional Code of Conduct.

Students have the right to freedom of expression within an atmosphere of culturally responsive inclusiveness and sensitivity. The free dissemination of ideas is key to promoting the academic, personal, and professional growth of Baylor students.

Students have the right to a safe learning environment that is free of discrimination, violence, and harassment. Baylor seeks to provide a community of respect, open communication, collaboration, and inclusiveness.

Students have the right to due process in incidents of alleged student misconduct, and have the right to appeal decisions in this regard. Baylor strives to guarantee accuracy in academic results and decisions.

Students have the right to confidentiality of education records. Explicit written confidentiality policies and procedures are in place to achieve the protection of all personal information and academic records.

ARTICLE 7. STUDENT RECORDS

7.1 Maintenance of Student Records (Revised 08/01/16)

The Office of the Registrar is responsible for maintenance of all official academic records of students. BCM maintains a file on each student. Included in a student's file are the original application form of the student for admission to BCM, transcripts of any college records, and test scores. Subsequent to the enrollment of the student at BCM, the student file contains enrollment forms, grades, letters of correspondence to other institutions concerning the student, narrative summaries rendered by the faculty concerning the student's academic work, letters indicating actions of the Promotions Committee, communications concerning the scholarships and loans, and other correspondence relating to the student's education at BCM. In addition to written material kept in the student files, BCM maintains, on a

computer, general information about each student: courses taken, grades, summary statements of academic actions, and enrollment information. BCM's policy regarding creation and maintenance of student records is based upon practice recommended by the American Association of Collegiate Registrars and Admissions Offices.

7.2 Confidentiality of Student Records (Revised 8/27/15, 08/01/16)

It is the Institutional Student Records Policy (Section 23.1.06) that the material contained in the student records is confidential; transfer of such information within the school is permitted only for legitimate academic purposes. The school complies with the provision of both the Texas Open Records Act of 1973 and the Federal Family Educational Rights and Privacy Act of 1974, and regulations governing educational institutions written by the Department of Health and Human Resources. The institution is responsible for ensuring that student academic records are properly secured and trains all staff supporting the education mission in Family Educational Rights and Privacy Act (FERPA), American Association of College of Registrars and Admissions Officers (AACRAO) and Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) accreditation requirements.

7.3 Student Access to Records (Revised 08/01/16)

A student may examine student records at BCM concerning himself/herself by presenting the request to the Office of the Registrar. These records shall be made available for review by the student as promptly as possible. The records shall be examined in the office in which they are kept, under observation of administrative personnel, and shall not be altered, destroyed, or carried away from the office by the student. Material which relates to more than one individual shall not be made available for direct review, but the student shall be told the information contained in such records which relates to him/her. Former students have the same access to their records as those currently enrolled. A student may obtain a copy of his/her records.

7.4 Challenge of Content Accuracy (Revised 08/01/16)

A student may challenge the accuracy of information contained in a record or may challenge information in a record that appears to represent an undue invasion of privacy. In the case of a challenge, the student should meet with the faculty member or administrative official responsible for the information being questioned. The faculty member or administrative official may, through discussions with the student, concur with the challenged points and correct or delete the information accordingly. If no compromise can be reached, the student may file a grievance (see GSBS policy 6.13).

7.5 Faculty Access to Records (Revised 08/01/16)

All review of information in the file of a student in the Office of the Registrar by faculty members and administrative officers other than by those persons responsible for keeping the records, requires the signature of the faculty member or administrative official on a written form kept within the student's file and accompanied by the date of review and by a brief statement indicating the reason for review of the records.

7.6 Transfer of Information from Records

The student shall be notified prior to the transfer of any information within the student file to persons or institutions other than those associated with or affiliated with BCM. Such

information may be transferred only: 1) By reason of a valid subpoena or judicial order of a court; 2) To federal or state educational agencies, providing the agency legally requests the information in writing and specifies the purpose for acquiring the information. 3) To organizations responsible for the accreditation of BCM; 4) Upon written request of the student, to persons he/she designates.

7.7 Criminal Background Checks and Health-Related Information (New 02.07.09, 08/01/16)

Although applicants are required to disclose any criminal background on their applications, formal criminal background checks, drug and/or alcohol testing, or vaccination or other health records may be required of students who perform research laboratory, hospital or clinical settings. Information obtained from these checks will only be used in accord with state and federal laws. The Graduate School and its representatives will hold such information in strict confidence and it will not become part of the student's official file. The student will have the right of access to all information collected and will be afforded the right to challenge its accuracy. In cases where there are findings reported on these checks, the Dean will appoint a Committee consisting of an Associate or Assistant Dean and the Program Director of the student's Program to recommend what if any actions should be taken.

Students are required to comply with the BCM Influenza Vaccination Policy (Section 18.1.04).

ARTICLE 8. RESIDENCY

8.1 Residency Requirements (Revised 06/21/02, 11/02/06)

All candidates for the degree of Doctor of Philosophy are required to spend 15 terms (3 years) in residency at BCM with the exception of those students receiving transfer of credit. The residency requirement will be reduced by one term for each 12 term hours transferred. The student who has obtained approval of the full transfer of credit (60 term hours) will have a residency requirement of 10 terms (2 years). Under rare circumstances (for example, the departure of the Major Advisor, so that the student must leave BCM to complete his/her research) the residency requirement may be waived upon request. This request must be approved by the Dean and by the Promotions Committee. Completion, in good standing, of the first year's Program in the BCM School of Medicine may be used by a student in the MD/PhD Program to satisfy one year of the residency requirement in the Graduate School.

8.2 Leave of Absence (LOA) (Revised 01/16/04, 06/14/05, 11/02/06, 08/03/09)

A student who seeks a LOA must submit a completed Leave-of-Absence/Clearance Form to the Graduate Program director prior to the start of the leave. Requests approved by the Program director are submitted for approval to the Dean. A LOA may be granted for a period of up to one year and shall be permanently noted on the student's transcript.

If the request for LOA is approved by the Graduate School after the student has completed all the course requirements, including the final examination if applicable, the transcript will reflect the grade earned. Outstanding grades of I at the time of withdrawal will be changed to WD (withdrawn).

Students on LOA who fail to register within one week of the termination of the LOA shall be administratively withdrawn. A request from the student for an extension to the leave must be submitted in writing to the dean no later than the beginning of the term in which the original leave will expire. When a LOA is granted to a student with incomplete grades, the Promotions Committee determines whether or not to extend the time allowed for completing course requirements.

Students on a LOA will not be charged tuition. Baylor group health insurance may be continued during a LOA. Release from the group policy during a LOA may be obtained by signing the appropriate forms in the Graduate School Office. (Request for Leave-of-Absence and LOA Clearance Form). Payment for health insurance, if continued during the LOA, must be made by the student prior to the start of the leave. An authorized LOA, for a period of up to one year, may be granted to graduate students who have completed their dissertation research, have accepted another position, and plan to complete the writing of their dissertation during the leave.

Students on an approved LOA who go into year eight during the leave period will automatically have an extension of the 7-year rule through the end of their approved leave. Students on an approved LOA which begins after the defense will be granted an automatic extension of the 7-year rule to accommodate the 2-month period provided for revising their thesis. A student returning to BCM for the purpose of dissertation defense, may petition the Dean for return to active status for the period required to defend the dissertation. (Registration as a full-time student is not required during this period.)

Foreign students may be prohibited by selective regulations of the U.S. Immigration and Naturalization Service from going on leaves of absence.

8.3 Remote Student Status (Revised 04/15/98, 01/16/04, 08/03/09, 08/02/10, 08/01/16)

Students who wish to leave Baylor with their Major Advisor and also continue their studies as a full-time Baylor graduate student may do so by becoming a remote student. A remote student's Major Advisor remains the chair of the student's Committee and must attend each meeting of the thesis Committee and the defense. A local BCM advisor must also be appointed to serve as a local contact. The local BCM advisor must also be a member of the student's TAC. A Remote Student Form must be completed prior to departure and prior to receiving a stipend from the remote institution. Students on remote status without permission may be subject to dismissal. Before a student can be put on remote status, they must be admitted to candidacy. The Major Advisor must also guarantee that the student will continue to receive a stipend and health insurance benefits.

Remote students are responsible for all requirements expected of other Baylor graduate students (i.e. status reports, registration, symposium abstracts, etc.). Remote students and their Remote Advisors are required to meet with their thesis Committee every six months. If traveling to BCM twice a year presents financial or logistical problems and if approved by the Program Director, remote faculty advisor, and local faculty advisor at the time of the remote status, a student may be permitted to hold one of the biannual status report meetings by communicating with Committee members over the telephone, or via video conferencing, and the Status Report Signature page can be completed by faxing the form to the Committee members for their signatures. The Remote Advisor must also be physically present at the student's dissertation defense. The required travel to BCM for the student and the Remote Advisor for at least one thesis Committee meeting per year and for the final dissertation defense is the financial responsibility of the Remote Advisor.

8.4 Remote Advisor (New 06/14/07, Revised 08/02/10, 08/01/11, 08/01/16)

If a student's advisor leaves the College permanently or is on a LOA or sabbatical that is likely to be of duration of greater than a year, the advisor will become a Remote Advisor and a local BCM advisor will be appointed. The Remote Advisor will be the student's Major Advisor. Remote Advisor status requires the submission of a Remote Advisor Status form which includes a plan that satisfactorily addresses the continued progress of the student toward their degree. Remote Advisor Status requires approval of the student, the advisor, the thesis Committee, the Graduate Program and the Dean. Students cannot have a Remote Advisor until they have been admitted to candidacy and have been enrolled in the Graduate School for at least three years.

The plan accompanying the request for Remote Advisor Status must include the following: (1) the appointment of a local BCM advisor who will have the responsibility of monitoring the student's progress and facilitate communication with the Remote Advisor, the thesis Committee and the Graduate Program. The BCM advisor will have co-mentor status with the Remote Advisor and serves as a member of the TAC; (2) an approximate time-line for the student's completion of thesis research and their defense which is acceptable to the student's Graduate Program; (3) a mechanism for local supervision of the student's research, including a description of the role of the local advisor and other BCM personnel that will be available to the student on a regular basis; (4) a description of assigned laboratory space and the student's access to equipment, materials and supplies that will be sufficient to complete the dissertation research; (5) a guarantee that the student's stipend, insurance and research expenses will be paid for the duration of their enrollment. The source of the stipend, including any mechanisms for transferring remote funds to BCM to pay for the stipend must be described. Ultimately, the Graduate Program will be responsible for ensuring that financial support continues; (6) a description of how status reports and thesis Committee meetings will be held. The Remote Advisor must be physically present at BCM for at least one of the status report meetings each year.

8.5 Childbirth/Adoption Accommodation (New 06/15/06, Revised 08/01/11, 07/29/13, 01/29/15, 08/01/16)

A graduate student is entitled to a maximum of eight (8) weeks stipend and benefits continuation from the current financial provider following the birth or adoption of his or her child. Students will not be placed on LOA during childbirth/adoption accommodation.

A graduate student who seeks a childbirth/adoption accommodation must submit a completed Childbirth/Adoption Accommodation form to the Graduate Program director prior to the start of the leave. Baylor strongly encourages graduate students to submit requests approximately three (3) months prior to the anticipated childbirth or adoption. Requests approved by the Program director are submitted for approval to the Dean. In most cases, the childbirth/adoption accommodation period will begin on the date specified in the childbirth/adoption accommodation form which is filed with and approved by the Graduate School Office but may be amended as necessary to correspond with the actual birth/adoption date. If childbirth/adoption occurs prior to the filing of the childbirth/adoption accommodation form, the accommodation period begins on the date of childbirth or adoption.

In order to be eligible for childbirth/adoption accommodation, the graduate student is required to provide the appropriate documentation to the Graduate Program director. If the graduate student fails to provide the appropriate documentation within fourteen days of

delivery or adoption, the stipend and benefits may be discontinued until the documentation is submitted.

The general policies of the school will remain in effect during the period of childbirth/adoption accommodation. During the childbirth/adoption accommodation period, the student may be assigned some reasonable reading, writing, data analysis or other activities that may be accomplished without being present at BCM. The student is expected to make prior arrangements to submit work needed for the completion of any requirements missed during the accommodation period (e. g. status reports or course requirements) when the graduate student returns to the College. If the accommodation requires the student to miss classes or exams, the student may make arrangements to complete these requirements after returning or the student may withdraw from the course.

Accommodations for Breastfeeding Mothers as defined by BCM policy (Section 02.2.50) are available to students.

8.6 Pursuit of Other Degrees While Enrolled in the GSBS (New 08/02/10)

Students in the Graduate School of Biomedical Sciences are expected to devote their academic efforts entirely to the PhD/M.S. Programs. The GSBS does not enroll students on a part-time basis. BCM students may pursue multiple degrees while enrolled as a BCM student only if they are part of an official joint/dual degree Program of BCM (i.e. MD/PhD or School of Medicine Research Track/M.S.). Enrollment at another institution (such as the UT School of Public Health) that may be required as part of a BCM degree Program is permitted as are the completion of courses at other institutions for BCM credit that are covered by a reciprocal agreement for education (i.e. Rice, University of Houston, The University of Texas-Houston, Texas A&M, and UTMB-Galveston).

ARTICLE 9. PROGRESS TOWARD THE DEGREE

9.1 Oversight (Revised 06.16.08)

Students must continue to make satisfactory progress toward their degree. The student should set goals toward completing their studies with the assistance of the TAC and the Director of Graduate Studies their Program. Before appointment of the student's TAC, the Director of Graduate Studies of the student's Program is responsible for advising and mentoring the student. After the appointment of the TAC, the student is under the direction of a faculty preceptor supported by the student's TAC. Through the status report meetings, the TAC regularly reports the student's progress to the Director of Graduate Studies who conveys the status reports to the Promotions Committee of the Graduate School.

9.2 The Major Advisor & TAC (Revised 04/22/03)

9.2.1 Appointment of Major Advisor and Advisor/Student Compact (also see 1.6.4) (New 04/22/03, Revised 06/16/08)

The Major Advisor is the Chairman of the student's TACTAC. The Major Advisor is responsible for providing mentorship and direction in helping the student develop research skills and the ability to do independent research. The Major Advisor must be selected by the student and the selection must be agreed to by the Major Advisor and the Graduate Program by the beginning of the student's second year (Appointment of Major Advisor Form). The Major Advisor must be present at all meetings of the TAC.

Upon appointment of the Major Advisor the Student and Major Advisor should review and sign the Compact between Students and their Mentors and return a signed copy to the Graduate School.

9.2.2 Appointment of TAC (Revised 04/22/03, 08/23/04, 11/08/07, 06/16/08)

Each student will be provided with advice from a faculty group charged with oversight of the student's academic, technical and professional development. Before appointment of a TAC, the Program's Graduate Education Committee shall perform this role. The student's TAC must be appointed by the end of the third term of the student's second year in residence, but it may be appointed earlier and students are strongly encouraged to meet with their TAC as soon as practical after the Committee is appointed. TAC members agree to provide the student with oral and written feedback on their progress two times each year at the TAC meetings and to fulfill their commitment to attend these meetings. This Committee shall consist of a minimum of four members: the Chairperson of the Committee (the student's Major Advisor, who must be a member of the Graduate Faculty with an appointment in a department or Program offering a graduate degree), two additional members of the student's Program, and at least one faculty member (the outside member) who holds a primary academic appointment in a Department that is different from the primary academic Department of the Major Advisor. The Graduate Program Director is an *ex officio member of the Committee*. Additional members may be appointed at any time.

The Committee shall be appointed by the Dean upon written request from the Graduate Program Director, with counsel from the student and the Major Advisor (TAC Form). Requests to change the composition of the TAC are made in writing by the Graduate Program director to the Dean (TAC Form).

The TAC shall be responsible for choosing any additional course work that the student must complete, for monitoring progress made, for requesting transfer of credit, and for petitioning, with the approval of the Graduate Program Director) to the Dean for exception to any academic regulations.

The TAC is also responsible for mediating potential disputes which may arise between the student and the Major Advisor. It shall review requests for dismissal of the student submitted by the advisor and approve or oppose such requests. In these cases, a temporary Chairperson will be appointed by the Program director from the TAC members. The Committee's decisions shall be reported in writing by the temporary Chairperson to the Program Director who shall inform the Dean regarding substantive changes in the student's progress or status.

The Committee administers the final oral examination and approves (by signing) the final copies of the student's dissertation. All members of the TAC must be present at the final defense. In the case of unforeseen extenuating circumstances, the student, Major Advisor, and Graduate Program Director may petition the Dean for an exception.

9.3 Appeal of TAC Decisions (Revised 06/16/08)

A student or a Committee member, who disagrees with a TAC decision, may appeal in writing to the Dean.

9.4 Status Reports (Revised 08/01/97, 06/21/02, 04/22/03, 03/31/04, 06/14/07, 06/16/08, 01/16/13)

Graduate students, second year and above, are responsible for meeting with their TAC and submitting a status report at least twice a year. The purpose of these meetings is to ensure that students receive feedback and direction on their thesis research and to promote a timely assessment of progress toward their degree and to help plan future work.

9.4.1 Due Dates (Revised 06/16/08, 1/16/13)

Status reports for second year students are due in the Graduate School by 5:00 p.m. on the last business day preceding December 24 (Year 2 Fall Status Report) and the last business day in June (Year 2 Spring Status Report). For students third year and above, status reports are due by 5:00 p.m. on the last business day in the month of their birth and the 6-month anniversary of their birth month. For the purpose of these status reports, the month of July will count towards the Fall reporting period (e.g. a 2nd year student with a July/January birthday should use the form 'Status Report – Year 3 Fall-Year 4 Fall). There are no extensions of these deadlines, but the TAC meeting may be held at any time between the deadlines. It is the responsibility of the student to schedule and hold the TAC meeting so that they are completed before the deadlines. Since scheduling difficulties may be encountered, the student should begin arranging the meeting significantly in advance of the deadlines. Committee members are expected to respond to the student's request for a meeting in a timely fashion and to be as accommodating as possible in helping the student arrange the Committee meeting. Unanticipated emergencies and other significant extenuating circumstances may be considered by the Dean on a case-by-case basis.

9.4.2 Status Report Contents (Revised 06/16.08)

The Status Report Form, which must be submitted after the completion of the status report meeting, includes a summary of the meeting prepared by the Major Advisor, an evaluation of the student's progress, and a completed signature page.

At least five days prior to the thesis Committee meeting, the student will submit to all members of the thesis Committee a succinct written summary of their accomplishments since the last Committee meeting, including significant experimental findings, results and/or difficulties with an experimental approach, and the status of any publications. The status report should also include a brief description of plans for experiments in the coming six months. For meetings held during the spring of the student's fourth year and thereafter, a timeline (Section 9.4.2.1) must be submitted with the status report and reviewed by the TAC. The Graduate School strongly recommends that the status report and the TAC meeting follow the guidelines published by the Graduate School (available from the Graduate School web site).

9.4.2.1 Status Report Timeline (New 06/16/08)

The TAC should help ensure that the student is continuing to make timely progress toward the degree. By the spring meeting of the fourth year of enrollment, the student, mentor and TAC members must evaluate the student's progress and future plans for completion of the PhD. Before the meeting, the student, in consultation with the mentor, should prepare a timeline that lists graduation requirements and estimated dates of completion, if possible (i.e. June 20XX, summer 20XX, or too early to predict). The timeline, which must be included with the Status Report

Form, is intended to represent the best estimates at the time it is written. The timeline should be revised and updated n each subsequent status report meeting. The timeline should follow the format guidelines established by the Graduate School (available from the Graduate School web site).

9.4.3 The Status Report Meeting (Revised 06/16/08)

Status report meetings (except under the special circumstances described in Section 9.4.7) must include Major Advisor and at least two other members of the thesis Committee. A Committee member (including the mentor) may be present through teleconferencing or video conferencing arrangements.

9.4.4 Status Report Signature Page (Revised 06/16/08)

Before the meeting ends, the Chairperson and Committee members will read any notes that might have been taken during the Committee meeting and together they will come to a consensus on the content of the summary statement. Any Committee member who disagrees with the summary and evaluation may append a statement to the status report indicating the basis for their disagreement.

The signatures of the mentor, all Committee members and the student on the status report form denotes their presence or absence at the meeting and indicates their agreement with the evaluation and summary statement. If one or more Committee members write a dissenting statement, the signatures on the status report form signify that the Committee members and the student have read the dissenting opinion.

If a student disagrees with comments in the summary statement or a Committee member's addendum, he/she may submit a written rebuttal to the status report describing the disagreement. The rebuttal must be submitted within one month of the date of the thesis Committee meeting with a copy of the disputed status report. The rebuttal statement must be signed by the Major Advisor, all members of the thesis Committee and Program Director in acknowledgment that they have seen it and discussed it with the student. Signatures of the thesis Committee, including the chairman, do not indicate that they agree with the student's objections. The signed statement should be submitted to the Graduate School for inclusion in the student's file.

9.4.5 Permission to Write (Revised 06/10/08, 08/03/09, 08/02/10, 08/01/16)

By granting "permission to write," the student's thesis Committee acknowledges that all key experiments have been completed and that a thesis outline was presented and reviewed which described a sufficient body of work to merit a PhD if the dissertation and defense are satisfactorily completed. The student, in consultation with the mentor, must present a detailed outline of the thesis to the Committee at least two weeks before the meeting. The outline should present sufficient detail to judge the completeness of the experimental work with a clear indication of which portions of the experimental work are finished and which remain to be completed.

The Committee expects that the student will complete all requirements and defend the thesis before the next status report deadline, and a timeline for completion of the written thesis and the oral defense should be set at the time permission to write is granted. Permission to write is not automatically renewed, and if a subsequent status report meeting is held, permission to write must be requested again.

Permission to write is granted by completing the permission to write section of the status report form including checking all of the appropriate boxes. The permission to write meeting must be attended by a majority of the student's Committee. If any members of the Committee are not able to attend the meeting, they should review the proposed thesis outline and any proposed experiments and if satisfactory they should sign the form in the appropriate section acknowledging that they concur that the body of work presented in the thesis outline is sufficient.

A student must be making good academic progress, including the completion of the required training in the responsible conduct of research (16 hours) when granted permission to write. The ethics requirement can be met by attending the required topics in the Science as a Profession course, the Postdoc Career Development Course, or for Clinical Scientist Training Program (CSTP) students completion of FCI. Ethics training requirements cannot be transferred from other institutions. This requirement will go into effect for students entering in academic year 10-11. For students entering prior to academic year 10-11, the completion of ethics training is required for admission to candidacy so that this requirement does not apply to permission to write status. "Permission to write" status does not relieve the student from any academic requirements including submission of status reports, attendance at seminars, retreats, and other activities required by the Program or the Graduate School.

9.4.6 Late Penalties (Revised 06/16/08, 01/16/13, 07/20/13, 07/29/13)

The status report meeting is an integral part of a student's progress toward their degree. If a report is not submitted by the deadlines specified for year 2, or year 3 and above students (Section 9.4.1) and the student has had no prior late penalties assessed at previous deadlines, the student will be assessed a $25 fine. If the completed status report is not submitted within 15 calendar days of the original deadline, an additional $50 fine will be assessed and if still delinquent after 30 calendar days from the original deadline, the student will receive a grade of F for Dissertation or Special Projects. The thesis committee will be notified of delinquent status reports.

On the second instance of status report delinquency, the initial fine will be $50 and if still delinquent, 15 calendar days after the original deadline, the student will receive a grade of F for Dissertation or Special Projects. On the third instance of status report delinquency, the student will receive a grade of F for Dissertation or Special Projects immediately after the original deadline.

A grade of F in Dissertation or Special Projects may be sufficient to cause a recommendation for dismissal from the Graduate School by the Promotions Committee (Section 6.8). The student may appeal the grade of F, any fines, and/or their dismissal through the appeals process of the Promotions Committee (Section 6.10).

9.4.7 Special Circumstances (Revised 08/02/10, 08/01/11, 01/16/2013)

Students who are standing for their final dissertation examination (defense, or submission of a terminal M.S. thesis) no later than three months after their given status report deadlines (Section 9.4.1) may submit the "Defense of Dissertation Date" or Application for a Terminal M.S. Form to the Graduate School office in lieu of the status report if it is received in the Graduate School before the status report deadline.

If the defense is not held or the terminal M.S. thesis is not submitted on the scheduled defense date, a status report becomes due within 2 weeks.

In cases of illness or other unexpected circumstances beyond the student's control that prevent the attendance of the student, mentor, or a quorum of the committee (two members, student and mentor), the Dean may grant an extension of the status report deadline and waive any penalties.

Remote students (Section 8.3) or students with Remote Advisors (Section 8.4), will be allowed to have one status report meeting conducted by teleconference without returning to BCM if this is approved by the student's Graduate Program. However, the status report and the Status Report Signature page must be completed. At least one thesis Committee meeting a year must be held with the student present at BCM along with a majority of the thesis Committee present (section 9.4.3), including the local advisor. The Remote Advisor must at least be present by phone or teleconference

9.5 The Seven Year Rule (previously part of 8.1)

9.5.1 Monitoring student progress at the beginning of Year 6 (Revised 08/03/09, 07/20/13, 08/01/16)

The purpose of PhD training is for the student to develop the ability to function as an independent researcher. This includes maintaining steady progress toward completing the degree and the development of critical research skills and knowledge. This responsibility is shared among the student, his or her Major Advisor, the TAC and the Graduate Program. Once a student has entered their sixth year of study (including time on LOA), unless they have already received permission to write, the student's Graduate Program (GEC or steering Committee) will appoint an *ex-officio* member to the student's thesis Committee from the Program steering Committee or another designated member of their graduate faculty. The student or any member of the thesis Committee may, at any time, request that the Graduate Program appoint an *ex-officio* member. The Promotions Committee, at their discretion, may place an *ex officio* member representing the Promotions Committee on the student's TAC to monitor the student's progress toward the degree.

The *ex-officio* member must be present at the thesis Committee meetings beginning at the Fall status report of year six and continuing until the student sets a defense date. The role of the Program's *ex-officio* member is to monitor the student's progress and to ensure that progress toward degree, including alternative strategies, has been discussed at the Committee meeting and that an appropriate time-line for graduation is presented. The Program's *ex-officio* member may not vote in any decisions of the Committee. After the meeting, a written evaluation (*ex-officio* check list) will be completed by the *ex-officio* member and submitted to the Program director for review. The Program director should discuss the report with the student and their mentor and submit a copy of the ex-officio report to the Graduate School. The function of the *ex officio* member is to report to the Promotions Committee and the *ex officio* member may not vote in any Committee decisions. For students with an appointed *ex-officio member*, a status report that is not accompanied with a report from the ex-officio member will not be accepted by the Graduate School.

9.5.2 Extension of the Seven Year Rule (Revised 08/03/09, 07/29/13, 08/01/16)

No more the 7 years may elapse between matriculation into the Graduate School, excluding leaves-of-absence, and completion of all degree requirements for the PhD degree. At the Spring TAC meeting preceding the beginning of the student's 8th year, the TAC and Graduate Program must request an extension of the 7-year rule by completing and signing the Seven Year Rule extension section of the Status Report Form, including the summary of the circumstances leading to the request. The extension of the seven-year rule must be requested by the TAC at each subsequent thesis Committee meeting. If a student has defended prior to the beginning of their 8th year, a waiver of the 7-year rule will be granted automatically to accommodate the two-month period for revision between the defense and the submission of the final thesis. After review of the recommendations from the student's Program Director and the Program's *ex-officio* Committee member, the Promotions Committee will make a recommendation to the Dean concerning request to waive the 7-year requirement.

9.6 Credit Requirements (Revised 08/03/09)

The PhD requires satisfactory completion of 180 term hours. A minimum of 60 term hours of course work is required (includes Special Projects, Research Rotation, Seminar and Readings and other courses).

30 term hours of this requirement must be from courses which either:

1) have a letter grade assignment ("letter graded" courses) and be graded A-F by objective criteria, or 2) are designated by the Curriculum Committee as "approved Pass/Fail" graded courses (excluding seminars and journal clubs.

Any course counting toward the 30-hour requirement must be approved by the Curriculum Committee. Special Topics courses (course number xxx-463) cannot be applied to the 30-hour requirement.

At least 24 of the required 30 term hours must come from courses assigning a letter grade; 6 term hours may come from the approved Pass/Fail category. For courses grades on a PASS/FAIL basis that are offered for graduate credit at another institution or by the School of Medicine, more than 6 term hours of Pass/Fail courses can be used toward the 30 term hour requirement if the courses are required by a BCM Graduate Program and after review and approval by the Curriculum Committee on a case-by-case basis.

"Letter-graded courses" must be graded A, B, C or F and grades must be assigned by objective criteria, i.e. by examination. Approved Pass/Fail courses must also use specific grading criteria. While such criteria may not include written exams *per se*, each approved Pass-Fail course must utilize appropriate assessment tools, consistent with the educational goals of the course: (i.e. a paper, an oral presentation, homework problem solving, etc.).

The remaining 120 term hours may consist of any courses approved by the Curriculum Committee and listed by a Program in the catalogue, including dissertation research. Specific required courses might differ among the various Programs as long as they conform to the above requirements.

Specific required courses might differ among the various Programs as long as they conform to the above requirements. At the beginning of the academic year, each Program will inform the Graduate School as to their specific course requirements, including any tracks or groups of flexible required electives and these requirements will be posted on the Program's web

site. The Graduate School must be notified prior to any changes to course requirements. Students must repeat any required course when they receive a grade of C or F; however, the Program may determine if elective courses, including flexible requirements, must be repeated.

9.7 Transfer of Credit (Revised 04/22/03, 06/14/05, 08/03/09, 06/18/15, 8/27/15)

A student may request transfer of graduate level course work completed (with grades of B or above, satisfactory or Pass) at another university, provided that the courses were taken within 5 years of the date of matriculation at BCM and a grade of A or B was earned. Only those courses in which a grade is assigned as the result of an examination (not seminar, special projects, or research) will be considered by the Promotions Committee for transfer.

A maximum of 60 term hours (30 semester hours) may be submitted for transfer. Of the 30 hours required for Admission to Candidacy, individual Programs may set different limits on the number of hours that may be transferred, but no more than 24 hours of transfer credit will be allowed.

Course work completed at a university outside the USA will be considered on a case by case basis.

BCM School of Medicine courses that are preapproved for transfer credit by the Promotions Committee will be automatically allowed as transfer credit upon completion of a transfer of credit form. Other School of Medicine courses will be considered by the Promotions Committee on a case-by-case basis.

The specific courses transferred will not be listed on the graduate school transcript, only total credit hours transferred. Programs may accept previous course work to satisfy Program requirements without requesting transfer of credit from the Promotions Committee.

BCM School of Medicine courses that are offered for Pass/Fail credit can be considered for transfer of credit if they have been reviewed and approved by the Curriculum Committee. Courses that are approved for transfer credit can be used toward the 30 hour of required course work if the course is evaluated by specific grading criteria.

Additionally, the Graduate School complies with the BCM Acceptance of Transfer Credit Policy (Section 23.1.05) that provides criteria for evaluating, awarding, and accepting transfer credit by examination, advanced standing and professional certificates.

9.8 The Qualifying Examination (Revised 11/13/96, 06/16/08)

The purpose of the qualifying exam is to determine whether the student has sufficient general knowledge, oral and written communication skills, and intellectual ability to successfully carry out independent, scholarly research that will satisfy the requirements for awarding of the PhD or M.S. degree. The qualifying exam is administered by the individual Graduate Programs, which also determines the format of the exam. In general, the exam tests the ability of the student to formulate a significant scientific hypothesis, to develop an approach to experimentally test the hypothesis and interpret the possible results, and to discuss the proposed project with respect to the relevant body of knowledge.

All candidates for a degree must take the Qualifying Examination at BCM by the end of their 2nd year of enrollment. Any exception must be approved by the Program director and the Dean. Only full-time students are eligible to take the qualifying exam upon recommendation by the Program director and approval by the Dean (Statement of

Qualifying Examination Date Form). The Program director shall recommend the examination date, nominate the Examining Committee, and decide whether or not to make the exam public. It is the responsibility of the student to submit the completed Statement of Qualifying Examination Date Form to the Dean for approval prior to the date of the exam. Once the examination date has been set, if any member of the examination Committee finds he/she cannot be present at the examination, he/she must inform the Dean in writing prior to the date of the exam.

Transfer students must take the Qualifying Examination at BCM and all exceptions must be approved by the Promotions Committee.

9.8.1 Results of the Examination (Revised 08/29/97, 02/05/00, 11/08/07, 07/29/13, 08/21/14)

In the event of Programs using both a written and oral Qualifying Examination, all phases of the examination process must be complete before indicating a result on the "Result of Qualifying Examination Form." Passage, incomplete, or Failure of the Qualifying Examination is certified by the Examining Committee, the Program director, and endorsed by the Dean (Result of Qualifying Examination Form). There are three possible outcomes of a Qualifying Examination – **Pass, Incomplete, or Fail**.

A **Pass** is awarded to students who successfully complete the examination.

An **Incomplete** is used when the Examining Committee determines that the student's performance is inadequate and that additional requirements must be completed to remedy the deficiency. The additional requirements must be specified by the Examining Committee on the Result of Qualifying Examination Form, including a date by which the additional requirements must be completed (the Program director and the Dean must sign the Result of Qualifying Examination Form). After the requirements stipulated by the Examining Committee have been satisfied, the Examining Committee and Program director will notify the Dean using the Result of Qualifying Examination Form and the student's academic record will be updated from incomplete to Pass. If the requirements to remediate an incomplete are not completed satisfactorily, the Examining Committee and Program director will notify the Dean using the Result of Qualifying Examination Form and the student's academic record will be updated from Incomplete to Fail on the date the Program submits written verification of the resolution of the incomplete.

A **Fail** is awarded if the student's performance on the Qualifying Examination is unsatisfactory, either at the initial examination or when an incomplete is resolved with a grade of Fail. Failure of the Qualifying Examination is reported to the Promotions Committee and the student will be placed on Academic Probation. A student who Fails their initial Qualifying Examination may be recommended for dismissal to the Dean by the Promotions Committee. A second Qualifying Examination may be taken only if recommended by the student's Program. Students remain on Academic Probation until successfully completing a second qualifying exam.

The second examination must be taken within six months of the initial examination date. In the event of a second Failure, the student will be recommended for dismissal by the Promotions Committee. To appeal this recommendation of dismissal, see Article 6.10.

9.9 Admission to Candidacy for the Degree (Revised 06/23/99, 01/25/02, 06/14/05, 08/02/10)

A student is accepted into candidacy only after successful completion of the Qualification Exam and Passing the Program required curriculum, including the completion of 60 term hours of which 30 term hours must be in courses that meet the credit requirements as described in section 9.6, and completion of the first two years (8 sessions) of the ethics requirement. The ethics requirement can be met by attending the required topics in the Science as a Profession course or in the Postdoc Career Development Course or for CSTP students through FCI. To provide alternative instruction that will meet this requirement, Programs offering their own ethics training must provide at least 8 contact hours, cover all of the NIH-proscribed topics, and provide at least 30% of the instruction in small group case discussions. Ethics training requirements cannot be transferred from other institutions. This requirement will go into effect for students entering in academic year 10-11. For student entering prior to academic year 10-11, admission to candidacy requires completion of the seven required topics presented in the Science as a Profession course prior to 2010.

The TAC must be appointed prior to admission to candidacy. Admission to candidacy must be approved nine months (36 weeks) before the expected date of graduation. A student with transfer credit must have spent at least four academic terms in residency before admission to candidacy. He/she must present 48 term hours of course work completed in residence. Admission to candidacy requires approval of the departmental chair and the Dean (Admission to Candidacy Form). Students who are not admitted to candidacy by the end of their second year will be reviewed for potential academic action by the Promotions Committee and Dean. Any exception to the two-year rule must be approved by the Program Director and the Dean.

9.10 Other Examinations

Programs reserve the right to examine students upon admission or during their studies to determine their qualifications for graduate work. Such examinations shall not be the Qualifying Examination for admission to PhD candidacy, but purely a Program procedure. Based on its evaluation of these exams, the Program may recommend to the Promotions Committee that the student be placed on probation or dismissed from the Program.

9.11 Candidates for the Master of Science Degree (Revised 08/30/01, 06/16/08, 01/29/2015, 06/18/15)

The Graduate School considers applications for master's degree admission for the Clinical Scientist Training Program (CSTP) and medical students participating in the School of Medicine Research Track (MSRT). A PhD candidate student may request permission to terminate graduate study by completing the requirements for a Master's degree. Eligibility for the terminal Master's degree may be considered when a student is not able to complete the requirements for a PhD degree.

The MS requires satisfactory completion of 84 term credit hours and all Program curriculum requirements. Thirty (30) term hours of this requirement must be from courses which either: 1) have a letter grade assignment ("letter graded" courses) and be graded A-F by objective criteria, or 2) are designated by the Curriculum Committee as "approved Pass/Fail" graded courses (excluding seminars and journal clubs). Any course that counts toward the 30-hour requirement must be approved by the Curriculum Committee as didactic credit. Special Topics courses (course number xxx-463) cannot be applied to the 30-hour requirement.

At least 24 of the required 30 term hours must come from courses assigning a letter grade; 6 term hours may come from the approved Pass/Fail category. More than 6 term hours of courses graded on a P/F basis that are offered for graduate credit at another institution or by the School of Medicine can be used toward the 30 term hour requirement if the courses are required by a BCM Graduate Program and are reviewed and approval by the Curriculum Committee on a case-by-case basis.

"Letter-graded courses" must be graded A, B, C or F and grades must be assigned by objective criteria, i.e. by examination. Approved Pass/Fail courses must also use specific grading criteria. While such criteria may not include written exams, each approved Pass-Fail course must utilize appropriate assessment tools, consistent with the educational goals of the course: (i.e. a paper, an oral presentation, homework, problem solving, etc.).

The remaining 54 term hours may consist of any course approved by the Curriculum Committee and listed by a Program in the catalogue, including dissertation research.

9.11.1 Qualifications for the Terminal Master of Science Degree (New 08/30/01, Revised 08/03/09, 08/01/11, 01/29/2015, 06/18/15, 08/01/16, 07/30/18)

To be eligible to apply for a terminal master's degree, a student must have completed the 30 credit hour coursework requirement and all department curriculum requirements and appointment of TAC. The applicant's Program must submit to the Dean a request to apply for the M.S. degree (Application for a Terminal M.S. Form). The request should confirm that the applicant meets the requirements, outline any additional requirements placed on the applicant by the Program (i.e. a formal defense and/or public seminar may be required) and indicate a date by which the completed thesis must be submitted to the Graduate School. A student granted permission for a terminal M.S. degree and who is enrolled as a student must fulfill all requirements for attendance at seminars or other Program activities (see section 9.4.7 regarding requirements for Status Reports). The request must be signed by the applicant, the applicant's mentor, all members of the TAC, and the Program Director. If the request is approved, the applicant shall prepare a thesis based on original work completed to date which must be submitted to the TAC no less than one week prior to the thesis examination. The thesis will be evaluated by the student's TAC in a closed session oral examination. Successful defense of the thesis shall be indicated by the signatures of the entire Committee on the Defense of MS Thesis Result form. The preparation of the thesis should be guided by the policies found in sections 10.2 and 10.2.1. If the Committee notes deficiencies, all corrections must be made prior to Committee acceptance and signature. Once accepted and signed by the Committee, the Director of Graduate Studies shall sign the thesis. An original, signed copy of the thesis and three additional copies must be presented to the Graduate School for acceptance, binding, and archiving as part of the degree requirements. At the time the Dean accepts and signs the thesis, the student shall have completed all academic obligations for the degree and be making good academic progress. After the Dean signs the thesis, the student will be eligible to have the degree conferred. If awarded a terminal M.S. degree, a student cannot be admitted to any Graduate Program at BCM without successfully re-applying to graduate school.

9.11.2 Qualifications for the Master of Science Degree in CSTP (New 08/30/01, Revised 08/23/04, 01/29/2015, 06/18/15)

The Clinical Scientist Training Program accepts students who seek the Master of Science degree. A student is accepted into candidacy after completing the Program required curriculum including 60 term hours of which 30 must be in courses that meet the credit requirements as described in section 9.5. Upon satisfactory completion of the research project approved by the TAC, the thesis is prepared and defended before the Final Examination Committee. The preparation of the thesis should be guided by the policies found in sections 10.2 and 10.2.1. Upon approval of the thesis by the Final Examination Committee, the thesis is signed by the Committee members and the Director of the CSTP Program and presented to the Dean for signature. At the time the Dean accepts and signs the thesis, the student shall have completed all academic obligations for the degree and will be eligible to have the degree conferred. An original, signed copy of the thesis and three additional copies must be presented to the Graduate School for acceptance, binding, and archiving as part of the degree requirements.

9.11.3 Pursuit of an M.S. Degree by Medical Students Participating in the School of Medicine Research Track (New 06/16/08, Revised 01/29/15)

Medical students participating in the School of Medicine Research Track (MSRT) may enroll in a degree Program leading to the M.S. degree. The student, at any time during their first year of research as part of the MSRT Program may make application to a Graduate Program for the M.S. Degree. Accepted students will matriculate into the Graduate School during their leave from School of Medicine. MSRT students may be on leave from School of Medicine for no more than two years. Requirements for the M.S. degree include 30 term hours of graduate course work, with no more than 24 hours transferred from School of Medicine courses, completion of the qualifying exam administered by the Program, the appointment of a mentor and thesis Committee. Students matriculated in the MSRT-M.S. Program must submit status reports during their time of enrollment as a graduate student. Completion of the MSRT-M.S. requires a seminar and the submission of an M.S. thesis. All requirements for the MSRT-M.S. degree must be completed prior to the student's graduation from School of Medicine. The preparation of the thesis should be guided by the policies found in sections 10.2 and 10.2.1. After its defense and any needed corrections are made, the thesis must be signed by the members of the thesis Committee and Program director and submitted to the Dean for final approval. At the time the Dean accepts and signs the thesis, the student shall have completed all academic obligations for the degree and will be eligible to have the degree conferred. If awarded an MS degree through this Program, a student cannot be admitted to any Graduate Program at BCM without successfully re-applying to graduate school.

9.12 Publication Policy for Students and Postdocs (New 08/01/11)

Communication of research results to the scientific community is an integral part of research activity and is especially important for trainees (students and postdoctorals). Mentors are expected to give students and postdocs, even those that are no longer in the laboratory, the opportunity to satisfy all the criteria for authorship as specified in the BCM

Authorship Policy when they have contributed work to a manuscript. The BCM Authorship Policy (BCM 02.9.40 Policy on Authorship) states in part:

"An author is one who has met all of the three criteria a) made a substantial contribution to the conception and design of the project, acquisition of data, the analysis and interpretation of the data, or other substantial scholarly effort; b) participated in drafting and/or revising the Publication critically for important intellectual content; and c) approved the final version to be submitted"

ARTICLE 10. GRADUATION

10.1 Dissertation Examining Committee (Revised 11/11/99, 08/01/16)

The Examining Committee is appointed by the Major Advisor, in consultation with the Program director and is approved by the Dean. The Examining Committee shall be composed of the student's TAC, and any additional ex-officio members deemed appropriate by the Major Advisor and Program director. A student must be making good academic progress to schedule the defense dissertation.

10.2 The Dissertation (Revised 08/30/01)

The PhD dissertation represents an authoritative contribution to scientific knowledge and demonstrates that the student has the intellectual and technical ability to conduct an independent and scholarly research project. The PhD dissertation is an academic document submitted by the student to the Graduate School following the defense and approval of the entirety of the document by the Dissertation Committee. The Committee members shall indicate their approval of the dissertation by signing on the Approval Page. No signatures may be affixed until all changes are completed as requested by the Committee members. Unanimous approval of the dissertation is required. The dissertation shall consist of original scientific research carried out by the student. Collaborations or participation by others and the conduct of the work shall be clearly defined. The dissertation shall reach conclusions that are a logical result of the experiments performed. Sufficient experimental details shall be included to allow the work to be reproduced by an individual skilled in the methodology, from the information provided. The dissertation can include information already published by the student, but this fact must be acknowledged by appropriate references, and the text and data presentations must be reformatted to conform to the dissertation style. Any experimental results obtained by others and included in the original publication must either be expunged from the dissertation or attributed by name in footnotes or text citations to the original experimenter. The form of the dissertation shall follow a standard format as outlined below.

10.2.1 Format and Organization of the Dissertation (Revised 08/30/01)

Detailed instructions for completing the dissertation, its defense, submission to the Graduate School, and text format are available from the Graduate School Office in a document entitled, "Instructions for Submitting a Thesis or Dissertation." In those instances when published work is to be incorporated in the dissertation suitable adjustments in style shall be made to bring all sections of the document into a uniform presentation style, including bibliographic citations.

Section Name	Order	Section Name	Order
Title Page*	1	Introduction & Background	8
Approval Signature Page	2	Methods & Materials	9
Acknowledgments	3	Results	10
Abstract	4	Discussion	11
Table of Contents	5	Summary & Significance	12
List of Figures	6	Bibliography	13
List of Tables	7	Appendices	14

* For the PhD dissertation, the Title Page shall bear the exact title of the dissertation, followed by the statement: "A Dissertation submitted to the Faculty of The Graduate School of Biomedical Sciences of BCM in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy by *name of student*. Houston, Texas, *Month, Year*." For the M.S. thesis, the Title Page shall bear the exact title of the thesis, followed by the statement: "A Thesis submitted to the Faculty of The Graduate School of Biomedical Sciences of BCM in Partial Fulfillment of the Requirements for the Degree of Master of Science by *name of student*. Houston, Texas, *Month, Year*."

The Introduction and Background (Section 8) shall constitute a literature review which sets the stage for the research and its rationale.

The order of sections 9, 10 and 11 may be repeated or combined to facilitate production of the dissertation's chapters from the student's scientific publications. It is usual to choose to combine all methods sections together, but at the student's and Committee's discretion sections may be kept apart for clarity. Similarly, results and discussion can appear together in discrete chapters separated by content or specific aims. These sections must, however, be reformatted to conform to the dissertation style.

Individual chapters may contain their own discussion sections. However, at the end of the dissertation the Summary and Significance section should re-capitulate the salient findings and conclusions of the work and place these observations in the context of current studies in that field. The student is encouraged to use this section to speculate on the work's significance, and/or to recommend future avenues of fruitful experimentation.

The dissertation is an academic document submitted by the student to the Graduate School

10.2.2 Defense of the Dissertation (Revised 11/11/99)

10.2.2.1 Scheduling the Defense of Dissertation (Defense of Dissertation Date Form) (Revised 11/11/99)

The student should schedule the dissertation seminar sufficiently in advance so that all members of the Examining Committee can be present. All members of the Examining Committee are expected to be in attendance at the dissertation seminar and defense. Committee members should acknowledge their acceptance

of the examination date by signing and dating the form. Once the date of the examination has been set, members can be excused from attendance only under extraordinary circumstances. Permission to be absent from a dissertation defense examination must be requested by the Committee members and acknowledged by the Dean prior to the examination date.

10.2.2.2 Defense of Dissertation (Revised 11/11/99, 08/02/10)

The students must submit the dissertation to the Examining Committee no less than two weeks prior to the defense. The dissertation should be complete and near to its final form. A public dissertation seminar must be presented before the final defense. In addition, the Examining Committee will meet with the student in either closed or open session (at the discretion of the student's Graduate Program) for the final dissertation examination. Successful defense of the dissertation shall be indicated by the signatures of the entire Committee and the approval of the Dean (Result of Defense of Dissertation form).

If unexpected circumstances prevent the occurrence of the defense, it should be rescheduled as soon as possible. Any status reports that were waived because of the schedule defense become due.

If there are any significant deficiencies of the thesis (other than typographical errors) that must be corrected before final approval, these should be indicated directly on the form or on attached pages. A single dissenting vote is sufficient grounds for Failing the dissertation defense. Failure of the dissertation defense can be appealed to the Promotions Committee by the student or the student's Major Advisor. The Promotions Committee may recommend to the Dean to uphold the Failure, award the PhD, appoint a new Committee and examination, or recommend another examination of the student by the same Committee. The defense of dissertation should be satisfactorily completed at least one month before the intended date of graduation.

10.2.3 Submission of Completed Dissertation with Revisions (Revised 1/02/06, 08/03/09, 08/01/16)

No later than two months after successful defense of the dissertation and at least one month prior to the annually scheduled graduation ceremony, the amended dissertation must be typed in final form, signed by all members of the Examining Committee and Department Chair, approved by the Dean, and submitted for binding. Any extension of the two month deadline for submission of the final dissertation must be requested by the student prior to the deadline and approved by the Dean. The Graduate School cannot verify completion of the degree until all requirements, including submission and approval of the dissertation are completed. It is the student's responsibility to submit the original and three copies of the dissertation, completely ready for binding, to the Graduate School office in order to complete degree requirements. Students on an approved LOA (after the defense) which is longer than 2-months, shall have an extension of the 2-month dissertation rule through the end of the approved leave. At the time the Dean accepts and signs the dissertation, the student must be making good academic progress, will have completed all academic obligations for the degree and

will be eligible to have the degree conferred. The official date of graduation will be the day the dissertation was signed by the Dean.

10.3 Financial Clearance

During the 4th year of enrollment, student must pay a graduation fee that covers the diploma and academic regalia rental. Other fees payable prior to graduation are binding fees and optional microfilm agreements, copyright, and reprint fees. The student must be certified to be free of debts and obligations to the school before the degree can be conferred. This is accomplished by obtaining a Graduation Clearance Form requiring validating signatures from the various departments and divisions of the Medical Center with whom the student could have done business. All signatures must be obtained. Failure to do so will prevent release of any official documents. A student in financial obligation to the school should quickly move to dispose of the debt.

10.4 Commencement (Revised 07/01/16, 08/01/16)

Instructions for the annually scheduled graduation ceremony originate from the Office of Student Affairs. The graduating student is responsible for meeting these requirements.

ARTICLE 11. BCM SEXUAL HARASSMENT AND SEXUAL VIOLENCE

(New 04/24/03, Revised 01/16/04, 04/08/2015, 08/27/2015, 08/01/16, 07/30/18)

BCM Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, prohibits discrimination based on sex in all Programs or activities that receive Federal financial assistance. Title IX also prohibits sexual harassment, including same-gender harassment and student-to-student harassment. BCM does not discriminate based on sex and will not tolerate discrimination which includes sexual harassment, sexual violence, dating violence, domestic violence and stalking. Incidents of sexual harassment, sexual violence, dating violence, domestic violence and stalking are taken seriously. Reports will be promptly investigated and appropriate actions will be taken to remedy the effects of the harassment or violence and prevent the reoccurrence.

A student who experiences sexual harassment, sexual violence, dating violence, domestic violence and/or stalking may contact the BCM Title IX Coordinator for assistance.

Interim Title IX Coordinator
Mikiba W. Morehead
Office of Student Services
BCM
One Baylor Plaza-Main Campus
Cullen Building, 415A
Mikiba.morehead@bcm.edu (713)798-8137.

A student may also report to the BCM Security Office via the campus emergency line at 8811 or the non-emergency campus extension of 8-8300. The BCM Security Office can assist students with filing a report with local law enforcement and in the case of any emergency encourages you to call the police at 911. BCM complies with the Family Educational Rights and Privacy Act (FERPA), and to the extent possible will protect the privacy of all persons involved in the report of sexual harassment, sexual violence, dating violence, domestic violence and/or stalking.

Baylor College of Medicine has designated certain College leaders as Responsible Employees based on either their administrative title (Director Level and above) or responsibilities by serving in a major education role. Responsible Employees have a duty to promptly report incidents of sex based

discrimination, and Prohibited Conduct directly to the Title IX Coordinator. Additionally, Responsible Employees are not confidential reporting resources.

BCM does not tolerate acts of retaliation. Individuals responsible for retaliation against any person who provides information, or participates in an investigation or the adjudication of a report will be met with disciplinary action up to and including removal from the BCM community. See BCM Whistleblower policy (Section 02.10.10).

BCM provides prevention programs and education to faculty, staff and students in an effort to dispel the myths, address the effects, and reduce the occurrence of sexual harassment, sexual violence, dating violence, domestic violence and stalking. More information on BCM's efforts, options for reporting and available support services can be found by visiting the Office of Student Services webpage.

ARTICLE 12. STUDENT SERVICES

(New 07/30/18)

12.1 Wellness Intervention Team

The Baylor College of Medicine (BCM) Wellness Intervention Team (WIT) effectuates a coordinated institutional response to a health or wellness crisis causing student distress, when the student is referred by the Dean or Designee. WIT does not provide emergency services or immediate, direct intervention with students purported to be in distress, but primarily coordinates an acute care assessment of the health and safety of students and links them with necessary resources to promote mental, emotional, psychological, or physical wellness and well-being. The School Dean or Designee will activate the WIT to initiate one of these primary functions, as appropriate: Acute Care & Crisis Management, Access to Academic & Non-Academic Support Resources, or Processing of Long-Term Leave of Absence (LOA) Requests & Returns from LOA. Students referred to WIT may register dissent or concern regarding the WIT process by filing a Grievance, as described in the Student Appeals and Grievances Policy (23.1.08). For further details about the WIT purpose and process, contact the GSBS Dean or studentservices@bcm.edu.

NOTICE OF NON-DISCRIMINATORY POLICY

BCM and the Graduate School of Biomedical Sciences admits students of any race, gender, ethnic or national origin, sexual orientation, disability, economic status or age to all the rights, privileges, Programs, and activities generally accorded or made available to students at the school. It does not discriminate on the basis of race, gender, ethnic or national origin, sexual orientation, disability, economic status or age in administration of its educational policies, admissions policies, scholarship and loan Programs, and other school-administered Programs.

Appendix A: New Student-Related Policies Published by Baylor College of Medicine, August 1, 2018 to Present

New or Revised?	#	Policy Title/Link	Stakeholders Affected	Purpose	Pub Date

Graduate School Core Service Curriculum

Organization of the Cell (GS-GS-501)
This course covers the principles of cellular organization and communication. The emphasis will be on cellular compartmentation, communication within and among cells, and the maintenance of cellular structure. The general features of proteostasis (i.e., protein homeostasis) in normal disease scenarios will be discussed. Protein import and export will include the endoplasmic reticulum, nucleus, lysosome and peroxisome as well as vesicular transport and secretion. Signaling within the cell will emphasize G-protein coupled signal transduction, calcium signaling and growth factors. The structural maintenance of cellular morphology will discuss the cytoskeleton, myosin, intermediate filaments and junctional complexes.
Credits: 2
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Rick Sifers and Dr. Karl-Dimiter Bissig

Molecular Methods (GS-GS-502)
Molecular Methods covers methods for studying and manipulating DNA, RNA, and proteins; these range from the most basic to state-of-the-art technologies available in the Baylor College of Medicine Advanced Technology Cores. Nucleic acid topics include DNA manipulation, cloning, preparation of libraries, sequencing, next generation sequencing, genomic profiling, RNA interference and CRISPR/Cas9. Protein topics include protein expression and purification, antibody generation and applications, flow cytometry, methods to detect/visualize protein-protein interactions, proteomics/mass spectrometry, and high throughput methods to study protein/protein and protein/DNA interactions.
Credits: 3
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Nancy Weigel

Genetics A (GS-GS-503)
This course will discuss the general principles of genetics and its implication for inheritance and variation in living organisms. First, the concepts of the gene and mutation will be introduced and their link to phenotype will be discussed. This is followed by linkage, complementation and non-Mendelian inheritance. The use of genetics as a research tool is illustrated by the molecular basis of phenotype, the dissection of genetic pathways, and the use of genetic techniques in bacteria, yeast and Humans.
Credits: 2
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Christophe Herman and Dr. Herman Dierick

Genetics B (GS-GS-504)
This course focuses on introducing genetic approaches offered by different model organisms for solving biological problems, understanding how these models can address problems related to human diseases, and learning technical terms and concepts unique to each system. Yeast genetics will be used to demonstrate how to order genes in a genetic pathway. Classical and modern genetic methods for studying gene function in *C. elegans* during development will be discussed, as will use of Drosophila genetics to study pattern formation, mutation isolation and mapping and mosaic analysis. Mouse genetics (gene knock-out, generating specific strains by crosses, and the use of transgenic approaches) and human genetics (linkage and pedigree analysis, gene mapping and analysis, and population biology and evolution) will be covered.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Zheng Zhou

Cell Division (GS-GS-505)
This course examines the fundamental concepts in cell cycle regulation, DNA, telomeres and chromatin duplication, chromosome segregation as well as cytokinesis. The course presents principals of cellular response to DNA damage, telomere dysfunction, perturbation in DNA replication and chromosome segregation. The molecular mechanisms of various DNA repair pathways including recombination and their regulation in cell cycle will be discussed. The relevance of cell cycle in growth regulation, development and cancer will be presented.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Grzegorz Ira and Dr. Eric Chang

Development (GS-GS-506)
The Development of a mature organism from a single cell is one of the most fascinating problems in biology. Understanding development can shed light on fundamental processes such as gene regulation and control of the cell cycle, and on translational problems such as the origins and progression of cancer and the possibility of tissue engineering and regeneration to treat human disease. This course of 12 lectures is designed as an introduction to some of the concepts of modern developmental biology.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Andrew Groves

Cancer (GS-GS-508)
This is a short course on the biology of cancer. The course objective is to introduce students to basic mechanisms that lead to tumor initiation, progression, and metastasis. A history of oncogenes and tumor suppressor genes and their modern definitions are presented. Current concepts of cancer stem cells, tumor microenvironment, mouse models, and cancer therapeutics are discussed. Class includes lecture and group discussion of key recent papers in which students are expected to participate.
Credits: 1
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Stephanie Pangas

Gene Regulation (GS-GS-509)
This course focuses on the mechanisms of regulated gene expression with a focus on eukaryotes. The course begins with RNA polymerase and transcriptional regulation through transcription factors, enhancers/repressors, co-transcriptional regulation, and the effects of chromatin structure and histone modification. The details of pre-mRNA processing are covered including the major and minor splicesomes, polyadenylation, alternative splicing, and RNA editing. Mechanisms of regulation by noncoding RNAs including miRNAs, siRNAs, piRNAs and lncRNAs are also considered. Mechanisms of regulation of translation and protein degradation complete the discussion.
Credits: 3
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Thomas Cooper

Neuroscience (GS-GS-511)
This is an introductory course covering fundamental aspects of modern neuroscience. The lecture series begins with a discussion of neural development, evolution and the resulting organization of the mammalian nervous system, then progresses into the molecular and structural specializations that allow neurons to process and transmit information via electrical current. The course next explores how neurons contribute to autonomic functions that keep us alive and higher brain functions such as learning and memory. The course will close on an examination of how neural dysfunction leads to common neurological disorders such as developmental pathophysiologies, autism, and Alzheimer's disease.
Credits: 1
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Russell Ray

Immunology (GS-GS-512)
In the field of biology, the immune system is unique in that it crosses all organ boundaries and affects a vast number of processes critical for organismal function and survival. This short course introduces the basic cellular and molecular mechanisms of immunity. These include: the innate immune system (molecular "danger" patterns); the acquired immune system (B and T cell receptor gene rearrangement and their effector functions); the cross-talk between innate and acquired immunity; an overview of the principles of immune tolerance exemplified by mechanisms of transplant rejection and cancer immunity; and a discussion of autoimmune diseases and immunotherapies.
Credits: 1
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Jonathan Levitt

Ethics – Year 1 (GS-GS-514)
Ethics-Year 1 is the first of 4 modules on responsible conduct of research. Sessions will involve students in discussion during lectures, as well as in small groups where case studies will be reviewed. Issues surrounding data collection and documentation, research material and its ownership will be presented, as will responsible authorship, proper citation, plagiarism and copyright. A discussion will also be held for first-year students on what to look for in laboratory rotations goals, selecting mentors and keeping on track towards your degree.
Credits: 0.5
Term: 1 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Ethics - Year 2 (GS-GS-515)
Ethics-Year 2 is the second of 4 modules on responsible conduct of research. The course will discuss research misconduct, including College and federal policies and procedures. It will also review safe practices in the laboratory and the ethics of experiments with animals. This will be followed by small group discussion covering cases studies of scientific misconduct and animal research. A discussion will also be held for second-year students and their mentors on matching goals and expectations of the mentor and student, developing communication channels and using the thesis advisory committee as a resource.
Credits: 0.5
Term: 2 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Ethics - Year 3 (GS-GS-516)
Ethics-Year 3 is the third of 4 modules on responsible conduct of research. The course will discuss writing and review of scientific manuscripts, how grant applications are reviewed including conflicts of interest in the peer-review, and financial conflicts of interest. Collaborative research arrangements, particularly with industry, will be considered along with intellectual property relative to publication and thesis submission. There will be a small group discussion covering case studies associated with these topics. A discussion will also be held for third-year students and their mentors on matching goals and expectations of the mentor and student, evaluating progress towards degree and alternative approaches for risky projects.
Credits: 0.5
Term: 3 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Ethics - Year 4 (GS-GS-517)
Ethics-Year 4 is the fourth of 4 modules on responsible conduct of research. The course will discuss ethical considerations in research involving human subjects, including experiments with human derived materials and informed consent. A discussion on contemporary ethics issues and the scientist as a responsible member of society is included. This will be followed by a small group discussion covering case studies associated with these topics. A discussion will also be held for fourth-year students and their mentors on expectations of mentor and student, setting goals and timelines for graduation, career decisions and planning for the next step.
Credits: 0.5
Term: 3 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Macromolecules: Structure and Interactions (GS-GS-518)
This course will provide fundamental information on macromolecular structures, techniques used in structure determination, principles of thermodynamics and kinetics, and how this information can be leveraged to design/develop lead compounds to modulate disease targets for clinical relevance with the help of novel cell-based screening techniques.
Credits: 3
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. B.V. Venkatar Prasad and Dr. Ming Zhou

Introduction to Scientific Writing (GS-GS-519)
This course will increase student knowledge and skills in effective scientific writing. Students will learn basic principles of scientific writing that they can put into practice immediately such as selecting high impact words, building effective sentences and paragraphs, and structuring individual sections of a scientific manuscript. The course, which centers on the concept of writing with clarity and brevity, includes exercises to build skills.
Credits: 1
Term: 4
Counts for 30 hr. requirement: N
Director: Dr. Susan Marriott

Research Design (GS-GS-522)
This course is designed to guide the student through the process of identifying a research problem, developing specific hypotheses and designing well-controlled experiments to test them. It will be taught in small groups of ~8 students/class. A faculty mentor helps formalize and organize the process, but students will develop their ideas through literature searches and discussion. The terms and discussion will center around the NIH format for grant applications (Specific Aims, Background and Significance, Experimental Design).
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. B.V. Venkatar Prasad

Method and Logic in Molecular Biology (GS-GS-523)
This course is intended to train students to read and critically interpret the primary literature. Students will learn what constitutes a well-designed experiment with proper controls. Small groups of students (8-10) will meet twice per week to discuss two assigned journal articles. The first meeting will be without faculty participation while the second meeting will be guided by one or two instructors per group. The first meeting will allow students the opportunity to independently address the scientific merit and design of the assigned readings and formulate their own opinions. During the second meeting, instructors will guide a discussion among students to bring out the salient features of the readings pertinent to the goals of the course.
Credits: 3
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Graeme Mardon, Dr. Melissa Suter, and Dr. Noah Shroyer

Introduction to Intellectual Property (GS-GS-525)
So you now have a great discovery or idea, how can you protect and market it? In this course we will learn about intellectual property law and technology transfer. We will cover different types of intellectual property, such as patents, trademarks, copyrights, etc., with an emphasis on genetic and biotechnology patents, both in the USA and internationally. We will also discuss copyrights: their nature, acquisition, and how to avoid infringing them, with an emphasis in instructional activity and educational settings.
Credits: 1
Term: 4
Counts for 30 hr. requirement: N
Director: Dr. Patrick Turley

ABC-Applications to Biology of Computation (GS-GS-527)
The course will offer a broad survey of different topics from a computational perspective: genomics, epigenomics, population genetics, transcriptomics, proteomics, structure-function, systems biology, networks, cellular imaging, phylogenomics, pattern discovery, drug design, medical informatics, the microbiome, the cancer genome and neurosystems. The objectives are to become familiar with basic computational challenges in these fields and with the current algorithmic solutions.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Olivier Lichtarge

Responsible Conduct of Research – Year 1 (GS-GS-528)
Sessions will involve students in discussion during lectures, as well as in small groups where case studies will be reviewed. Students will be mentored on this scientific process (accessing the scientific literature, thinking with the scientific method). Issues surrounding rigor, reproducibility, research material and its ownership will be presented, as will responsible authorship, plagiarism and copyright. Classes will also be devoted to the practical aspects of being a student scientist such as what to look for in laboratory rotations, selecting mentors, coping with stress and deadlines, what to do when experiments don't work, and how to go about career decision-making as well as professional aspects of being a scientist such as funding and advocacy.
Credits: 1
Term: 1
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Responsible Conduct of Research – Year 2 (GS-GS-529)
Sessions will involve students in discussion during three lectures, as well as in one small group session where case studies will be reviewed. Students will be mentored on research misconduct, focusing on topics such as falsification, fabrication, and plagiarism. College and federal policies and procedures for handling misconduct allegations will be reviewed. A session with 2nd year students and their mentors will review expectations between mentor and student. Students will receive training on the ethics of biomedical studies with animals, covering topics such as when can animals be used ethically in research, the importance of avoiding unnecessary pain/suffering and euthanasia and animal use approval. The final session, which will be held in a small group discussion format with faculty facilitators, will focus on case studies involving scientific misconduct and experiments with animals.
Credits: 0.5
Term: 2
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Responsible Conduct of Research – Year 3 (GS-GS-530)
Sessions will involve students in discussion during four lectures, as well as in one small group session where case studies will be reviewed. Topics covered during this module include authorship and peer review conflicts of interest and their management, and collaboration within academia and with industry. The mentorship lecture will be a meeting with 3rd year students and their mentors. The final large group session will be focused on rigor and reproducibility using interactive case studies, reviewing principles introduced in year 1. Finally, the session conducted in a small group discussion format with faculty facilitator will be utilize case studies to highlight issues relevant to the review of grants and papers, conflicts of interest, and collaboration.
Credits: 0.5
Term: 3
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

Responsible Conduct of Research – Year 4 (GS-GS-531)
Sessions will involve students in discussion during three lectures, as well as in one small group session where case studies will be reviewed. Topics covered during the lecture on research with human subjects will include defining what constitutes research with human subjects versus experiments with human material, confidentiality of medical data, and informed consent. The mentorship session on will be a meeting with 4th year students and their mentors. The lecture on the scientist as a responsible member of society will address contemporary ethical issues in biomedical research and the environmental and societal impacts of scientific research. Finally, the session conducted in a small group discussion format with faculty facilitator will utilize case studies to highlight issues relevant to research with human subjects and societal impact of research, focused on genetics/genomics, stem cells and neuroethics.
Credits: 0.5
Term: 3
Counts for 30 hr. requirement: N
Director: Dr. Alison Bertuch

MSTP Reading (GS-GS-548)
MSTP Reading provides MSTP students early in their combined physician-scientist training with in-depth exposure to critical reading of the current biomedical literature in order to improve their ability to identify and design research strategies for solving current biomedical problems.
Credits: 1.5
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Sharon Plon

Biochemistry and Molecular Biology

Thinking Like A Scientist (GS-BC-400)
This is the first in a series of 4 courses that aim to help first year graduate students develop the critical thinking, speaking and writing skills that are necessary for their professional success in graduate school and beyond. In this term, students set short-term professional goals around courses and laboratory rotations and gain strategies to improve their skills in technical writing and critical evaluation of the literature. Learning is achieved through group-based problem solving.
Credits: 1
Terms: 1 (First year BC students only)
Counts for 30 hr. requirement: N
Director: Dr. Anna Sokac

Thinking Like a Scientist - Term 2 (GS-BC-407)
The goal of this term is to develop critical reading skills for evaluating the scientific literature. For a set of assigned papers, student will learn to identify the gap in knowledge and the hypothesis that was tested, and analyze the experimental outcomes in relation to the hypothesis. Students will also develop reasonable future directions in the form of a new set of hypotheses that follow from the results of each paper. Each week one student will present an assigned paper in the style of a journal-club. The other students will write a summary of the same paper, highlighting the logical flow of the paper.
Credits: 2
Terms: 2 (First year BC students only)
Counts for 30 hr. requirement: Y
Director: Dr. Anna Sokac and Dr. Ido Golding

Thinking Like a Scientist - Term 3 (GS-BC-408)
The goal of this term is to build up on the analytical and presentation skills students develop through critical reading of the literature in Term 2. Students will continue to use the concept of the framing funnel to identify an existing gap in knowledge, and formulate a hypothesis/model that makes specific predictions that can be critically tested experimentally. Each student will write an abstract of a research proposal that will be discussed and revised in response from feedback from students and faculty.
Credits: 2
Terms: 3 (First year BC students only)
Counts for 30 hr. requirement: Y
Director: Dr. Ming Zhou and Dr. Nicolas Young

Thinking Like a Scientist – Term 4 (GS-BC-409)
The goal of this term is to build upon the activities of Term 3 that culminated in writing a proposal abstract based on a published paper. Students will do additional literature-based research to add both depth and breadth to each component of the abstract using the concept of the framing funnel, and develop one new specific aim building off of published results. By the end of the course, each student will have written a full research proposal, whose specific aims, outline and early drafts will be presented to the class in written and oral form. They will receive feedback from students and faculty in the process of finalizing the proposal. Each student will also present a final presentation on the full proposal in a format similar to that of the qualifying examination.
Credits: 2
Terms: 4 (First year BC students only)
Counts for 30 hr. requirement: Y
Director: Dr. Theodore Wensel

Special Projects (GS-BC-435)
Faculty mentored research for students that have selected their thesis advisor not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Special Topics (GS-BC-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr. course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Seminar in Biochemistry (GS-BC-466)
Student Seminar
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Readings (GS-BC-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Research Rotation (GS-BC-549)
Faculty mentored research for students who have not yet selected a faculty advisor
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Dissertation (GS-BC-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Clinical Scientist Training Program

Fundamentals of Clinical Investigation (GS-CT-400)
The objective of this course is to train students to interpret the results of other clinical investigators and to use the knowledge for providing state-of-the-art care for their patients. The course includes three modules reflecting specific areas relevant to a clinical researcher. These modules are: principles of clinical research; statistical methods in clinical research; special topics.
Credits: 3
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Farrah Kheradmand

CICS I: Grant Development for Clinical Investigators (GS-CT-403)
This course provides students with the skills to develop an important research question, formulate strong hypotheses and specific aims, and begin to draft the components of a career development grant proposal.
Credits: 2
Terms: 1
Counts for 30 hr. requirement: Y
Director: Dr. Ashok Balasubramanyam

CICS II: Clinical Trials for Clinical Investigators (GS-CT-404)
This course provides students with an understanding of the theory and practice of conducting scientifically rigorous clinical trials. Building on the work of the previous CICS I course and from knowledge gained from the Fundamentals in Clinical Investigation course, students will fully develop the hypothesis, specific aims, and experimental design of their projects.
Credits: 3
Terms: 2
Counts for 30 hr. requirement: Y
Director: Dr. Farrah Kheradmand
Prerequisites: CICS I: Grant Development for Clinical Investigators (GS-CT-403) and Fundamentals of Clinical Investigation (GS-CT-400)

CICS III: Translational Research for Clinical Investigators (GS-CT-405)
This course provides students with an understanding of the theory and practice of conducting bench-to-bedside translational research. Building on the work of the previous term, students will continue the development of a K-type grant proposal, focusing on the career development plan and mentor's letters.
Credits: 3
Terms: 3
Counts for 30 hr. requirement: Y
Director: Dr. Jesus Vallejo
Prerequisites: CICS I: Grant Development for Clinical Investigators (GS-CT-403) and Clinical Trials for Clinical Investigators (GS-CT-404)

CICS IV: Health Services Research for Clinical Investigators (GS-CT-406)
This course provides students with an understanding of the theory and practice of health services research. Building on the work of the previous term, students will continue the development of a K-type grant proposal.
Credits: 3
Terms: 4
Counts for 30 hr. requirement: Y
Director: Dr. Frederick Pereira
Prerequisites: CICS I: Grant Development for Clinical Investigators (GS-CT-403) and Translational Research for Clinical Investigators (GS-CT-405)

CICS V: Evaluating a Completed Career Development Grant (GS-CT-407)
This course provides students with an appreciation of the NIH study section review process and a completed career development award.
Credits: 2
Terms: 5
Counts for 30 hr. requirement: Y
Director: Dr. Frederick Pereira
Prerequisites: CICS I: Grant Development for Clinical Investigators (GS-CT-403) and CICS IV: Health Services Research for Clinical Investigators (GS-CT-406)

Development and Commercialization of Biomedical Innovations (GS-CT-408)
This course provides a general overview of the steps required to move a biomedical innovation into the marketplace. The course begins with an overview of the ecosystem and a framework to assess opportunities for product development and commercialization. Other lectures take the students through the product development process, and provide insights into strategies for funding translational research projects through the "valley of death" gap that exists between basic research funding and commercial funding. Other topics include an introduction to intellectual property basics, and options for commercialization of biomedical assets, licensing and new ventures.
Credits: 1
Term: 4 (Not offered in AY18)
Counts for 30 hr. requirement: Y
Director: Dr. Ashok Balasubramanyam

Responsible Conduct of Research for Clinical Investigators (GS-CT-409)
The RCRCI course is designed for the early career scientist/clinical or translational investigator, and will provide students with a fundamental competency and appreciation for the core topics within the ethical dimensions of biomedical research. During this one-week course, students will receive lectures from faculty with expertise in each of these core topics, to be followed by small group case study discussions illustrating ethics topics from the preceding lecture.
Credits: 1
Term: 1
Counts for 30 hr. requirement: N
Director: Dr. Maria Gramatges

Special Projects (GS-CT-435)
Faculty mentored research for MS students or PhD students that have selected their thesis advisor but have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ashok Balasubramanyam

Seminar in Clinical Sciences (GS-CT-466)
The purpose of this course is to provide a forum for students to improve their knowledge and skills in planning, preparing and effectively presenting their research to an inter-disciplinary audience.
Credits: 1
Term: 1, 2, 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Ashok Balasubramanyam

Reading – CSTP (GS-CT-548)
Faculty directed literature reading projects that survey a specialized topic of interest to the student.
Credits: 1
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ashok Balasubramanyam

Research Rotation (GS-CT-549)
Faculty mentored research for students who have not yet selected a faculty advisor
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ashok Balasubramanyam

Dissertation (GS-CT-550)
Thesis research directed by a faculty mentor and thesis advisory committee. Open only to candidates for the PhD degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ashok Balasubramanyam

Developmental Biology

Preparing for Your Developmental Biology Qualifying Exam (GS-DB-400)
This course will explain the requirements and expectations of the Developmental Biology qualifying exam. The course is geared specially towards second year students who have successfully completed their first year coursework and several months' work in their chosen thesis lab. The course will cover the format of the written and oral exams, tips for structuring the aims and scope of the written proposal, and provide students with opportunity to develop and deliver their oral presentation for feedback from the group. The goal of the course is to help students begin thinking about their work independently and to present their research problem and experimental goals clearly. Ultimately, this course is intended to encourage independent NRSA or other fellowship applications from those students who qualify.
Credits: 1
Term: 2
Counts for 30 hr. requirement: N
Directors: Dr. Melanie Samuel and Dr. Benjamin Arenkiel

Classical Developmental Biology (GS-DB-402)
This course provides introductory information related to major questions in developmental biology. It also provides an introduction to classical experimental methods and examples are provided which highlight how developmental principles have been tested. These examples will allow the students to grasp how earlier investigations presaged present areas of inquiry for each organism. The course introduces the anatomy and histology of most organs and cells during development with a particular emphasis on *C. elegans*, *Drosophila*, mouse, chick, zebrafish, and *Xenopus*. The development of each organism is described in lectures and observed by the students in lab settings so that students can readily grasp the complex issues of modern developmental biology and begin to see how questions might be approached.
Credits: 2
Term: 1
Counts for 30 hr. requirement: Y
Directors: Dr. Ross Poché and Dr. Michael Lewis

Neural Development (GS-DB-403)
This advanced graduate course in developmental neurobiology provides students with a more detailed background of neural development that will serve as conceptual framework for future studies. It particularly focuses on molecular genetic studies that have helped us elucidate the mechanisms underlying the development of the nervous system. This course integrates knowledge about molecular patterning of the nervous system using a cross-species approach that also emphasizes evolutionary relationships. The role of genes and mechanisms that play a role in the selection of neuroblasts and neuronal differentiation, in the specification and function of glial cells, in growth cone guidance and synapse formation are covered in detail.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Directors: Dr. Benjamin Arenkiel and Dr. Roy Sillitoe

Genetics and Genomics in Vision Research (GS-DB-404)
This course provides graduate students and postdoctoral fellows with broad exposure to the molecular genetics underlying normal and abnormal visual system development and function. This course offers an in-depth analysis of normal vertebrate and invertebrate development, genetic causes of disease, as well as the use of animal models for genetic analysis of normal and abnormal development and function.
Credits: 1
Terms: 4 (Offered in AY18; even year course)
Counts for 30 hr. requirement: Y
Director: Dr. Graeme Mardon

Evolutionary Conservation of Developmental Mechanisms (GS-DB-422)
This course focuses on the similarities and differences of developmental mechanisms between vertebrates and invertebrates. Invertebrates, such *as Drosophila* and *C. elegans*, have allowed scientists to isolate many genes that are required for proper development through genetic screens. Vertebrate homologs of many of these genes have been identified, and their role is being studied through a variety of approaches, including manipulations in chick and zebrafish as well as through mouse knockouts. The view of vertebrate and invertebrate developmental biologists on a series of topics like segmentation, Hox and Polycomb-group genes, limb development, and cell death is presented in this course. In addition, the lecturers discuss and compare the function of proteins required for specific developmental pathways in invertebrates whose homologs are involved in tumorigenesis in vertebrates. Additional topics include: evolution, evolutionary trees, and the evolution of developmental pathways, as well as how during evolution numerous molecular players are conserved and how they are deployed in various developmental processes in diverse organisms.
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Andrew Groves

Topics in Development (GS-DB-425)
The purpose of this course is to introduce the students to some current topics in developmental biology, to improve the students' ability to read and interpret primary literature, and to improve the students' skills in presenting scientific data. A lecturer introduces a topic and then assigns two papers to two students to present in the next lecture. All students are expected to critically evaluate and interpret the assigned papers prior to attending class, and the selected students prepare a 45 min lecture on the assigned topic. Each student presents twice. Topics discussed include sex determination, epithelial morphogenesis and cancer, hematopoietic and cardiac development, stem cell therapy, skin cancer, nuclear hormone receptors, cell motility and invasive behavior (metastasis), and ectoderm-mesoderm interactions.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Daisuke Nakada and Dr. Joshua Wythe

Special Projects (GS-DB-435)
Faculty mentored research for students who have selected their thesis advisor but have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Special Topics (GS-DB-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr. didactic course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Seminar in Developmental Biology (GS-DB-466)
The purpose of this course is to guide the students into learning how to approach scientific literature directly. Students are expected to read the primary literature and lead discussions in a group setting. Students in the Program in Developmental Biology participate in this seminar every term during their first four years at BCM.
Credits: 1
Term: 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Readings (GS-DB-548)
Faculty directed literature projects that survey a specialized topic of interest to the student.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Research Rotation (GS-DB-549)
Faculty mentored research for students who have not yet selected a faculty advisor .
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Dissertation (GS-DB-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degrees.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Andrew Groves

Immunology

Logic and Presentation of Problem-Solving (GS-IM-400)
Understanding and presenting research in a logical manner is a critical skill for scientists. This course dissects of the logic of problem-solving science through using the rubrics of “OPTEMA” (Observations; Problematization; Testable ideas; Experimental design: Methods; and Analysis) and teaches both logical analysis and presentation through the One Figure Journal Club in which class participants including the instructor work through a single journal club article. In addition, the elements of scientific discourse, scientific statements with their associated citations, are approached using the evidential typology of Bruno Latour and a typology of citation –functions.
Credits: 1
Term: 1
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Logic and Rhetoric of Writing Science (GS-IM-401)
Uses structure-functional analysis of scientific text to teach techniques of reading and writing science articles based on logic and rhetoric principles of *transdiscourse* (including summary, synopsis, paraphrase and, occasionally, quotation) and *metadiscourse* (including *hedges* and *boosts*).
Credits: 1
Term: 2
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Logic and Rhetoric of Writing Proposals (GS-IM-402)
This course covers the logic of experimental design for general experimentation and grant proposals and the art of persuasion as it pertains to grant proposals. It will also cover the needs to students preparing for qualifying exams.
Credits: 1
Term: 4
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Clinical Aspects of Immunology (GS-IM-405)
This course is designed for immunology students to learn more about the roles and importance of immunology in various human diseases and animal models, including cancer immunology, autoimmune diseases, infectious/tropical diseases, allergy and immunodeficiency. The goals of this course are to introduce students to these active research topics, to bridge basic immunology to clinical immunology, and motivate them for the selection of their own research topics related to important human diseases. This course will combine faculty lectures (50%), student presentations of scientific papers and student-designed future directions in the selected topics (50%).
Credits: 3
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. Richard Cook

Seminars in Immunology Research (GS-IM-407)
Graduate students will attend a weekly research seminar series. Presentations in this series are by Baylor Faculty, Postdoctoral Fellows and Graduate students as well as presentations by scientists from other institutions. Students having passed their Qualification Exam will present their laboratory research once per year. Faculty and student evaluators will provide student presenters with useful written and oral feedback on their presentations based on anchored rubrics.
Credits: 1
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gretchen Diehl

Immunology (GS-IM-423)
This is a series of lectures stressing basic concepts in immunology. These include immunoanatomy and cytology, innate immunity, development of the immune system, immunoglobulin structure and genetics, antigen-antibody reactions, the major histocompatibility complex and antigen presentation, T cell receptors (genetics, structure, selection), T cell activation and effector functions, cell trafficking, phagocytic cell functions, immune responses to infections organisms and tumors, autoimmunity, allergies and immunodeficiency. The course includes weekly reviews led by senior graduate students that help to explore and clarify concepts.
Credits: 3
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Jonathan Levitt

Regulation of Immune Responses (GS-IM-425)
This course is composed of mini-lectures by faculty (30%) and student presentations and discussions of articles (70%) from the current literature. Students receive written constructive comments from the instructors to help improve their presentation content and style. The focus of the articles, selected by the participating faculty, is on the cells, proteins and mechanisms that regulate cellular and humoral immune responses. Topics that are covered include pathways for antigen presentation by MHC molecules, thymic selection, T cell receptor structure/function, T cell co-stimulation, regulatory and memory T cells, dendritic cells, NK, CD4 and CD8 cell function, autophagy, toll-like receptors, cell-cell interaction molecules, and B cell activation and differentiation.
Credits: 3
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Richard Cook

Molecular Immunology (GS-IM-428)
This course consists of a series of faculty lectures (50%) and student-led discussions (50%) of major molecular mechanisms that control immune responses. Students receive written constructive comments from the instructors to help improve their presentation content and style. The course approaches the subject of immunology from the viewpoints of innate immunity, the immunological synapse, ion channels, central and peripheral tolerance, microRNA control of gene regulation in lymphocytes, lymphocyte activation and CTL killing. Each student develops a research proposal in an area covered in the course, guided by the companion course GS-IM 406.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Richard Cook

Special Projects (GS-IM-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Immunology Journal Club (GS-IM-446)
This course consists of weekly meetings, attended by students and faculty, for student presentations and discussions of high impact literature in immunology. These weekly meetings are considered a part of a student's education. Students are required to attend all immunology seminars.
Credits: 1
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Min Chen

Special Topics (GS-IM-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Readings (GS-IM-548)
Faculty-directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Research Rotation (GS-IM-549)
Faculty-mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Dissertation (GS-IM-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. John Rodgers

Integrative Program in Molecular and Biomedical Sciences

IMBS Director's Course (GS-MB-401)
This course will prepare students to become leaders in interdisciplinary and integrative cell and molecular biomedical research by developing practical and intellectual skills very early in their training. The objectives are to: (i) identify and evaluate the primary scientific literature and interpret the results; (ii) evaluate and identify critical problems, identify significance and innovative approaches; (iii), develop and justify the scientific rationale, testable hypotheses, design rigorous experimental approaches to test leading hypotheses using multiple and independent predictions; (iv) develop specific aims and grant proposals; (v) develop scientific writing skills; vi) conceptualize, plan, write, and orally defend a mock NIH R21 grant proposal; and (vii) develop and give lucid presentations.
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Frederick Pereira

Biology of Aging & Age-Related Diseases (GS-MB-430)
This course provides students and post-docs with the up-to-date information and current understanding of the aging process and age-related human disorders. The course covers molecular aspects of aging research, models and theories of aging, and clinical perspectives of aging processes. This advanced graduate elective course is offered for trainees who will specialize in or have a strong background in the interrelated areas of development, aging and age-related diseases. Students comment that participation in discussions of each topic is a highlight of the course.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Frederick Pereira

Translational Cancer Biology (GS-MB-431)
This course integrates the basic science and translational aspects of research with clinical applications, thus enhancing student understanding of current research and clinical correlations in particular cancers. Each week will have a particular cancer focus and the meeting time will include a clinically focused lecture, a basic science focused lecture, and a journal club article presented by students. Students will attend a minimum of two tumor board sessions during the term, which include a patient case presentation followed by discussion detailing the background, treatment, outcomes, and research avenues of the patient's malignancy. These tumor boards can be attended at any time during the course.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Jason Yustein

Special Projects (GS-MB-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. David Nelson

Special Topics (GS-MB-463)
Scholarly study directed by a faculty member. Special topics allow a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. David Nelson

Seminar in Cell & Molecular Biology (GS-MB-466)
This is a Research in Progress Seminar Series for students enrolled in the Integrative Molecular and Biomedical Sciences Graduate Program (IMBS). The objective of the course is for students within the Graduate Program to have an opportunity to present their ongoing research to a diverse group of colleagues, and to receive feedback from these colleagues in regards to the quality of their presentation and work. The aggregate of the IMBS student body is divided into student six critique groups, two of which are assigned to each seminar on a rotating basis. Each member of the assigned critique group is required to complete one of two evaluation forms (Presentation Style or Scientific Rigor) and return it to the student presenting.
Credits: 1
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Joel Neilson

Readings (GS-MB-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. David Nelson

Research Rotation (GS-MB-549)
Faculty mentored research for students who have not yet selected a faculty advisor
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. David Nelson

Dissertation (GS-MB-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. David Nelson

Molecular and Cellular Biology

Explorative Data Analysis (GS-CB-400)
Explorative Data Analysis will teach concepts of statistical learning and of data integration in database systems that together will enable students to explore and learn from large and complex datasets to generate new and unique biological insights. The approach to teaching will emphasize methods of statistical learning and their conceptual underpinnings rather than their mathematical properties, and will use a hands-on approach to progressive 'omics'-data integration and mining by using community-based resources for data analysis rather than on writing codes
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Rainer Lanz

Reproductive Biology (GS-CB-406)
Reproductive Biology covers mammalian reproductive processes at all levels of biological organization (anatomical, physiological, cellular, biochemical and molecular). The course is taught with a comparative approach analyzing findings in different animal model systems and clinical studies to ensure that clinical issues affecting reproductive success are presented, and to also demonstrate how basic science is moving toward understanding the causes and treating reproductive failure and diseases.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. JoAnne Richards and Dr. Stephanie Pangas

Cellular Signaling (GS-CB-425)
Cellular signaling covers major cellular signaling pathways, actions of intracellular kinases and nuclear receptors, and strategies for regulating cell signaling. The pathways covered include those regulated by GPCR, receptor tyrosine kinases, TGFβ, Notch, Hedgehog, WNT, Hippo and nuclear receptors. In addition, signaling pathways regulated by small molecules including calcium, phospholipids, cAMP, cGMP, and AMP are discussed.
Credits: 3
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Nancy Weigel

Integrated Microscopy (GS-CB-426)
The course is composed of a set of lectures that cover basic and advanced forms of light and electron microscopy, and an accompanying set of practical labs where students receive hands-on training on all the available instruments. The main topics addressed in the class are: basic optics, light- and fluorescence-based microscopy (i.e., brightfield, DIC, phase contrast, deconvolution, confocal, live cell imaging), fluorescence-based molecular tools (i.e., FRET, FRAP, fluorescent proteins), transmission electron microscopy, super-resolution microscopy (i.e., SIM, STORM), and specialized automated high throughput microscopy and image analysis.
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Michael Mancini and Dr. Fabio Stossi

Special Projects (GS-CB-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. JoAnne Richards

Introduction to Molecular Carcinogenesis (GS-CB-457)
The course explores the fundamental concepts and experiments in tumor biology, cancer virology and oncogenes and growth control. This course provides a broad based introduction to students who have an interest in modern cancer research. Faculty from four departments (Cell Biology, Molecular Virology, Pharmacology and Biochemistry) serve as instructors.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Yi Li

Cells, Tissues and Organs (GS-CB-461)
The Cells, Tissues and Organs course focuses on analysis of structure/function relationships in tissues and organs. This will include correlating tissue histology with organ physiology. Interactive lectures and discussions occur simultaneously with direct observation of human and some animal model tissues by the students through multi-head microscopes with a pathologist. Students participate in weekly essays and presentations.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. David Rowley

Special Topics (GS-CB-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Joanne Richards

Introduction to Research and Research Proposals (GS-CB-465)
Introduction to Research & Research Proposals addresses topics relevant to the successful conduct of research including plagiarism and misconduct, and preparation of effective oral and poster presentations and research papers, as well as optimizing use of web-based resources. The second section of the course instructs students in how to prepare a competitive grant proposal with emphasis on developing research plans, design and analysis of experiments and enhancing significance and innovation with the goal of preparing students to take their qualifying examination.
Credits: 1
Term: 5 (First-year MCB students only)
Counts for 30 hr. requirement: N
Director: Dr. John Lydon

Seminar in Cell Biology (GS-CB-466)
Student Seminar
Credits: 1
Term: 1, 4
Counts for 30 hr. requirement: N
Director: Dr. Charles Foulds

Regulation of Energy Homeostasis (GS-CB-468)
Regulation of Energy Homeostasis addresses the control of metabolism in health and disease, and how energy balance is signaled among organs. Emphasis will be placed on defining regulatory mechanisms and pathways, with particular attention to abnormalities occurring with disease. The approach will be inter-disciplinary, including metabolomic, biochemical, genetic and cellular aspects.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Robb Moses and Dr. David Moore

Readings (GS-CB-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. JoAnne Richards

Readings B (GS-CB-548B)

Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. JoAnne Richards

Research Rotation (GS-CB-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. JoAnne Richards

Dissertation (GS-CB-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. JoAnne Richards

Molecular and Human Genetics

Introduction to Data Mining (GS-GE-402)
Data mining provides practical approaches and tools that allow biomedical researchers to analyze and understand their data and to craft new hypotheses. The course will focus on data mining essentials and will cover standard approaches to clustering, classification, regression and model selection, along with several domain-oriented techniques such as gene enrichment analysis. We will focus on applications of these methods through a visual programming platform that requires no training in programming. We will provide a basic introduction to the inner workings and mathematics, helping students to intuitively understand the data analysis algorithms without having to understand deep mathematical concepts.
Credits: 2
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Gad Shaulsky

Gene and Cell Therapy (GS-GE-403)
This course covers various approaches to somatic and germ cell gene therapy, with emphasis on vector systems and other methods for gene delivery and targeting; model systems for specific applications of gene therapy; and the status of current therapeutic strategies for various inherited and acquired disorders.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Philip Ng

Human Genetics (GS-GE-411)
The goal of this course is help graduate students learn the fundamental principles of human genetics they will need to be effective contributors to the field of human genetics. By the end of the course, students will have an increased ability to comprehend the human genetics literature, conduct human genetics research, accurately interpret genetic data obtained from human subjects and communicate these findings to other researchers and the general public.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Daryl Scott

Clinical Genetics (GS-GE-419)
The course is aimed at training graduate students in the applied aspects of clinical genetics. Students will learn how Human Geneticists address medical genetic problems in the clinic, interact with genetic fellows and learn how to design tests and experiments to address clinical problems.
Credits: 1
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Daryl Scott

Mammalian Genetics (GS-GE-421)
This course describes the contribution of mammalian molecular genetics techniques to understanding the function of genes and the impact of genetic and epigenetic factors on human disease. The first half of the course focuses on historical aspects and advanced technologies used in mouse genetics. The second half of the course explores topics such as the human genome project, primate genetics, epigenetics, comparative sequence analysis and RNAi-based screens in the mammalian systems.
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Hamed Jafar-Nejad and Dr. Jason Heaney

Genetic Epidemiology and Population Genetics (GS-GE-423)
This introductory level course in genetic epidemiology focuses on the design of studies to identify disease-gene associations. The lectures concentrate on the two most common study designs for genetic association studies: case-control studies and case-parent trios, and address disease-gene associations, gene-environment interactions, and maternal genetic effects. Students will learn about study design and data analysis through class lectures, independent readings, completion of problem sets and class discussions.
Credits: 1
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Philip Lupo and Dr. Michael Scheurer

Introduction to Medical Genetics (GS-GE-425)
This course will: provide students insight into the specialty of medical genetics and its place within the practice of medicine in the United States; offer students an opportunity to understand what it is like to be a medical geneticist and work in a diagnostic laboratory; and, inform students about educational and training requirements that lead to eligibility for board certification by the ABMG. The focus of the course will be on laboratory specialties, however, the specialties of Clinical Genetics and Genetic Counseling will also be discussed.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Marco Sardiello

Special Projects (GS-GE-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gad Shaulsky

Bioinformatics and Genomic Analysis (GS-GE-459)
This course is intended to provide a background in the theory and application of standard computational methods for molecular biology research. The topics to be discussed include databases, sequence comparison, phylogeny, pattern inference and matching, RNA secondary structure, and protein structure. The course will also address computational issues for the Human Genome Program in the areas of large-scale DNA sequencing, chromosome mapping, and gene recognition. During the term, a seminar speaker, with expertise in an area relevant to the subject area of the course, is invited as a guest lecturer. Students are required to attend this seminar.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Kim Worley

Special Topics (GS-GE-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gad Shaulsky

Seminar in Molecular & Human Genetics (GS-GE-466)
This course is required of all first and second year students enrolled in the Molecular and Human Genetics Graduate Program. The course is conducted as a journal club to study current literature, to practice critical analysis of the literature and to refine presentation techniques. First year students present papers from the current literature, all students join in discussion of the paper presented.
Credits: 1
Term: 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Hamed Jafar-Nejad and Dr. Noah Shroyer

Student Research Seminar (GS-GE-468)
A seminar series in which senior students (second year and up) will present their own research to an audience of students and faculty to develop their oral communication skills. The students will present their own work approximately once each year in a revolving schedule. Following each student's seminar, constructive advice from faculty and students will be provided about improving presentation skills and about producing effective presentation materials. The course is aimed to supply the students with the experience necessary to perform highly successful presentations outside of the college in national scientific meetings.
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Christophe Herman and Dr. Herman Dierick

Readings (GS-GE-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gad Shaulsky

Research Rotation (GS-GE-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gad Shaulsky

Dissertation (GS-GE-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Gad Shaulsky

Molecular Physiology & Biophysics and Cardiovascular Sciences

Molecular Physiology & Biophysics

Advanced Topics in Muscle Physiology (GS-PY-400)
This course will focus on skeletal muscle and integrate current information on molecular structure of muscle, its function, signaling pathways controlling its development, growth and response to disease. The course consists of lectures by faculty, presentations by students of assigned papers with student participating and a final exam.
Credits: 2
Term: 3 (Not offered in AY18)
Counts for 30 hr. requirement: Y
Director: Dr. George Rodney

Introduction to Animal MRI (GS-PY-411)
This course provides an introduction to the theory and application of small animal MRI which is currently not readily available through other courses.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Robia Pautler

Grant Writing Skills (GS-PY-413)
The goal of this course is to guide students to write a specific aims page on a specified theme while teaching them about grant structure, grant writing styles, and reinforcing scientific thinking in developing models, hypotheses, and experimental tests through question and answer sessions. The course interleaves lectures with group discussion. In the lectures, the students will be instructed in the overall layout of a grant, the purpose of the various grant sections, and the writing style for grants. Before each discussion, the students will be required to write a section of the specific aims page. In the discussion, the students will question each other's hypotheses, aims and approaches.
Credits: 1
Term: 2
Counts for 30 hr. requirement: N
Director: Dr. Irina Larina and Dr. William Lagor

Cell Physiology (GS-PY-415)
This course will introduce students to a variety of topics related to cellular physiology while also providing instruction as to how one critically evaluates primary research literature. The topics covered will include NeuroPhysiology, Metabolism and Physiology, Cancer Physiology, Cardiovascular Physiology, Muscle Physiology and Biophysics/Bioengineering. The lectures will be general overviews of the stated topics so that students of varying academic backgrounds may become familiar with systems they will encounter in subsequent physiology courses. The course will consist of a 1-hour class that meets twice weekly. The first class will consist of a faculty lecture from an expert in each respective field. The second class will be in the format of a journal club Powerpoint presentation and include an open discussion and critical evaluation of literature pertaining to the previous faculty lecture. The presenting faculty member will choose a single paper to accompany their lecture.
Credits: 2
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Ross Poché

Human Physiology I (GS-PY-430)
This course will provide students with the basic knowledge of organ systems and integrative physiology in humans upon which the pathophysiology of human diseases can later be expanded. Lectures are intended to educate students about the current research being performed in each field and to elicit ideas about future research and human applications. Topics covered in this course, which is the first of two Human Physiology courses, include: cellular physiology, the nervous system, skeletal muscle, the cardiovascular system, and the respiratory system.
Credits: 3
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Frank T. Horrigan and Dr. Ross Poché

Human Physiology II (GS-PY-431)
This course will provide students with the basic knowledge of organ systems and integrative physiology in humans upon which the pathophysiology of human diseases can later be expanded. Lectures are intended to educate students about the current research being performed in each field and to elicit ideas about future research and human applications. Topics covered in this course, which is the second of two Human Physiology courses include: the immune system, renal physiology, bone, the endocrine system, the reproductive system, the gastrointestinal system and liver.
Credits: 3
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Frank T. Horrigan and Dr. Ross Poché

Special Projects (GS-PY-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Special Topics (GS-PY-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hour course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Transmembrane Signaling (GS-PY-465)
This highly interactive upper level course is designed for students interested in understanding in-depth the important principles of trans-membrane signaling. In addition to introducing the roles of lipids, ion channels, kinases, and second messengers, selected examples of signal transduction pathways underlying muscle physiology and cell survival will be discussed in detail. One half of the course will be lectured by experts from related fields. Each lecture is paired with a group discussion of a relevant article.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Christine Beeton

Seminar in Molecular Physiology & Biophysics (GS-PY-466)
Student Seminar
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Irina Larina

Reading (GS-PY-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Research Rotation (GS-PY-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Dissertation (GS-PY-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Cardiovascular Sciences

Cardiovascular Physiology (GS-CS-411)
Topics covered include cardiac cycle, cardiac contractility, neural, and nonneural control of the circulation, biomedical instrumentation, and physical analytical methods. The various components of the cardiovascular system is integrated to define its basic control functions.
Credits: 4
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Xander Wehrens and Dr. Na Li

Cardiovascular Disease and Pathology (GS-CS-412)
This course explores cause and mechanism of cardiovascular disease. Specific topics include mechanistic discussion of atherosclerosis (lipids and lipoproteins, inflammation, oxidatively modified LDL), hypertension (epidemiology, mechanisms, and consequences), hemostasis (thrombosis and bleeding disorders), cerebral stroke, heart failure (systolic and diastolic dysfunction), cardiac arrhythmias, myocardial ischemia (healing and remodeling, cardia fibrosis, myocarditis), laterality in heart disease and aging in the cardiovascular system. This course is taught by a combination of clinicians, basic scientists, and clinician scientists from throughout the Texas Medical Center.
Credits: 4
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. James Martin and Dr. Jun Wang

Special Projects (GS-CS-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Sean Marrelli

Special Topics (GS-CS-463)
Scholarly study directed by a faculty member. Special Topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Sean Marrelli

Seminar in Cardiovascular Sciences (GS-CS-466)
Student Seminar

Credits: Variable
Term: 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Sean Marrelli

Readings (GS-CS-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Sean Marrelli

Research Rotation (GS-CS-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5 (Not offered in AY18)
Counts for 30 hr. requirement: N
Director: Dr. Sean Marrelli

Dissertation (GS-CS-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Christine Beeton

Molecular Virology and Microbiology

General Virology (GS-MV-401)
This series of lectures and student paper presentations emphasize fundamental principles related to interactions of animal viruses with their host cells. General topics include chemical and physical properties of viruses, virus classification, cultivation and assay of viruses, viral replication and morphogenesis, vaccines and antivirals, viral pathogenesis, virus vectors, and viral oncogenesis. These topics are highlighted through detailed discussions of selected RNA and DNA virus families.
Credits: 4
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Ronald T. Javier

Literature Review in Molecular Virology & Microbiology (GS-MV-410)
Literature Reports is a course in which all students in the Department of Molecular Virology and Microbiology must participate. At each meeting, two students each present a paper that they have picked alone, or with the help of their faculty mentor, to an audience of their fellow students and MVM faculty. (Every session has a different faculty mentor.) The goal of the class is to give the students a chance to gain experience presenting to critical audiences, to learn to critically assess data, respond to oral questions and prepare cogent presentations.
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Anthony Maresso

Concepts in Microbial Pathogenesis (GS-MV-413)
Microbial Pathogenesis will provide interested graduate students or postdoctoral fellows with knowledge of the basic and clinical aspects of mechanisms and consequences of microbial (bacterial and viral) pathogenesis. This course will provide students with the knowledge to understand how bacteria and viruses cause disease, insights into research approaches used to answers questions on microbial pathogenesis, and a forum for in depth discussion of data from selected papers and enhance their ability to critically analyze, discuss, and present data.
Credits: 4
Term: 4 (Offered in AY18; even year course)
Counts for 30 hr. requirement: Y
Director: Dr. Margaret Ellen Conner

Bacterial Structure and Function (GS-MV-417)
The course covers the physiology of bacterial cells with an emphasis on current research topics. The first part of the course is devoted to discussion of the components of the bacterial cell wall and their roles in pathogenesis, cell motility, cell structure, nutrient transport, and protein secretion. The next section of the course includes lectures on the regulation of bacterial function, including transcription, translation, and specialized functions unique to bacteria. Finally, mechanisms by which bacteria adapt to their environment are discussed.
Credits: 3
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Joseph Petrosino

Special Projects (GS-MV-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Special Topics (GS-MV-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Seminar in Molecular Virology (GS-MV-466)
Student Seminar
Credits: 1
Term: 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Readings (GS-MV-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Research Rotation (GS-MV-549)
Faculty mentored research for students who have not yet selected a faculty advisor
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Dissertation (GS-MV-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Robert Franklin Ramig

Neuroscience

Fundamentals of Human Neuroimaging (GS-NE-400)
Neuroimaging has rapidly become one of the most popular and powerful tools for neuroscience. This course surveys a variety of brain imaging modalities, describing what each measures and how the results are used for research. Neuroscience has classically relied on invasive electrode measurements, mostly in animals, to directly map electrical activity in the brain, and modem microelectrode arrays have expanded this method. Two other brain activity measurement schemes, electroencephalography (EEG) and magnetoencephalography (MEG), provide non-invasive measurements with excellent temporal resolution but limited spatial accuracy. Recently, magnetic resonance imaging (MRI) has become tremendously popular because it is non- invasive, involves no ionizing radiation, and offers substantial flexibility. In particular, MRI is used to measure brain structure in a variety of fashions, to measure white-matter connectivity using diffusion-weighted imaging (e.g., DTI), and to measure brain function (e.g., fMRI). Extensive techniques have been developed to localize and probe cortical activity in a variety of specialized areas. Optical imaging techniques have also contributed substantially to our understanding of brain function, mostly as an invasive technique in animal models. Positron-emission tomography (PET) provides additional specialized information about brain function. Students should have introductory physics and calculus capability at the freshman level.
Credits: 4
Terms: 1-2
Counts for 30 hr. requirement: Y
Director: Dr. David Ress

Neurobiology of Disease (GS-NE-422)
This course will cover important and scientifically tractable disorders of nervous system function. The course will expose the students to the incidence, clinical manifestations, pathophysiology and current scientific models of the causes and mechanisms of some of the most common disorders of brain and nervous system function and development throughout the lifespan. This is an advanced course assuming basic knowledge of neuroscience. Completion of an introductory course is required. Students outside the Neuroscience Graduate Program must receive permission from course director to register, as registration is limited to 20 students.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Jeffrey Noebels

Physiology of the Visual System (GS-NE-424)
This is an advanced level course on the physiology of the visual system. It covers the biochemistry, physiology and biophysics of phototransduction, synaptic transmission in the retina and functional architecture of the retina and central visual pathways. Additionally, principles of visual information processing in the eye and in the brain, mechanisms controlling eye movement and gaze stabilization are discussed.
Credits: 3
Terms: 4 (Not offered in AY18; odd year course) A minimum of four students must register for this course to be taught.
Counts for 30 hr. requirement: Y
Director: Dr. Samuel Wu

Analyses of Neuronal Function (GS-NE-431)
This course will cover the basic concepts of synaptic biology. The topics include the organization of the synapses, neurotransmitter release, neurotransmitter receptors, synaptic plasticity in learning and memory, synaptic organization of microcircuits, and synaptic dysfunction in diseases. Students will learn synaptic biochemistry, cell biology, and physiology and how to study synapses.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Mingshan Xue

Special Projects (GS-NE-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Matthew Rasband

Genetics for Neuroscience (GS-NE-441)
This course is intended to teach neuroscience students how to tackle neurobiological problems using genetic strategies and tools. Students will be exposed to the basic concepts in genetics and will be taught the advantages and approaches used in invertebrate model organisms, *C. elegans* and *D. melanogaster*, focusing on different genetic, cell biological and neurobiological tools available in those organisms. The course will also focus on mouse genetics, highlighting the different techniques and approaches commonly used in the mouse, followed by genetic approaches in humans.
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Ronald Parchem

Preparing for Your Neuroscience Qualifying Exam (GS-NE-447)
This course will explain the requirements and expectations of the qualifying exam in Neuroscience. The course is geared specifically towards second year students who have successfully completed their first year coursework and several months' work in their chosen thesis lab. The course will cover the format of the written and oral exams, tips for structuring the aims and scope of the written proposal, and provide students with opportunity to develop and deliver their oral presentation for feedback from the group. The goal of the course is to help students begin thinking about their work independently and to present their research problem and experimental goals clearly. Ultimately, this course is intended to encourage independent NRSA applications from those students who qualify.
Credits: 1
Term: 2
Counts for 30 hr. requirement: N
Directors: Dr. Joanna Jankowsky and Dr. Kim Tolias

Electrical Signaling in the Brain (GS-NE-448)
This course covers the basics concepts of electrical signaling from the chemical and physical principles involved, to the biological components involved in generating, modulating and transmitting electrical signals in the brain. Students will learn about the foundations of electrical signaling, how ion channel function and regulation actively regulate membrane potential, how to analyze membrane potential using circuitry methods, and how to understand how electrical signals propagate across long distances. Finally this course will explore some of the new methods to measure and manipulate electrical signaling in awake behaving animals.
Credits: 3
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Paul Pfaffinger

Neuroscience Lab I (GS-NE-449)
Students will be introduced to basic approaches of molecular and cellular neuroscience including learning how to model biological systems and how to perform basic laboratory techniques. Primary focus will be on understanding how to break complex neuronal systems down to enable useful computational analyses as well as the importance of design and controls in different experimental approaches. Students will be exposed to a combination of problem solving, practical demonstrations, and discussions of pluses and minuses for different approaches.
Credit: 1
Term 1
Counts for 30 hr. requirement: N
Director: Dr. Paul Pfaffinger

Neuroscience Lab II (GS-NE-450)
This course extends the practical laboratory demonstrations begun in GS-NE-449 with hands-on demonstrations in systems and computational neuroscience. Methods to be covered include classical and modern neuro-anatomical techniques, in vivo pharmaco- and opto-genetics, model systems behavioral assays, fMRI, and computational modeling among others. One hour lecture and 3 hour laboratory demonstration per week.
Credits: 1
Term: 2
Counts for 30 hr. requirement: N
Director: Dr. Russell Ray

Neural Systems I (GS-NE-455)
Neural Systems I course covers the mechanisms involved in processing sensory information by the brain. The course will cover the major sensory systems from organizational principles to the transformation of information. This course will cover the key topics in the processing of sensory information by the brain. The course will also introduce students to in depth analysis of important papers in systems neuroscience to better assist their development of critical reading skills. This course will prepare students for Neural Systems II which will cover how sensory inputs are transformed into motor actions by the brain. Following completion of this course students will understand the locations, functional organization, and functional significance of the main sensory processing streams in the central nervous system.
Credits: 3
Term: 3
Counts for 30 hr, requirement: Y
Director: Dr. Jeffrey Yau

Neural Systems II (GS-NE-456)
Neural Systems II course covers the mechanisms involved in transforming sensory inputs into motor action and higher brain functions. The course will cover the spinal, cortical, limbic and cerebellar systems involved in motor planning and execution, behavioral control, and learning and memory. This course will cover the key topics in translation of sensory inputs into patterns of motor behavior as well as brain circuits involved in higher cognitive functions. The course will also introduce students to in depth analysis of important papers in systems neuroscience to better assist their development of critical reading skills. Following completion of this course student will understand the locations, functional organization, and functional significance of the main motor pathways as well as key findings linking brain function to complex cognitive behaviors.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Roy Sillitoe
Prerequisites: Neural Systems I (GS-NE-455)

Theoretical Neuroscience: Networks and Learning (GS-NE-457)
This course provides and introduction to the mathematical theories of computation and learning by neural systems. These theories use concepts from dynamical systems (nonlinearities, attractors, chaos) and concepts from statistics (information, uncertainty, inference) to understand the properties and functions of brain computations (perception, cognition, and action).
Credits: 4
Term: 3-4
Counts for 30 hr. requirement: Y
Director: Dr. Zachary Pitkow
Prerequisites: Linear algebra, basic probability and statistics.

Brain Cell Biology and Development (GS-NE-459)
This course covers the basic molecular and cellular organization of the Nervous system. The first 2/3 of the course provides an overview and focal lectures on topics of particular importance to understanding molecular and cellular organization of neurons. The last third of the course covers aspects of neural development that integrates principles learned in the first 2/3 of the course.
Credits: 3
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Matthew Rasband

Concepts of Learning and Memory (GS-NE-462)
This course is designed to introduce graduate students to the field of learning and memory. The course will introduce the student to classical and modern concepts of learning and memory across all levels at which learning and memory is studied, including behavioral, anatomical, cellular, molecular and genetic levels of analysis. The basic concepts of learning and memory will also be related to known diseases of learning and memory.
Credits: 3
Term: 4
Counts for 30 hr requirement: Y
Directors: Dr. Mauro Costa-Mattioli and Dr. Daoyun Ji

Special Topics (GS-NE-463)
Scholarly study directed by a faculty member. Special Topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Matthew Rasband

Cellular Neurophysiology I (GS-NE-464)
This course provides a general background in cellular neurophysiology with an emphasis on an understanding of the properties of excitable nerve membranes and chemical synapses. The first part of the course covers the theory of ions in solutions, ion conduction through membranes, ion transport and distribution, nonlinear properties of neurons, nerve excitation and conduction, and stochastic properties of single ion channels. The second part of the course covers linear cable theory, multiple types of voltage-gated conductances, synaptic transmission including, quantal analysis; the role of calcium and transmitter release, various forms of synaptic plasticity.
Credits: 3
Term: 4 (Offered in AY18; even year course) A minimum of four students must register for this course to be taught.
Counts for 30 hr. requirement: Y
Director: Dr. Samuel Miao-Sin Wu

Anatomy of the Nervous System (GS-NE-471)
The course will cover the basic concepts in neuroanatomy in a combined lecture, demonstration, and hands-on lab format. The emphasis will be on the structural organization of the nervous system. A large part of the course will consist of lectures that cover a structure or region of the brain augmented by simultaneous hands-on dissection of fixed sheep brain tissue, histological photographs, and representative MRIs. The students will be divided into small teams and will dissect a sheep brain along with the instructor. It is expected that the teams will interact with the instructors as the lecture/demonstration progresses. Additional lectures and demonstrations will be used to compare and contrast mammalian brains with other species' brains commonly used in neuroscience research.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. David Shine
Prerequisites: Brain Cell Biology and Development (GS-NE-459)

Advanced Functional Magnetic Resonance Imaging Laboratory (GS-NE-472)
This laboratory course will teach students to use blood-oxygen level dependent functional magnetic resonance imaging (BOLD fMRI) to explore human brain function. BOLD fMRI is the most popular method for examining the human brain, but poses unique technical, methodological, and data analysis obstacles. Students will learn how to overcome these obstacles by designing experiments and collecting fMRI data using the 3-tesla MRI scanners in BCM's Core for Advanced Magnetic Resonance Imaging (CAMRI).
Credits: 2
Term: 4
Counts for 30 hr. requirement: N
Director: Meghan Robinson

Prerequisites: Fundamentals of Human Neuroimaging (GS-NE-400) and permission from Course Director

Theoretical Neuroscience: From Cells to Learning Systems (GS-NE-473)
The goal of this course is to introduce the most salient features of neural systems at the biophysical, cellular and systems levels, as well as to develop the ability to construct and test mathematical models from basic principles of biophysics. Upon completion of the course, students should be able to: (i) formulate and solve algebraic equations for the resting state of cells; (ii) formulate and solve differential equations for the dynamic state of cells and their interactions; (iii) use Fourier transforms to describe the response properties of visual neurons; (iv) apply probabilistic models to describe synaptic transmission and behavior; and (v) analyze the responses of networks of neurons and study learning in such networks.
Credits: 4
Terms: 1-2
Counts for 30 hr. requirement: Y
Director: Dr. Fabrizio Gabbiani

Seminar Journal Club in Neuroscience (GS-NE-474)
This course is required of all first and second year students enrolled in the Neuroscience Graduate Program. The course is conducted as a journal club to study the scientific literature, to practice critical analysis of the literature, and to develop and refine presentation skills. This course is coordinated with the Department of Neuroscience seminar series such that second-year students present papers from the laboratory of the upcoming seminar speaker. All students join in discussion of the paper and evaluation of the journal club presentation.
Credits: 1
Terms: 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Javier Medina and Dr. Jeannie Chin

Core Concepts in Computational Neuroscience (GS-NE-475)
How do brains compute? This course covers the basic concepts underlying neuronal computation, from individual neurons up to networks of neurons in circuits. The focus will be on achieving a computational level understanding: how populations of neurons compute tasks critical for the organism’s survival from sensory input. Students will also be exposed to key ideas from the field of Deep Machine Learning wherein artificial neural networks are employed to solve difficult real-world tasks.
Credits: 1
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Ankit Patel

Prerequisites: GS-NE-455 Neural Systems and GS-NE-456 Neural Systems II (can be taken concurrently)

Readings (GS-NE-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Matthew Rasband

Research Rotation (GS-NE-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Matthew Rasband

Dissertation (GS-NE-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Matthew Rasband

Pharmacology

Drug Discovery: From Bench to Bedside (GS-PG-414)
The objective of this course is to provide an overview of the making of a small-molecule drug. The topics include the identification of a drug target, bioassay development, structural biology, rational drug design and development, intellectual property protection as well as FDA regulations on new drug clinical trials.
Credits: 2
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. Yongcheng Song

General Pharmacology (GS-PG-426)
Basic pharmacological principles as they apply to basic research and to everyday life. The objectives of this course are to present the basic principles of pharmacology. Principles of pharmacodynamics, pharmacokinetics and major classes of therapeutic agents will be discussed.
Credits: 4
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Pui-Kwong Chan

Chemical Biology (GS-PG-427)
Chemical Biology is a scientific discipline spanning the fields of chemistry, biology, and physics. It involves the application of chemical techniques, tools, and analyses, and often compounds produced through synthetic chemistry, to the study and manipulation of biological systems. The course teaches topics including an introduction to chemical biology, bio-orthogonal ligand reactions, small molecule inhibitors for protein-protein interactions and epigenetics, chemoproteomics, sensors for living cells, and state-of-the-art imaging techniques. The course content emphasizes applications of chemical tools in solving biological and biomedical problems.
Credits: 2
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. Jin Wang

Special Projects (GS-PG-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Special Topics (GS-PG-463)
Scholarly study directed by a faculty member. Special topics allows a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Seminar in Pharmacology (GS-PG-466)
Student Seminar
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Readings (GS-PG-548)
Faculty directed literature projects that survey a specialized topic of interest
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Research Rotation (GS-PG-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Dissertation (GS-PG-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Choel Kim

Quantitative and Computational Biology

Computational Mathematics for Quantitative Biomedicine (GS-SB-401)
This course introduces essential computational, statistical and mathematical concepts to students who are interested in computational biology. It is intended that each of the concepts will be taught in the context of the real biological problems ranging from genomics bioinformatics, structural biophysics, computational neuroscience, systems biology, protein design, drug discovery, and medical bioinformatics
Credits: 8
Term: 1-2
Counts for 30 hr. requirement: Y
Director: Dr. Zhandong Liu

Computational Molecular Biophysics and Structural Biology (GS-SB-402)
This course is designed for students in computationally-oriented theoretical, biophysical, biomedical and bioengineering majors to introduce the principles and methods used for computer simulations and modeling of macromolecules of biological interest. Fundamental concepts in statistical mechanics, thermodynamics, and dynamics will be emphasized. Protein conformation/dynamics, empirical energy functions and molecular dynamics calculations, as well as other approaches will be described. Specific biological problems are discussed to illustrate the methodology. Classic examples such as the cooperative mechanisms of hemoglobin and more frontier topics such as the motional properties of molecular motors and ion channels as well as results derived from the current literature are covered. Other potential topics are protein folding/predictions, the nature of reaction rate enhancement in enzyme catalysis, physical chemistry properties of biologically relevant nano-materials, simulations of free energy changes in mutations, electrostatic properties of protein, molecular recognition, and the properties of binding sites. Particular emphasis is also given to the applications of molecular graphics. During the final reading period, each student carrier out an original research project that makes use of the techniques and grading is based on the written and oral presentations of the results from the final projects.
Credits: 6
Term: 1
Counts for 30 hr. requirement: Y
Director: Dr. Jianpeng Ma

Advanced X-ray Crystallography (GS-SB-403)
X-ray crystallography is a powerful technique to determine atomic resolution structures from small, inorganic molecules to large, multi-subunit macromolecular assemblies. This course covers both theory and practical applications starting with crystallization, crystal systems, and data processing to finding a structure solution, model building, and structure refinement/validation. The course will prepare students with diverse scientific backgrounds to expand their research to protein crystallography as an analytical tool to probe the structure-function relationship of proteins and enzymes at the atomic level.
Credits: 3
Term: 4 (Offered in AY18; even year course)
Counts for 30 hr. requirement: Y
Director: Dr. Francis T.F. Tsai

Computer-Aided Discovery Methods (GS-SB-405)
The objective of this course is to introduce students to the concepts, methods and tools relevant for computer-aided discovery using data collected using high-throughput technologies. The course will focus on the methods of integration of data, tools, and discovery processes and the methods of computational pattern discovery, hypothesis generation and testing. The students will master advanced applications of computing that enable new methods of discovery in a field of focus, which will initially be cancer biology. The course will not focus exclusively on technical, algorithmic or mathematical aspects nor will it focus on biology alone. Instead, the focus will be on genuine integration of the two fields.
Credits: 3
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Aleksandar Milosavljevic

Practical Introduction to Programming for Scientists (GS-SB-406)
In this course students will learn Python, one of the most widely used scripting languages in scientific computing. The course is primarily aimed at students with little or no programming background, but those with some programming experience in other languages wishing to learn Python are also welcome. The course covers basic programming concepts and data structures, and students will learn to write simple programs to improve their data processing productivity. We will also cover a number of open source scientific libraries available in Python (Biopython, SciPy, Matplotlib, etc.). Some basic familiarity with using a computer will be expected, and each student must have a laptop computer for use in class by the beginning of the term.
Credits: 3
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Steven J. Ludtke

Current Topics in Computational Biomedicine (GS-SB-407)
This course introduces graduate students to the diversity of biological and clinical research problems that benefit from computational approaches. On alternating weeks the students will be exposed to speakers, or they will present a journal club. The speakers are drawn from across BCM, the TMC, Rice University and the greater Houston area and occasionally will include outside seminar speakers. During this one hour, a format of two short talks from two different speakers will discuss some of the most salient current problems studied in their laboratories, often with a significant emphasis on computational aspects. Style and content vary but, generally, the level is introductory and accessible to all members of the audience. Topics range from genomics to clinical text-mining and from bioengineering to public health, representing the rich diversity of computational biology research in the Gulf Coast area. The following week, the students will present two papers at journal club. One paper will be drawn from the immediate literature of the past 3 months, and the second paper will be drawn from any past time period, focusing on highly cited past influential papers across the field of computational biology. The papers will be selected by the participating Faculty, drawn from the QCB program, with input from the students if they so desire.
Credits: 1
Term: 1, 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Oliver Lichtarge and Dr. Richard Sucgang

Molecular Biophysics: Methods and Principles (GS-SB-408)
This is a course lasting one semester (two BCM terms). It presents in lecture format a survey of the major techniques of molecular biophysics, and the underlying physical principles and mathematics on which they are based.
Credits: 6
Term: 1-2
Counts for 30 hr. requirement: Y
Director: Dr. Theodore Wensel

Electron Cryomicroscopy for Molecules & Cells (GS-SB-410)
This course discusses in-depth theoretical and practical techniques in structural biophysics with a particular emphasis on electron imaging and crystallography. The topics include cryo-specimen preparative techniques, electron microscope optics, image contrast theory, specimen radiation damage, single particle image reconstruction, tomographic reconstruction, density based modeling, 3-D visualization, biological knowledge discovery from cryo-electron imaging.
Credits: 2
Term: 4 (Not offered in AY18; odd year course)
Counts for 30 hr. requirement: N
Director: TBA

Structural Basis of Human Disease (GS-SB-423)
This course is designed for medical and graduate students to understand the potential use of structural information for solving disease problems and to be aware of the different structural and computational tools. Each one hour lecture will be jointly led by two instructors who will present the medical problems and the structural approaches towards solving them. Attendance is required for passing this course.
Credits: 1
Term: 4
Counts for 30 hr. requirement: N
Director: Dr. B.V. Venkatar Prasad

Advanced Topics in Structural & Computational Biology (GS-SB-430)
This course is designed for the QCB students to read current literature in structural and computation biology, to critically review the papers and to present the topic in front of an audience. This is run similar to a journal club. Under the supervision of the two faculty members, each student will pick a topic area, research the necessary papers and make a 50 minute lecture presentation.
Credits: 1
Term: 1, 2, 4
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Special Projects (GS-SB-435)
Faculty mentored research for students that have not been admitted to candidacy. Students are expected to consult with the faculty on the research topic to investigate; take part in laboratory research, read relevant literature, interact with laboratory personnel, attend regular research laboratory meetings, and report the research results to the faculty mentor regularly and at the end of the term.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Special Topics (GS-SB-463)
Scholarly study directed by a faculty member. Special topics allow a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Readings (GS-SB-548)
Faculty directed literature projects that survey a specialized topic of interest in computational biology and biophysics. The student will pick a topic of interest and do a literature research after consulting with the faculty; hold regular meetings to discuss with the faculty on the chosen topics, and write up a summary report at the end of the term to provide a critical review on the state of the art knowledge of the chosen topics of study.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Research Rotation (GS-SB-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Dissertation (GS-SB-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Aleksandar Milosavljevic

Translational Biology and Molecular Medicine

Animal Models of Human Disease (GS-TB-401)
This course is designed to expose students to methodologies employed in generating animal models for human diseases and in analyzing these models. The major emphasis is on mouse models, but other model organisms will be discussed as well.
Credits: 2
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. Cindy Buckmaster

Pathophysiology & Mechanisms of Human Disease (GS-TB-402)
This course will provide students with an understanding of the basic mechanisms of human disease with a systems biology perspective. Molecular defects at different levels including the gene, RNA, protein, cell, tissue, and organ will be covered. The focus is on helping students develop critical thinking skills that will help them approach complex scientific problems.
Credits: 2
Term: 4
Counts for 30 hr. requirement: Y
Director: Dr. Daniel Lacorazza

Translational Breast Cancer Research (GS-TB-405)
This course provides an introduction into current issues in translational breast cancer research. The course encompasses a series of lectures on problems in clinical breast cancer diagnosis and treatment, breast development, and evolution of breast cancer, and approaches to translational breast cancer research. The purpose of the course is to provide a broad understanding of clinical issues and problems in breast cancer, familiarize students with breast cancer from the clinician's standpoint, and with research areas of active development in the field.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Suzanne A. W. Fuqua

Introduction to Leadership Skills (GS-TB-407)
The objective of the course is to provide students with knowledge regarding the importance of leadership skills in their training and future career development. While leadership skills are essential components in career development, it is appreciated that leadership skills can't be taught and imparted upon students in a short didactic lecture-based setting. Therefore, the objective of this course is to introduce students to the basic concepts of leadership skills.
Credits: 1
Term: 3
Counts for 30 hr. requirement: N
Director: Dr. Suzanne A. W. Fuqua

Ethics, Conduct and Practical Aspects of Clinical Research (GS-TB-408)
This course is designed to provide students practical insight into the bioethical conduct, practical aspects, including types and categories of clinical trials and the different phases of translational research, as well as regulatory considerations of clinical and translational research. The course encompasses a series of interactive didactic lectures, homework assignments, and observation of an IRB meeting. The purpose of the course is to provide a broad understanding of bioethical issues within the context of clinical research, as well as an understanding of the complex relationship between investigators, their designees, and research subjects.
Credits: 2
Term: 5
Counts for 30 hr. requirement: Y
Director: Dr. Melissa Suter

Method and Logic in Translational Biology (GS-TB-409)
This course is intended to illustrate to first year graduate and medical students skills important for the translational biology researcher, through evaluation of two medical cases and translational research related to the cases. Reading material will provide information students need to progress with their evaluation of translational research pertaining to the medical case, as well as provide a context for training in how to read and interpret primary literature. Emphasis will be placed on discerning elegant experimental approaches, what constitutes a well-designed experiment with proper controls and considerations for moving discoveries from pre-clinical to clinical testing.
Credits: 2
Term: 3
Counts for 30 hr. requirement: Y
Director: Dr. Tor Savidge

Fundamentals of Epidemiology (GS-TB-410)
This course introduces the basic principles and methods of epidemiology, with an emphasis on critical thinking, analytic skills, and application to clinical practice and research. Topics include outcome measures, methods of adjustment, surveillance, quantitative study designs, and sources of data. The course is designed for professionals intending to engage in, collaborate in, or interpret the results of epidemiological research as a substantial component of their career.
Credits: 2
Term: 2
Counts for 30 hr. requirement: Y
Director: Dr. Michael Scheurer

Introduction to Pharmacoepidemiology and Pharmacogenetics (GS-TB-411)
The purpose of this course is to outline strategies to avoid serious systemic toxicities from chemotherapy and radiotherapy. This course will review the principles of pharmacogenetics and phamacogenomics, pharmacodynamics and pharmacokinetics, and will outline the impact of genetic polymorphisms in drug metabolism and other pathways on the toxicity of anticancer agents and other therapies. The emphasis is on research concepts and applications and the interdisciplinary nature of the field.
Credits: 1
Term: 3 (Offered in AY18; even year course)
Counts for 30 hr. requirement: N
Director: Dr. Michael Scheurer and Dr. Melanie Bernhardt

Special Projects (GS-TB-435)
Faculty mentored research for students that have not been admitted to candidacy.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Cliona Rooney

Special Projects Clinical (GS-TB-436)
Clinical faculty mentored research for students that have not been admitted to candidacy.
Credits: 3
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ignatia B. Van den Veyver

Special Topics (GS-TB-463)
Scholarly study directed by a faculty member. Special topics allow a faculty member to develop individualized courses for students. Special topics cannot be used to satisfy the 30 hr. course requirement.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ignatia B. Van den Veyver

TBMM: Bench to Bedside (GS-TB-466)
This course is designed to provide a forum for an in-depth discussion of translational research. Each term will cover one subject or a specific aspect of a larger topic to allow for a more detailed review of the biomedical literature. The emphasis is on student participation and the role of the faculty member(s) at any given session is to facilitate the discussion. Students are expected to have reviewed assigned article(s) prior to each session and come prepared with comments, criticisms, questions or points of discussion. The faculty member will typically provide a brief overview of the topic at hand to provide some perspective on the subject, but will not direct the discussion. An outside speaker of national prominence engaged in translational research relevant to the topic will give a school-wide talk and meet with the TBMM students.
Credits: 1
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. William J. Craigen

Seminar (GS-TB-467)
Students who have been admitted to candidacy (years 3 and above) will be required to present a seminar yearly on the topic of their ongoing thesis research project with emphasis on the translational aspects of their research project. The purpose of this course is to provide a forum for students to improve their knowledge and skills in planning, preparing and effectively presenting their scientific research to an inter-disciplinary audience.
Credits: 1
Term: 2, 3, 4
Counts for 30 hr. requirement: N
Director: Dr. Sundararajah Thevananther

Reading (GS-TB-548)
Faculty directed literature projects that survey a specialized topic of interest.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ignatia B. Van den Veyver

Research Rotation (GS-TB-549)
Faculty mentored research for students who have not yet selected a faculty advisor.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Ignatia B. Van den Veyver

Dissertation (GS-TB-550)
Thesis research directed by a faculty mentor and advisory committee. Open only to candidates for the Ph.D. or M.S. degree.
Credits: Variable
Term: 1, 2, 3, 4, 5
Counts for 30 hr. requirement: N
Director: Dr. Cliona Rooney

Tropical Medicine

Diploma in Tropical Medicine Module 1 (GS-TM-400)
This module is a component of the four-module Diplomat in Tropical Medicine program. This module will provide the learners with knowledge and basic understanding of epidemiology, biostatistics, ethics, health economics and public health policies. By the end of the module, learners will be able to explain epidemiological surveillance of emerging infectious diseases, perform basic biostatistics computation skills, and describe ethics, health economic, policy and other public health topics as they relate to global health.
Credits: 4
Term: 3
Counts for 30 hr requirement: N
Director: Dr. Kristy Murray and Dr. Laila Woc-Colburn

Seminar in Tropical Medicine - Global Health Policy (GS-TM-466)
This course consist of a series of weekly lectures on a topic in tropical medicine. Lectures will convey different themes in tropical medicine from one year to the next. The learning themes are global health policy, one health, globalization and the impact on Houston health, tropical medicine abroad, and tropical medicine research.
Credits: 1
Term: 3
Counts for 30 hr requirement: N
Director: Dr. Peter Jay Hotez

GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

Baylor College of Medicine

Degree Requirements
Academic Year 2018-2019

This document includes all degree requirements for programs in the Graduate School of Biomedical Sciences. A table of contents is included below.

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Biochemistry and Molecular Biology
CURRICULUM (FLEXIBLE TRACK)
(30 hours didactic credit required)

REQUIRED COURSES (* = Non-didactic credit courses)

Term 1	Organization of the Cell (2 hrs)
	Molecular Methods (3 hrs)
	Genetics A (2 hrs)
	**Thinking Like a Scientist (1 hr)*
	**Science as a Profession 1 (Ethics for first year students)* (0.5 hr)
	*Seminar in Biochemistry (1 hr)
	*Research Rotation
Term 2	Cell Division (2 hrs)
	Thinking Like a Scientist (2 hrs)
	**Science as a Profession 1 (Ethics for second year students)* (0.5 hr)
	*Seminar in Biochemistry (1 hr)
	*Research Rotation
Term 3	Macromolecules: Structure and Interactions (3 hrs)
	Gene Regulation (3 hrs)
	Thinking Like a Scientist (2 hrs)
	**Science as a Profession 1 (Ethics for third year students)* (0.5 hr)
	*Seminar in Biochemistry (1 hr)
	*Research Rotation
Term 4	Biostatistics for Biomedical and Translational Researchers (3 hrs)
	Thinking Like a Scientist (2 hrs)
	**Science as a Profession 1 (Ethics for fourth year students)* (0.5 hr)
	*Seminar in Biochemistry (1 hr)
	*Research Rotation
Term 5	*Research Rotation

FLEXIBLE REQUIRED ELECTIVES (choose at least 7 hrs from at least 3 different areas)

GENETICS

Term 2	Genetics B (2 hrs)
Term 3	Mammalian Genetics (2 hrs)
Term 4	Human Genetics (3 hrs)
Term 4	Genetics of Animal Viruses (3 hrs) *odd years only*

DEVELOPMENT

Term 1	Classic Developmental Biology (2 hrs)
Term 2	Development (2 hrs)
Term 3	Evolutionary Conservation of Developmental Mechanisms (3 hrs)
Term 4	Neural Development (3 hrs)

IMMUNOLOGY

Term 2	Immunology (3 hrs)
Term 3	Immunology (1 hr)
Term 5	Molecular Immunology (3 hrs)

NEUROSCIENCE

Term 2	Neuroanatomy: Functional Organization of the CNS (2 hrs)
Term 3	Neuroscience (1 hr)
Term 3	Genetics of Neuroscience (2 hrs)
Term 4	Neural Development (3 hrs)
Term 4	Neurobiology of Disease (3 hrs)

DISEASE

Term 1	Cellular & Molecular Basis of Disease (2 hrs)
Term 2	Cancer (1 hr)
Term 4	Pathophysiology & Mechanisms of Human Disease (3 hrs)
Term 4	Introduction to Molecular Carcinogenesis (3 hrs)
Term 4	Gene & Cell Therapy (2 hrs)
Term 4	Biology of Aging & Age-Related Diseases (3hrs)

STRUCTURE & INFORMATICS

Term 2	Bacterial Structure & Function (3 hrs)
Term 2	ABC: Applications to Biology of Computation (2 hrs)
Term 3	Practical Introduction to Programming for Scientists (3 hrs) *even years only*
Term 4	Computer-Aided Discovery Methods (2 hrs)
Term 4	Electron Cryomicroscopy for Molecules & Cells (3 hrs) *odd years only*
Term 4	Advanced X-Ray Crystallography (3 hrs) *even years only*
Term 4	Bioinformatics & Genomic Analysis (3 hrs)

WILD CARDS

Term 2	Method & Logic in Molecular Biology (3 hrs)
Term 4	Regulation of Energy Homeostasis (2 hrs)

OTHER

Term 4	*Introduction to Scientific Writing (1 hr) (Note: ISW is NOT a didactic course; thus, will not count towards your 30 required credit hours)

BMB CURRICULUM (BIOPHYSICS TRACK)
(30 hours didactic credit required)

REQUIRED COURSES (*Non-didactic credit courses)

Term 1 Organization of the Cell (2 hrs)
Molecular Methods (3 hrs)
Molecular Biophysics I (3 hrs) (Rice U)
**Thinking Like a Scientist (1 hr)*
**Science as a Profession (Ethics for first year students)* (0.50 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 2 Molecular Biophysics II (3 hrs) (Rice U)
Thinking Like a Scientist (2 hrs)
**Science as a Profession (Ethics for second year students)* (0.50 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 3 Gene Regulation (3 hrs)
Thinking Like a Scientist (2 hrs)
**Science as a Profession (Ethics for third year students)* (0.50 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 4 Thinking Like a Scientist (2 hrs)
**Science as a Profession (Ethics for fourth year students)* (0.50 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 5 *Research Rotation

FLEXIBLE REQUIRED ELECTIVES (choose 10 hours of electives, with at least 6 hours from the Biophysics List, to reach total of 30 didactic hours)

BIOPHYSICS
Term 2 ABC: Applications to Biology of Computation (2 hrs)
Term 2 Computational Mathematics for Biomedical Students (4 hrs)
Term 3 Computer-Aided Discovery Methods (2 hrs)
Term 3 Macromolecules: Structure and Interactions (3 hrs)
Term 4 Electron Cryomicroscopy for Molecules & Cells (3 hrs) *odd years only*
Term 4 Advanced X-Ray Crystallography (3 hrs) *even years only*

CELL BIOLOGY (This is only a partial list; check with the Program Director for other choices)
Term 1 Genetics A (2 hrs)
Term 1 Cellular & Molecular Biology of Disease (2 hrs)
Term 2 Method and Logic in Molecular Biology (3 hrs)
Term 2 Cell Division (2 hrs)
Term 2 Cancer (1 hr)

OTHER
Term 4 *Introduction to Scientific Writing (1 hr) (Note: ISW is NOT a didactic course; thus, will not count towards your 30 required credit hours)

BMB CURRICULUM (MSTP TRACK)
(30 hours didactic credit required)

REQUIRED COURSES (* = Non-didactic credit courses)

Term 1
Molecular Methods (3 hrs)
Genetics A (2 hrs)
**Thinking Like a Scientist (1 hr)*
**Science as a Profession 1 (Ethics for first year students)* (0.5 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 2
Cell Division (2 hrs)
Thinking Like a Scientist (2 hrs)
**Science as a Profession 1 (Ethics for second year students)* (0.5 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 3
Macromolecules: Structure and Interactions (3 hrs)
Gene Regulation (3 hrs)
Thinking Like a Scientist (2 hrs)
**Science as a Profession 1 (Ethics for third year students)* (0.5 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 4
Biostatistics for Translational Researchers (3 hrs)
Thinking Like a Scientist (2 hrs)
**Science as a Profession 1 (Ethics for fourth year students)* (0.5 hr)
*Seminar in Biochemistry (1 hr)
*Research Rotation

Term 5
*Research Rotation

ELECTIVES (9 hrs) Medical school coursework will substitute for all elective requirements according to the table below.

Medical School Course	**# of lectures**	**Graduate School Course**	**# of lectures**	**GSBS Transfer Credit**
Core concepts (Foundations Basic to the Science of Medicine	20	Organization of the Cell (220-501)	15	2 term hrs
Hematology/Oncology	19	Cancer (220-508)	5	1 term hr
Neuroscience (Nervous System)	51	Neuroscience (220-511)	5	1 term hr
Immunology	40	Immunology (220-512)	5	1 term hr
Immunology	40	Immunology (344-423)	21	3 term hrs
Core Concepts (term 1) Core Concepts (term 2) Foundations Basic to the Science of Medicine: Cardiovascular-Respiratory-Renal System Core Concepts (term 3) Foundations Basic to the Science of Medicine: Gastrointestinal System, Metabolism System, Endocrine System and Reproductive System (GIMNER) Nervous System (terms 5 & 6)	11 41 27 11	 Human Physiology I Human Physiology II	 48 for both	 6 term hrs for both

J. Degree Requirements

Requirement	MS Track	PhD Track
Complete 84 term-hours of credit	✓	
Complete 180 term-hours of credit		✓
Write an NIH K-type or other career development award proposal	✓	✓
Pass the Quantifying Progress Review	✓	
Pass the Qualifying Examination		✓
Admission to Candidacy	✓	✓
Serve on an IRB and attend a minimum of 6 meetings	✓	✓
Complete the proposed research	✓	✓
Obtain “permission to write” from the thesis advisory committee	✓	✓
Submit a thesis to Thesis Advisory Committee	✓	✓
Successfully present the completed project to their thesis advisory committee. The program director or co-director will attend.	✓	
Successfully defend the completed thesis in a public defense. The program director or co-director will attend.		✓

K. Certificate of Added Qualification (CAQ) students

CAQ students must pass the CSTP required courses and complete development of a K-type award proposal. In addition, CAQ students are expected to attend the annual retreat.

APPENDIX A:

Director: Dr. Ashok Balasubramanyam

Co-Directors: Drs. Jesus Vallejo and Fred Pereira

Executive Steering Committee Members:

Drs. Susan Blaney, David Corry, and Hardeep Singh

Academic Administrator: Kelly Levitt

APPENDIX B:

Courses required for all CSTP students:

GS-CT-400, Fundamentals of Clinical Investigation (FCI)

The objective of this course is to train students to interpret the results of other clinical investigators and to use the knowledge for providing state-of-the-art care for their patients. The course includes four modules reflecting specific areas relevant to a clinical researcher. These modules are: principles of clinical research; statistical methods in clinical research; clinical research - related issues.

GS-CT-408, Responsible Conduct of Research for Clinical Investigators (RCRCI)

This course, or equivalent GS course(s) approved by the Senior Associate Dean of the Graduate School, is required.

The RCRCI course is designed for the early career scientist/clinical or translational investigator, and will provide students with a fundamental competency and appreciation for the core topics within the ethical dimensions of biomedical research, as described below. During this eight-hour course, students will receive lectures from faculty with expertise in each of these core topics, to be followed by small group case study discussions illustrating ethics topics from the preceding lecture. This course is designed to meet NIH requirements for training in the responsible conduct of research.

Clinical Investigation for the Career Scientist (CICS)

A year-long series of courses with a strong emphasis on grant writing and preparing an NIH “K” or equivalent career development award proposal.

GS-CT-403, CICS I: Grant Development for Clinical Investigators

This course provides students with the skills to develop an important research question, formulate strong hypotheses and specific aims, and begin to draft the components of a career development grant proposal.

GS-CT-404, CICS II: Clinical Trials for Clinical Investigators

This course provides students with an understanding of the theory and practice of conducting scientifically rigorous clinical trials. Building on the work of the previous CICS I course and from knowledge gained from the Fundamentals in Clinical Investigation course, students will fully develop the hypothesis, specific aims, and experimental design of their projects.

GS-CT-405, CICS III: Translational Research for Clinical Investigators

This course provides students with an understanding of the theory and practice of conducting scientifically rigorous clinical trials. Building on the work of the previous CICS I course and from knowledge gained from the Fundamentals in Clinical Investigation course, students will fully develop the hypothesis, specific aims, and experimental design of their projects.

GS-CT-406, CICS IV: Health Services Research for Clinical Investigators

This course provides students with an understanding of the theory and practice of health services research. Building on the work of the previous term, students will continue the development of a K-type grant proposal.

GS-CT-407, CICS V: Evaluating a Completed Career Development Grant

This course provides students with an appreciation of the NIH study section review process and a completed career development award.

CSTP students enrolled in the M.S. and Ph.D. degree programs must take additional courses, as described below:

Selectives

Graduate students must take at least two of the following four courses that are offered through the Baylor GSBS:

- GS-GS-427, ABC-Applications to Biology of Computation
- GS-TB-403, Biostatistics for Translational Researchers or equivalent
- GS-SB-405, Computer Aided Discovery Methods (“Omics”)
- GS-CT-408, Development and Commercialization of Biomedical Discoveries
- GS-GS-519, Introduction to Scientific Writing
- GS-PG-414, Drug Discovery: From Bench to Bedside

Developmental Biology

2018 Graduate Program Curriculum

Developmental Biology students are required to take all of the required courses with a grade of B or better and an additional 6 hours of elective credits, totaling at least *31 didactic hours*. Additional quantitative electives are highly recommended. (D) – denotes didactic courses
Students are encouraged to continue their education throughout graduate training and may consider auditing courses of interest (without earning credit hours) provided they have agreement from the course director.

	Course #	Course Title	Credits	Course Director
REQUIRED in YEAR 1:				
Term 1				
	GS-DB-402	Classical Developmental Biology	2 (D)	Poche/Lewis
	GS-GS-501	Organization of the Cell	2 (D)	Bissig/Sifers
	GS-GS-502	Molecular Methods	3 (D)	Weigel
	GS-GS-503	Genetics A	2 (D)	Herman/Dierick
	GS-GS-528	Responsible Conduct of Research - Year 1	0.5	Bertuch
Term 2				
	GS-GS-504	Genetics B	2 (D)	Zhou
	GS-GS-505	Cell Division	2 (D)	Ira/Chang
	GS-GS-506	Development	2 (D)	Groves
	GS-GS-508	Cancer	1 (D)	Pangas
	GS-DB-466	Seminar in Developmental Biology	1	Groves
Term 3				
	GS-DB-422	Evolutionary Conservation of Developmental Mechanisms	3 (D)	Groves
		Gene Regulation	3 (D)	Cooper
		Neuroscience	1 (D)	Jankowsky
	GS-DB-466	Seminar in Developmental Biology	1	Groves
Term 4				
	GS-DB-403J	Neural Development	3 (D)	Arenkiel/Sillitoe
	GS-DB-425	Topics in Development	3 (D)	Nakada/Wythe
	GS-GS-521	Introduction to Biostatistics **A different quantitative course may be substituted upon Director's approval.*	2 (D)	Minard
	GS-DB-466	Seminar in Developmental Biology	1	Groves
REQUIRED in YEAR 2:				
Term 2				
	GS-DB-400	Preparing for your Developmental Biology Qualifying Exam	1	Samuel/Arenkiel
	GS-GS-529	Responsible Conduct of Research - Year 2	0.5	Bertuch
	GS-DB-466	Seminar in Developmental Biology		Groves
Term 3				
	GS-DB-466	Seminar in Developmental Biology	1	Groves
Term 4				
	GS-DB-466	Seminar in Developmental Biology	1	Groves
REQUIRED in YEARS 3-4:				
Year 3, Term 3: Responsible Conduct of Research, GS-GS-530 **Year 4, Term 3**: Responsible Conduct of Research, GS-GS-531 **Years 3-4, Terms 2-4**: Seminar in Developmental Biology, GS-DB-466				

7. Required Courses (Ratified by the CPC June 2017)

7.1.Students shall pass the following courses before being Admitted to Candidacy.

7.2.**Students shall pass the following courses before being Admitted to Candidacy.**

Term	Course Title (credits)
1	*Organization of the Cell* (2)
	Molecular Methods (3)
	Genetics A (2)
	Logic and Presentation of Problem-Solving Science (1)
	Research Rotation (3)
	Journal Club (1)*
	Seminars in Immunology Research (1)
2	*Introduction to Immunology* (3)
	Cell Division (2)
	Logic and Rhetoric of Writing Science (1)
	Journal Club (1)
	Research Rotation (3)
	Seminars in Immunology Research (1)
3	*Regulation of Immune Response* (3)
	Gene Regulation (3)
	Macromolecules: Structure & Function (3)
	Research Rotation (3)
	Journal Club (1)
	Seminars in Immunology Research (1)
4	*Molecular Immunology* (3)
	Introduction to Biostatistics for Translational Research (3) or ***Introduction to Biostatistics*** **(GS-GS-521) (2)**
	Logic and Rhetoric of Writing Proposals (1)
	Journal Club (1)
	Seminars in Immunology Research (1)
5	*Clinical Aspects of Immunology* (3)
	Journal Club (1)
	Seminars in Immunology Research (1)

7.2.1. **Exceptions:** Students may request a waiver for courses for which they have had an equivalent. Students may transfer graduate level course credits to fulfill part of the requirement of thirty didactic credits. Waivers and transfers are subject to approval by the Curriculum and Progression Committee, the Program Director, and the Dean of the Graduate School of Biomedical Sciences.

8. Research Rotations

8.1. The purpose of the Research Rotations is to allow a student to experience the culture of the prospective laboratory, get to know the prospective Major Advisor, and explore research possibilities in that lab.

8.2. According to GSBS rules, students must rotate in three different laboratories but official commitment to any laboratory but are allowed four rotations. Under special circumstances, a fifth rotation is permitted under conditions to be specified by the Program Director

8.3. Rotations are subject to approval by Rotation Advisor and the Program Director.

8.4. Before the end of the first week of the rotation, students and their Rotation Advisors shall submit a Rotation Plan (see Appendix)

8.5. Following each Rotation, students and Rotation Advisors will separately report Rotation Evaluation Reports (see Appendix)

9. Journal Club (Ratified by the CPC June 2017)

9.1. Rules for students matriculating in or after 2017. The Program in Immunology requires the students be enrolled in the course for the Program in Immunology Journal Club for four terms each academic year, until they have been granted Permission to Write. (See Course Description in Appendix for details)

9.1.1. Briefly, students attend five terms each year and must present once every thirty sessions of the official JC.

9.1.2. The location and time of the Journal Club shall be determined by the Program Director in consultation with the Curriculum and Progression Committee and the Course Director.

9.1.3. Because of decisions by the Curriculum Committee of the Graduate School of Biomedical Sciences, students operating under the Policy adopted in 2016 must follow the rules of 2017.

9.2. **Rules for students matriculating before 2016.**

9.2.1. Rules for JC are in JC policy adopted in 2008. (See Appendix @), unless students opted into a newer policy.

9.2.2. Briefly, students register for JC every term until Admitted to candidacy. They must present a minimum of six (6) time and record 212 attendances.

10. The Methodological Annex (TMA) (Ratified by the CPC June 2017)

10.1. **Summary** TMA is provided to first and second year immunology graduate students who have yet to pass their qualifying exam. The course is an adjunct to the weekly immunology journal club and reviews the scientific and logical methods and procedures used in the literature. Students are assigned a specific question stemming from the current journal club paper and present their answer in a 15 minute chalk talk to the class.

10.2. **Specific needs addressed by TMA:** This course serves as skills preparation for the qualifying exam. It does this by reviewing the mechanisms and logic of scientific methods, techniques, models, reagents and procedures used in the literature that are often overlooked in the reading of published papers. Further, the course prepares student by

INTEGRATIVE MOLECULAR AND BIOMEDICAL SCIENCES GRADUATE PROGRAM
FIRST YEAR CURRICULUM
(30 hours didactic credit required/courses in *italics* are not didactic/minimum three rotations required)

TERM 1 REQUIRED COURSES	**FLEXIBLE REQUIRED COURSES**	**ELECTIVES**
GS-GS-501 Organization of the Cell (2 hrs)		See GSBS Schedule of Classes for electives
GS-GS-502 Molecular Methods (3 hrs)		
GS-GS-503 Genetics A (2 hrs)		
GS-GS-528 Resp Conduct Res (Ethics) Yr 1 (1 hr)		
GS-MB-466 IMBS Seminar (1 hr)		
GS-MB-401 IMBS Director's Course (1hr)		
GS-MB-549 Research Rotation (3 hrs) OR		
GS-MB-548 Reading (0-1 hr)		
TERM 2 REQUIRED COURSES	**FLEXIBLE REQUIRED COURSES**	**ELECTIVES**
GS-GS-505 Cell Division (2 hrs)	GS-GS-504 Genetics B (2 hrs)	GS-TB-405 Translational Breast Cancer Res (2 hrs)
GS-GS-523 Method & Logic in Mol Biol (3hrs)**	GS-GS-506 Development (2 hrs)	GS-GS-427 ABC-Applications to Biol of Comp (2 hrs)
GS-MB-466 IMBS Seminar (1 hr)	GS-GS-508 Cancer (1 hr)	
GS-MB-401 IMBS Director's Course (1hr)	GS-MB-431 Translational Cancer Biology (2 hrs)***	See GSBS Schedule of Classes for more electives
GS-MB-549 Research Rotation (1-4 hrs) OR	GS-IM-423 Immunology (3 hrs)	
GS-MB-548 Reading (0-1 hr)	GS-MV-417 Bacterial Structure and Function (3 hrs)	
TERM 3 REQUIRED COURSES	**FLEXIBLE REQUIRED COURSES**	**ELECTIVES**
GS-GS-518 Macrom: Structure & Interactions (3 hrs)	GS-GS-511 Neuroscience (1 hr)	GS-CB-400 Explorative Data Analysis (2 hrs)
GS-GS-509 Gene Regulation (3 hrs)	GS-GS-512 Immunology (1 hr)	GS-CB-426 Integrated Microscopy (2 hrs)
GS-TB-409 Method & Logic in Transl Bio (2 hrs)**	GS-GE-421 Mammalian Genetics (2 hrs)	
GS-MB-466 IMBS Seminar (1 hr)	GS-DB-422 Evolutionary Conservation of Developing Mechanisms (2 hrs)	See GSBS Schedule of Classes for more electives
GS-MB-401 IMBS Director's Course (1hr)		
GS-MB-549 Research Rotation (1-4 hrs) OR	GS-IM-425 Regulation of Immune Responses (3 hrs)	
GS-MB-548 Reading (0-1 hr)		
TERM 4 REQUIRED COURSES	**FLEXIBLE REQUIRED COURSES**	**ELECTIVES**
GS-GS-532 Biostats Biomed & Transl Res (3 hrs)	GS-CB-457 Intro to Molecular Carcinogen (3 hrs)***	GS-GS-522 Research Design (3 hrs)
GS-MB-466 IMBS Seminar (1 hr)	GS-MB-430 Biol of Aging & Age Related Dis (3 hrs)*	GS-TB-402 Pathophys & Mech of Human Dis (2 hrs)
GS-MB-401 *IMBS Director's Course (1hr)*	GS-NE-462 Concepts of Learning & Memory (3 hrs)	
GS-MB-549 Research Rotation (3-8 hrs)OR	GS-DB-403 Neural Development (3 hrs)	See GSBS Schedule of Classes for more electives
GS-MB-548 Reading (0-1 hr)	GS-NE-422 Neurobiology of Disease (2 hrs)	
	GS-MV-411 Gen of Animal Viruses (3hrs) odd yrs only	
	GS-GE-403 Gene and Cell Therapy (2hrs)	
	GS-IM-428 Molecular Immunology (3 hrs)	
TERM 5 REQUIRED COURSES	**FLEXIBLE REQUIRED COURSES**	**ELECTIVES**
GS-MB-549 Research Rotation (6-12 hrs) OR		GS-TB-401 Animal Models of Human Disease (2 hrs)
GS-MB-548 Reading (0-1 hr)		
		See GSBS Schedule of Classes for more electives

One course is required from each of the colors in the Flexible Required Courses column (Category 1-Cancer/Aging, Category 2-Genetics, Category 3-Development/Neuroscience, Category 4-Immunology/Microbiology/Virology * Biology of Aging course required for all Biology of Aging Track students ** Either course will fulfill requirement. ***Required for all Cancer Track students.

The Department of Molecular & Cellular Biology
Requirement Checklist For Students Matriculating in 2018

Students must satisfactorily complete the Service Curriculum before taking the Qualifying Examination in the Department of Molecular and Cellular Biology.

Service Courses [16 didactic credits]	Term Taken
GS-GS-501 Organization of the Cell **[2]**	
GS-GS-502 Molecular Methods **[3]**	
GS-GS-503 Genetics **A [2]**	
GS-GS-504 Genetics **B *[2]**	
GS-GS-505 Cell Division **[2]**	
GS-GS-506 Development *** [2]**	
GS-GS-518 Macromolecules: Structure and Interactions **[3]**	
GS-GS-509 Gene Regulation **[3]**	
GS-GS-518 Science as a Profession – Term 1 year 1 = ethics	
GS-GS-515 Science as a Profession - Term 2 year 2 = ethics	
GS-GS-516 Science as a Profession - Term 3 year 3 = ethics	

GS-GS-504 Genetics B or GS-GS-506 Development may be taken.

Department Requirements [5 didactic credits]	Term Taken
GS-CB-425 Cellular Signaling **[3]**	
GS-CB-461 Cells, Tissues & Organs **[2]**	
GS-CB-465 Introduction to Research and Research Proposals	
GS-CB -466 Seminar 1 (required)	
GS-CB -466 Seminar 2 (required)	
GS-CB -466 Seminar 3 (required)	
GS-CB -466 Seminar 4 (required)	
GS-CB -548 Reading 1 (required)	
GS-CB -548 Reading 2 (required)	
GS-CB -548 Reading 3 (recommended)	
GS-CB -548 Reading 4 (recommended)	
GS-CB -549 Rotation 1 (required)	
GS-CB -549 Rotation 2 (required)	
GS-CB -549 Rotation 3 (required)	
GS-CB -549 Rotation 4 (recommended)	

Elective Courses (at least 3 courses) [8+ didactic credits]	Term Taken
GS-CB-426 Integrated Microscopy **[2]**	
GS-CB-470J Neuroanatomy **[2]**	
GS-CB-406 Reproductive Biology **[3]**	
GS-CB-457J Introduction to Molecular Carcinogenesis **[3]**	
GS-CB-459J Bioinformatics and Genomic Analysis **[3]**	
GS-CB-462J Concepts of Learning & Memory **[3]**	
GS-GS-508 Cancer*** [1]**	
GS-GS-511 Neuroscience*** [1]**	
GS-GS-512 Immunology*** [1]**	
GS-GS-521 Introduction to Biostatistics **[2]**	
GS-MB-430 Biology of Aging & Age Related Disease **[3]**	
GS-IM-423 Immunology **[3]**	
GS-GE-421 Mammalian Genetics **[2]**	
GS-GE-403 Gene and Cell Therapy **[2]**	
GS-GE-407 Basic Biostatistics [retired 2012]	
GS-PY-430 Human Physiology I **[3]**	
GS-PY-431 Human Physiology II **[3]**	
GS-TB-405 Translational Breast Cancer Research **[2]**	
GS-TB-403 Biostatistics for Translational Researchers **[3]**	
GS-MB-431 Translational Cancer Biology **[2]**	

Revised 04/15/2020

GS-CB-468 Regulation of Energy Homeostasis **[2]**	
GS-GS-427 ABC: Applications to Biology of Computation **[2]**	
GS-GS-400 Explorative Data Analysis **[2]**	
GS-SB-406 Practical Intro to Programming for Scientists **[3]**	
GS-GS-532 Biostatistics for Biomedical Translational Researches **[3]**	
GS-NE6201 Analyses of Neuronal Function A Fall 2019	

Changes in the Major Thesis Advisor and/or the Thesis Research Advisory Committee membership must be approved by the Dean. Appointments are made upon written request. The Graduate School form, Request for Appointment of Student's Advisory Committee, must be refiled in the Graduate School Office.

VI. PROGRAM DESCRIPTION

A. Required Courses

The program provides didactic training in a variety of areas of Genetics.

Required courses for all students include the following:

Genetics A (2 hrs)
Responsible Conduct of Research- Year 1 (1 hr)
Method and Logic in Molecular Biology (3 hrs)
Genetics B (2 hrs)
Gene Regulation (3 hrs)
Human Genetics (3 hrs)
Introduction to Biostatistics for Translational Researchers (3 hrs)
Seminars in Molecular & Human Genetics (3 terms)
Student Research Seminars (4 terms)
A minimum of three Laboratory Rotations (Research Rotations)

Required courses **for students in the regular track** include the following (in addition to the courses listed above):

Molecular Methods (3 hrs)
Organization of the Cell (2 hrs)
Mammalian Molecular Genetics (2 hrs)

Required courses **for students in the BiGSB track** include the following (in addition to the courses listed above):

Introduction to Data Mining (2 hrs)

Typically, students would complete the required courses, and a minimum of 3 laboratory rotations (8 weeks each) by the end of the fifth term.

Requirements may be waived by the Graduate Education Committee based on the student's background in various subject areas. Students may petition the GEC for such waivers. Seminars in Molecular & Human Genetics is a required course for all first and second-year students.

B. Elective Courses

Students are required to complete a minimum of 60 term hours of course work, of which 30 term hours must be in courses that either have a letter grade assignment or are specifically designated by the Graduate School as “approved pass/fail” graded courses (e.g. Method and Logic in Molecular Biology and Research Design). Please note that completion of the required courses above will satisfy 23 of the 30 hours; therefore, a minimum of 7 course hour of electives will be required for students entering in 2017. Selection of elective courses will be made in consultation with the thesis advisor or the Director of the Graduate program.

Highly recommended electives include:

Introduction to Data Mining (required for BiGSB track students)
Cell Division
Development
Cancer
Neuroscience
Immunology
Computer-Aided Discovery Methods
Practical Introduction to Programming for Scientists
Macromolecules: Structure and Function
Gene and Cell Therapy
Concepts of Learning & Memory
Biology of Aging & Age Related Diseases
Research Design
Computer-Aided Discovery Methods
Introduction to Medical Genetics

Transfer of credit for work completed at another university or in another advanced program may be requested. No more than 60 term hours (30 semester) may be submitted for transfer. Transfer credit can only be granted for courses receiving a grade based on performance on an examination. No research or seminar credit will be transferred. Requests for transfer must be approved by the Director of Graduate Studies and the GEC for first year students, or the Major Advisor and the student's thesis committee for more senior students. Subsequently, the request is sent to the Promotions Committee of the Graduate School for final decision on acceptance.

C. Laboratory Rotations

Laboratory rotations (Research Rotations) are to be conducted in a minimum of three <u>different</u> laboratories. Students who wish to petition for a reduction in the number of required rotations may submit a written request for review by the GEC. Incoming students who work full-time for a minimum of four weeks in the lab of a faculty member participating in the MHG Graduate Program may count that work as a research rotation. To request approval for summer work to count as a rotation, the student should submit a written request to the GEC.

Laboratory rotation (Research Rotation) credit hours are considered course hours by the Graduate School and contribute to the total of 60 credit hours that are required for graduation. Students should expect to spend approximately 3 hours per week per credit hour in the laboratory during a rotation. The rotation period ends when classes end at the beginning of the study period before exams. Students and faculty should discuss the work schedule of the student, the class time and course load. The specific issue of time off for studying for mid-term and final examinations should be addressed at the time the student is considering doing a rotation in the lab. Major departmental events such as the annual retreat are very important for the students and rotation demands should not compromise their ability to attend these activities.

The grade of Pass/Marginal Pass/Fail is given for a rotation. The students should discuss with the faculty how they will be evaluated and should meet to evaluate the student's progress during the rotation period at various points (for example 2 to 3 weeks after the rotation starts, after mid-term and at the end). One of the major purposes of the rotation is to permit students to explore various experimental systems and laboratory settings in order to better select a thesis advisor. If a faculty member is unable to take a student for the coming year for thesis research, the student should be advised of this situation.

Because the terms are only 8-10 weeks in length, the academic demands are high, and many of the students are inexperienced in laboratory work, much of the "education" of the rotation is likely to be introducing students to the overall goals of the laboratory's research and instruction in basic laboratory skills.

It is expected that the faculty will make no commitments or request a commitment from a student prior to the completion of three rotation periods. The students need the opportunity to explore various labs without the pressure of "losing out" for a position in a particular lab that has more than one student interested.

D. Seminars and Retreats

1. Faculty Research Presentations: In the first term, faculty will meet with students to briefly describe their research interests. This activity is not a course and no credit is received; nevertheless it is an integral part of the training program. It is a particularly valuable way for students to learn about research activities of the department and to select future rotation sponsors and potential thesis sponsors.

2. Departmental Seminars: Participation and attendance at the departmental seminars and retreats are an important part of graduate training. Student attendance is expected throughout this term as a graduate student and should be strongly encouraged by the faculty preceptor.

VII. TYPICAL PROGRAM IN MOLECULAR AND HUMAN GENETICS

First Term	**Credit Hours**
Organization of the Cell (required for regular track)	(2)
Molecular Methods (required for regular track)	(3)
Genetics A	(2)
Responsible Conduct of Research	(1)
Student Research Seminar	(1)
Introduction to Data Mining (required for BiGSB elective for regular track)	(2)
Research Rotation	(4)
Second Term	
Genetics B	(2)
Method and Logic in Molecular Biology	(3)
Student Research Seminar	(1)
Cancer (elective)	(1)
Cell Division (elective)	(2)
Development (elective)	(2)
Research Rotation	(1-6)
Third Term	
Gene Regulation	(3)
Mammalian Molecular Genetics (elective for BiGSB track)	(2)
Seminars in Molecular & Human Genetics	(1)
Student Research Seminar	(1)
Macromolecules Structure and Function (elective)	(3)
Neuroscience (elective)	(1)
Immunology (elective)	(1)
Practical Introduction to Programming for Scientists (elective)	(3)
Explorative Data Analysis	(2)
Research Rotation	(2-5)
Fourth Term	
Human Genetics	(3)
Introduction to Biostatistics for Translational Researchers	(3)
Seminars in Molecular & Human Genetics	(1)

Student Research Seminar	(1)
Gene and Cell Therapy (elective)	(2)
Computer-Aided Discovery Methods (elective)	(3)
Concepts of Learning & Memory (elective)	(3)
Biology of Aging & Age Related Diseases (elective)	(3)
Research Design (elective)	(3)
Introduction to Medical Genetics	(3)
Research Rotation	(1-4)

Fifth Term

Seminars in Molecular & Human Genetics	(1)
Research Rotation	(11)

VIII. QUALIFYING EXAMINATION

Upon completion of the first year of study students will be evaluated on the basis of their academic performance and by completion of the Qualifying Examination. The format of this examination is the definition of a novel research problem and the development of a proposal to address the stated question and hypothesis. The significance, feasibility, and the relationship of the proposal to the literature will be important criteria for evaluation. The Qualifying Examination determines, in part, the student's eligibility for admission to candidacy for the Ph.D. degree. The examination is designed to test the student's basic knowledge of molecular biology and genetics, as well as assess creativity and rationality of research design.

The Qualifying Examination will be held near the end of Term 1 of the second year, unless the student petitions the GEC for a delay due, for example, to the need to make up courses that were not passed in year 1 or other extenuating circumstances. Students must take the qualifying examination by the end of their 2nd year of enrollment. Any exception must be approved by the Director of Graduate Studies and the Dean.

The Qualifying Examination Committee will consist of five (5) members; four are faculty (primary or secondary appointees) in the Department of Molecular and Human Genetics and one member is from outside the Department. The composition of the Qualifying Examination Committee will be formulated by the Director of the Qualifying Examination Committee in consultation with the Director of Graduate Studies. The student's advisor may not serve on the student's Qualifying Examination Committee, but is encouraged to attend the examination as an observer only.

The Qualifying Examination is comprised of four parts: 1) Preparation of one written abstract; 2) Preparation of a written proposal based on the abstract; 3) Oral presentation of the proposal; and 4) Oral defense of the proposal. Sample abstracts and proposals are available to students on the MHG web page. Note that effective 2013 the Qualifying Examination was changed from an “off-topic” format to an “in the field” format as described below. Consequently, the examples from prior to 2013 do not provide ideal guidance for the current format.

INSTRUCTIONS FOR THE STUDENT

”**In-the-Field” format and PI involvement**: Students will choose a Qualifying Exam topic that is in the field of their thesis research. The Specific Aims cannot be ones proposed previously or under consideration currently by their PI or members of their lab. The aims **can but do not necessarily** need to be aims the student will pursue for their thesis research, but must be relevant to the field. The proposal must be strongly rooted in genetics, include a hypothesis and be hypothesis driven. We encourage you to solicit the advice of your advisor and any other members of the scientific community. Nevertheless, it

MOLECULAR PHYSIOLOGY & BIOPHYSICS

CURRICULUM

(30 hours didactic credit required)

REQUIRED COURSES (* = Didactic credit courses)

Term 1	Organization of the Cell *
	Responsible Conduct of Research/Ethics
	Seminar in MPB
	Research Rotation
	Cell Physiology *
Term 2	Human Physiology I *
	Grant Writing Year 2
	Ethics Year 2
	Seminar in MPB
	Research Rotation
Term 3	Human Physiology II *
	Ethics Year 3
	Seminar in MPB
	Research Rotation
Term 4	Introduction to Biostatistics)*
	Transmembrane Signaling)*
	Seminar in MPB
	Research Rotation
Term 5	Research Rotation

Electives (choose at least 17 hours, to reach total of 30 **didactic** hours)

BIOPHYSICS and BIOENGINEERING

Term 1 Molecular Methods
Term 1 Fundamentals of Human Neuroimaging
Term 1 Electrical Signaling in the Brain
Term 1&2 Fundamentals of Human Neuroimaging
Term 2&3 Functional Magnetic Resonance Imaging Lab
Term 3 Macromolecules: Structure and Interactions
Term 4 Structural Basis of Human Disease
Term 4 Cellular Neurophysiology

(Rice courses 3 semester hours ~ 6 BCM credits each)

BIOE 505 Optical Imaging
BIOE 507 Systems Biology of Blood Vessels
BIOE 512 Biophotonics Instrumentation
BIOE 516 Mechanics, Transport, and Cellular Signaling BIOE 517 Instrumentation and Molecular Analysis
BIOE 519 Biomaterials Synthesis
BIOE 540 Introduction to Synthesis

METABOLISM

Term 1 Molecular Methods
Term 2 Cell Signaling
Term 3 Gene Regulation
Term 3 Macromolecules: Structure and Interactions
Term 4 Structural Basis of Human Disease
Term 4 Bioinformatics and Genomic Analysis Term 4 Regulation of Energy Homeostasis

BIOE 540 Introduction to Systems Biology and Systems Biotechnology

CARDIOVASCULAR SCIENCES

All terms: Seminar in Cardiovascular Sciences
Term 1 Genetics A
Term 2 Genetics B
Term 3 Cell Division
Term 3 Development
Term 3 Gene Regulation
Term 3 Neuroscience
Term 4 Cardiovascular Physiology
Term 5 Cardiovascular Disease and Pathology

NEURAL AND MUSCLE PHYSIOLOGY

Term 1 Brain Cell Biology
Term 1 Electrical Signaling in the Brain
Term 1&2 Fundamentals of Human Neuroimaging
Term 1&2 Theoretical Neuroscience: Cells, Circuits and Systems
Term 2 Anatomy & Development of the Nervous System
Term 2 Analyses of Neuronal Function
Term 2 Introduction to MatLab for Neuroscience
Term 3 Advanced Topics in Muscle Physiology)
Term 3 Advanced MatLab for Neuroscience
Term 3&4 Functional Magnetic Resonance Imaging Lab
Term 4 Cellular Neurophysiology
Term 4 Neurobiology of Disease

PHYSIOLOGY OF CANCER

Term 2 Cancer
Term 2 Translational Cancer Biology
Term 2 Cell Signaling
Term 2 Cell Division
Term 3 Immunology
Term 3 Gene Regulation
Term 4 Regulation of Energy Homeostasis

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Biophysics and Bioengineering
1st Year

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-GS-501	*	Organization of the Cell	Pedersen/Sifers
	GS-GS-528		Responsible Conduct of Research/Ethics	Bertuch
	GS-PY-415	*	Cell Physiology	Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	Rice BIOE 516	* +	Mechanics, Transport, and Cellular Signaling	Raphael
		*	Electrical Signaling in the Brain	
	GS-GS-502	*	Molecular Methods	Weigel
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-430	*	Human Physiology I	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	Rice BIOE 516	* (cont'd)	Mechanics, Transport, Cellular Signaling	Raphael
		*	Functional MRI Lab	
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-431	*	Human Physiology II	Horrigan/ Poche`
	GS-GS-518	*	Macromolecules: Structure and Interaction	Prasad/Pedersen
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-GS-509	*	Functional MRI Lab	
	Rice BIOE512	*	BioPhotonics Instrumentation	Tkaczyk

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Term 4 Mar. - May	Course #		Course Title	Instructor's Name
	Required			
	GS-PY-465		Transmembrane Signaling	Beeton
	GS-GE-407	*	Basic Biostatistics	Paylor
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
			Structural Basis of Human Disease	
	GS-NE-464	*	Cellular Neurophysiology	Wu
	Rice BIOE512	*	BioPhotonics Instrumentation	Tkaczyk
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-549		Laboratory Rotation	

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Metabolism
1st Year

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-GS-501	*	Organization of the Cell	Pedersen/Sifers
	GS-GS-528		Responsible Conduct of Research/Ethics	Bertuch
	GS-PY-415	*	Cell Physiology	Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	BIOE 540	*	Introduction to Systems Biology and Systems Biotechnology	Bio. Dept. Faculty
	GS-GS-502	*	Molecular Methods	Gilbert/Highlander
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-430	*	Human Physiology I	Horrigan/ Poche`
	GS-PY-415	*	Cell Physiology	Bayle
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-CB-425	*	Cell Signaling	Weigel
	BIOE 540	*	Introduction to Systems Biology and Systems Biotechnology	Bio. Dept. Faculty
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-431	*	Human Physiology II	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-GS-509	*	Gene Regulation	Rosen
	GS-GS-518	*	Macromolecules: Structure & Interactions	Prasad/Pedersen
Term 4 Mar. - May	**Course #**		**Course Title**	**Instructor's Name**
	Required			

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

	GS-PY-465		Transmembrane Signaling	Beeton
	GS-GE-407	*	Basic Biostatistics	Paylor
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
		*	Regulation of Energy Homeostasis	Moses
		*	Adv. Top. Muscle Physiology	Rodney
			Structural Basis of Human Disease	Prasad
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Physiology of Cancer 1st Year

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-GS-501	*	Organization of the Cell	Pedersen/Sifers
	GS-GS-528		Responsible Conduct of Research/Ethics	Bertuch
	GS-PY-415	*	Cell Physiology	Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-GS-503	*	Genetics A	Rosenberg/Kelley
	GS-GS-502	*	Molecular Methods	Gilbert/Highlander
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-430	*	Human Physiology I	Horrigan/ Poche`
	GS-PY-415	*	Cell Physiology	
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
			Cell Division	
			Cancer	
	GS-MB-431	*	Translational Cancer Biology	Yustein/Marriot
	GS-GS-512	*	Immunology	Levitt
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-431	*	Human Physiology II	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-GS-509	*	Gene Regulation	Rosen

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Term 4 Mar. - May	Course #		Course Title	Instructor's Name
	Required			
	GS-PY-465		Transmembrane Signaling	Beeton
	GS-GE-407	*	Basic Biostatistics	Paylor
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-MV-457J	*	Introduction to Molecular Carcinogenesis	Li
	GS-CB-468	*	Regulation of Energy Homeostasis	Moses
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-PG-413		Drug Discovery: From Bench to Bedside	

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Neural and Muscle Physiology
1st Year

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-GS-501	*	Organization of the Cell	Pedersen/Sifers
	GS-GS-528		Responsible Conduct of Research/Ethic	Bertuch
	GS-PY-415	*	Cell Physiology	Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-NE-400	*	Fundamentals of Human NeuroImaging	Ress
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-430	*	Human Physiology I	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
		*	Immunology	
	GS-NE-400	*	Fundamentals of Human NeuroImaging	Ress
	GS-NE-430	*	Anatomy and Development of the Nervous system	Rasband
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-431	*	Human Physiology II	Horrigan/ Poche`
	GS-PY-466	1	Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-PY-415	*	Advanced Topics in Muscle Physiology	Rodney
	GS-GS-511	*	Neuroscience	Jankowski
	GS-GS-512	*	Immunology	Levitt
	GS-NE441	*	Genetics for Neuroscience	Deneen
Term 4 Mar. - May	**Course #**		**Course Title**	**Instructor's Name**

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

	Required			
	GS-PY-465		Transmembrane Signaling	Beeton
	GS-GE-407	*	Basic Biostatistics	Paylor
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-549		Laboratory Rotation	
	Recommended			
	GS-CS-411	*	Cardiovascular Physiology	Wehrens / Li
	GS-NE-462J	*	Concepts of Learning and Memory	Costa-Mattioli/Ji
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-549		Laboratory Rotation	
	GS-CS-412	*	Cardiovascular Disease and Pathology	Martin/Wang

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

Cardiovascular Sciences
1st Year

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-GS-501	*	Organization of the Cell	Pedersen/Sifers
	GS-GS-528		Responsible Conduct of Research/Ethics	Bertuch
	GS-PY-415	*	Cell Physiology	Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-CS-549		Laboratory Rotation	
	Recommended			
	GS-GS-503	*	Genetics A	Rosenberg/Kelley
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-430	*	Human Physiology I	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-CS-549		Laboratory Rotation	
	Recommended			
	GS-GS-504	*	Genetics B	Zhou
	GS-GS-505	*	Cell Division	Sazer
	GS-GS-506	*	Development	S. Lee
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-431	*	Human Physiology II	Horrigan/ Poche`
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-CS-549		Laboratory Rotation	
	Recommended			
	GS-GS-518	*	Macromolecules: Structure and Function	Prasad/Pedersen
	GS-GS-509	*	Gene Regulation	Rosen
	GS-GS-511	*	Neuroscience	Jankowski
Term 4 Mar. - May	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-CS-411	*	Cardiovascular Physiology	Wehrens/Li

Physiology Recommended Course of Study

*** Didactic Credits**
Total Term Credits = 12

	GS-GE-407	*	Basic Biostatistics	Paylor
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-CS-549		Laboratory Rotation	
	GS-PY-465		Transmembrane Signaling	Beeton
	Recommended			
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-CS-412	*	Cardiovascular Disease and Pathology	Martin/Wang
	GS-CS-549		Laboratory Rotation	

Recommended Course of Study
2nd Year All Areas of Emphasis

Term 1 Aug. – Oct.	Course #		Course Title	Instructor's Name
	Required			
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS-PY-435		Special Projects	
Term 2 Oct. – Dec.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-413		Grand Writing Skills	Lagor/Larina
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS- PY -435		Special Projects	
Term 3 Jan. – Mar.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS- PY -435		Special Projects	
Term 4 Mar. - May	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS-PY-466		Seminar in Molecular Physiology	Larina
	GS- PY -435		Special Projects	
Term 5 May – Jul.	**Course #**		**Course Title**	**Instructor's Name**
	Required			
	GS- PY-435		Special Projects	

APPENDIX A

Areas of Competence
Department of Molecular Virology and Microbiology

AREA OF COMPETENCE	REQUIRED COURSE TO FULFILL COMPETENCE	ELECTIVE COURSES THAT CAN SATISFY COMPETENCE*
Fundamental Microbiology	GS-MV-401 General Virology GS-MV-417 Bacterial Structure and Function	
Basic Immunology	GS-IM-423 Immunology I	
Biochemistry	GS-GS-518 Macromolecules: Structure and Interactions	
Molecular Biology	GS-GS-501 Organization of the Cell GS-GS-502 Molecular Methods GS-GS-502 Genetics A GS-GS-509 Gene Regulation	GS-GS-505 Cell Division GS-GS-523 Method & Logic in Molecular Biology
<u>Advanced Virology</u>		
Tumor Virology		GS-CB-457 Intro to Molecular Carcinogenesis
Viral Replication & Gene Expression		Cross-Registration
Viral Genetics		GS-MV-411 Genetics of Animal Viruses
Viral Pathogenesis		Cross-Registration
Viral Epidemiology		Cross-Registration
Viral Methods/Techniques		GS-GS-521 Biostatistics GS-GS-522 Research Design
<u>Advanced Microbiology</u>		
Microbial Replication & Gene Expression	GS-GS-417 Bacterial Structure and Function	
Microbial Genetics		Cross-Registration
Microbial Pathogenesis		GS-MV-413 Concepts of Microbial Pathogenesis
Microbial Epidemiology		Cross-Registration
Microbial Methods/Techniques		GS-GS-521 Biostatistics GS-GS-422 Research Design

* Other electives can provide content for areas of competence. Those electives shown are those most frequently taken by MVM students.

APPENDIX B

Standard Graduate Curriculum
Department of Molecular Virology and Microbiology

NUMBER	COURSE	REQUIRED OR ELECTIVE	YEAR OFFERED	CREDITS
TERM 1 (AUGUST – OCTOBER)				
GS-GS-501	Organization of the Cell	Required	Every	2
GS-GS-502	Molecular Methods	Required	Every	3
GS-GS-503	Genetics A	Required	Every	2
GS-GS-528	Ethics – Year 1	Required	Every	1
GS-MV-549	Research Rotation	Required	Every	Variable
GS-MV-410	Literature Reports	Required	Every	1
TERM 2 (OCTOBER – DECEMBER)				
GS-MV-401	General Virology	Required	Every	4
GS-MV-417	Bacterial Structure and Function	Required	Every	3
GS-IM-423	Immunology I	Required	Every	3
GS-GS-515	Ethics – Year 2	Required	Every	0.5
GS-MV-549	Research Rotation	Required	Every	Variable
GS-MV-410	Literature Reports	Required	Every	1
GS-MV-466	Seminar	Required	Every	1
GS-GS-505	Cell Division	Elective	Every	2
TERM 3 (JANUARY – MARCH)				
GS-GS-518	Macromolecules: Structure & Interactions	Required	Every	3
GS-GS-509	Gene Regulation	Required	Every	3
GS-GS-516	Ethics – Year 3	Required	Every	0.5
GS-GS-517	Ethics – Year 4	Required	Every	0.5
GS-MV-549	Research Rotation	Required	Every	Variable
GS-MV-410	Literature Reports	Required	Every	1
GS-MV-466	Seminar	Required	Every	1
TERM 4 (MARCH – MAY)				
GS-MV-549	Research Rotation	Required	Every	Variable
GS-MV-410	Literature Reports	Required	Every	1
GS-MV-466	Seminar	Required	Every	1
GS-MV-411	Genetics of Animal Viruses	Elective	Odd	3
GS-CB-457	Introduction to Molecular Carcinogenesis	Elective	Every	3
GS-MV-413	Concepts in Microbial Pathogenesis	Elective	Even	4
TERM 5 (MAY – JULY)				
GS-MV-549	Research Rotation	Elective	Every	Variable
GS-GS-521	Introduction to Biostatistics	Elective	Every	2

In general all of the required courses are taken during the first year of residence. Electives that do not fit in year one are generally completed in the second year.

Neuroscience

2018 Graduate Program Curriculum

	Course #	Course Title	Credits	Course Director
REQUIRED in YEAR 1:				
Term 1				
	GS-NE-448	Electrical Signaling in the Brain	3 (D)	Paul Pfaffinger
	GS-NE-449	Neuroscience Lab I	1	Paul Pfaffinger
	GS-NE-459	Brain Cell Biology & Development	3 (D)	Matt Rasband
	GS-GS-528	Responsible Conduct of Research - Year 1	1	Alison Bertuch
Term 2				
	GS-NE-431	Analyses of Neuronal Functions (Synaptic Transmission and Plasticity)	2 (D)	Mingshan Xue
	GS-NE-471	Anatomy of the Nervous System	2 (D)	David Shine
	GS-NE-450	Neuroscience Lab II	1	Russell Ray
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina
Term 3				
	GS-NE-455	Neural Systems I (Neuroscience of Perception)	3 (D)	Jeff Yau
	GS-NE-441	Genetics for Neuroscience	2 (D)	Ron Parchem
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina
Term 4				
	GS-NE-456	Neural Systems II (Cognition and Action)	3 (D)	Roy Sillitoe
	GS-NE-475	Core Concepts in Computational Neuroscience **A different computational course may be substituted upon Director's approval.*	1 (D)	Ankit Patel
	GS-NE-422	Neurobiology of Disease	2 (D)	Jeff Noebels
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina
REQUIRED in YEAR 2:				
Term 2				
	GS-NE-447	Preparing for your Neuroscience Qualifying Exam	2	Joanna Jankowsky / Kim Tolias
	GS-GS-529	Responsible Conduct of Research - Year 2	0.5	Alison Bertuch
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina
Term 3				
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina
Term 4				
	GS-GS-532	Biostatistics for Biomedical and Translational Researchers **A different quantitative course may be substituted upon Director's approval.*	3 (D)	Susan Hilsenbeck / Charles Minard
	GS-NE-474	Neuroscience Seminar Journal Club	1	Javier Medina / Jeannie Chin-Medina

REQUIRED in YEARS 3-4:

Year 3, Term 3: Responsible Conduct of Research, GS-GS-530
Year 4, Term 4: Responsible Conduct of Research, GS-GS-531

ELECTIVES offered by the GSBS core service and by other BCM departments:

Students must complete 30 hours of didactic course work to be eligible for admission to candidacy. All GSBS core courses and most courses offered through another BCM department are open to Neuroscience students, provided they meet all stated pre-requisites.

ELECTIVES offered at Rice:

BCM GSBS students can cross-register for Rice courses provided four conditions are met:

1. The student has checked with the course director to ensure that the class will be offered that year. More courses are listed than are offered each year.
2. The thesis advisor must agree that the class is appropriate for the student's Ph.D. studies.
3. The Rice listing for the course must indicate that it has a graduate level designation (level 500 or above).
4. The course director must agree to accept the student into the class (provided there is space and our student meets the class requirements)

In order to enroll for the Rice class, BCM students must fill out an inter-institutional course registration form available on the Graduate School website under "Forms." After completing the Rice course with a grade of B or above, BCM students can then petition the GSBS promotions committee to obtain transfer credit towards their BCM degree.

MD/PhD students in the Neuroscience Program may transfer credit hours from Medical School to fulfill the following Neuroscience requirements:

- Neurobiology of Disease (If this course was taken as an elective in Medical School) 2(D)
- Anatomy of the Nervous System 2(D)
- Electives

Program Director: Matt Rasband, rasband@bcm.edu
Associate Director: Joanna Jankowsky, jankowsk@bcm.edu

Pharmacology

Curriculum

Required Courses – Students should complete the required courses and a minimum of 4 lab rotations by the end of the fifth term of the first year.

First Term
Molecular Methods (3 hrs)
Organization of the Cell (2 hrs)
Responsible Conduct of Research (1 hr)
Rotation (variable hrs)

Second Term
Cancer (1 hr)
Immunology (3 hr)
Rotation (Variable hrs)

Third Term
Gene Regulation (3 hrs)
Macromolecules: Structure and Interactions (3 hrs)
Rotation (variable hrs)

Fourth Term
General Pharmacology (4 hrs)
Research Design (3 hrs)
Rotation (variable hrs)

Fifth Term
Drug Discovery (2 hrs)
Chemical Biology (2 hrs)
Rotation (variable hrs)

Elective Courses - Students are required to complete a minimum of 60 term hours of course work, of which 30 term hours must be in courses that either have a letter grade assignment or are specifically designated by the Graduate School as “approved pass/fail” graded courses (e.g. Method and Logic in Molecular Biology and Research Design). Selection of elective courses will be made in consultation with the Pharmacology Graduate Program Committee.

The following courses are approved by the Pharmacology Graduate Program Committee as electives:

First Term
Cellular and Molecular Biology of Disease (2 hrs)
Computational Molecular Biophysics & Structural Biology (6 hrs)
Method & Logic in Molecular Biology (3 hrs)
Genetics A (2 hrs)

Second Term
Cell Division (2 hrs)
Genetics B (2 hrs)

THIRD TERM
COMPUTER-AIDED DISCOVERY METHODS (2 HRS)

FOURTH TERM
BIOINFORMATICS & GENOMIC ANALYSIS (3 HRS)
BIOSTATISTICS FOR TRANSLATIONAL RESEARCHERS (3 HRS)
CELLULAR SIGNALING (3 HRS)
INTRODUCTION TO MOLECULAR CARCINOGENESIS (3 HRS)
INTRODUCTION TO STATISTICAL COMPUTING & MODELING (3 HRS)
PRACTICAL INTRODUCTION TO PROGRAMMING FOR SCIENTISTS (3 HRS)

FIFTH TERM
PROTEOMICS & FUNCTIONAL GENOMICS (3 HRS)

Faculty Research Presentations – Each faculty member is given the opportunity to make a short presentation to the first year students describing their overall research program. These are informal talks and should last only around 20 minutes. Two faculty members will present twice a week for during the First Term. Attendance is mandatory for first year students.

Research Rotations - The primary goals for the research rotations are twofold: First, rotations allow new students to become familiar with research conducted in the laboratories of Pharmacology faculty members. Second, rotations allow students to familiarize themselves with laboratory procedures, approaches and a variety of research projects.

The student will select their Major Thesis Advisor primarily based on these rotations. All students are required by the department to complete four rotations in the first four terms. Students will select laboratories of professors with primary or secondary appointment in the Department of Pharmacology for rotation. At the fifth term, students will either choose their lab of study for their thesis work or participate in one more rotation.

Research Rotation credit hours are considered course hours (370-549) by the GSBS and contribute to the total of 60 credit hours that are required for graduation. For every credit hour of laboratory rotation for which a student is enrolled, they are expected to work a minimum of 3 hours per week in the laboratory. Some rotations may require more effort for limited periods of time (evenings or weekends). However, students are NOT expected to be full-time laboratory personnel.

In order to make the best of the research rotation for both the student and the faculty, they should meet before the rotation begins. If the faculty member will not be the direct supervisor for experimentation, the laboratory supervisor must be present at this meeting and understand the guidelines and requirements for the student's lab rotation. Both the faculty member and student should discuss and sign the Goals for Research Rotation Form and submit it to the PGP Director. The form will go into the student's program file. The form is due by the end of the first week of rotation.

The rotation period ends when classes end at the beginning of the study period preceding exams. At that time, the student and the faculty member should meet again. In consultation

with the faculty member, the student is to write a one-page description of the rotation. This will be attached to the Evaluation of Research Rotation Form (from PGP) which is filled out by the faculty member and discussed with the student. Both the faculty mentor and student sign the form indicating that they have discussed it. The form should be submitted to the department by the end of the corresponding term's exam week. The grade of Pass/Fail is given for a rotation by the faculty mentor.

Research Hours - All students must register for some form of research throughout their graduate career. First year students who are rotating through labs should register for Research Rotation (370-549). Students who have joined a laboratory, but have not yet been admitted to candidacy should register for Special Projects (370-435). Students who have been admitted to candidacy should register for Dissertation Research (370-550). The total number of hours of research and course credits each term should be at least 12. If the student is not taking courses during a term, they will register for 12 research hours.

Journal Club – Students will participate in a monthly journal club, led by faculty members. They will be notified of the dates and time by the Graduate Program office.

Student Presentation – All students who have passed their Qualifying Exams are required to make a formal presentation each academic year. These should be oral talks, not posters. Proof should be given to the Pharmacology Program Office. If the student is nearing the end of the academic year without having presented a talk, then they will be scheduled to do a departmental talk before the end of the year.

Departmental Retreat – The Department of Pharmacology participates in an annual retreat with the Department of Biochemistry and Molecular Biology. The research efforts of the faculty, post-doctoral researchers and graduate students are discussed at the retreat. Students are expected to participate in the departmental retreat. First year graduate student participation will be funded by the department.

Qualifying Examination

The purpose of the qualifying examination is to assess the student's eligibility for admission to candidacy for the Ph.D. degree. Eligibility is determined by examination of the student's capacity for originality and scientific approach to research as well as his/her knowledge of the core curriculum of Pharmacology. All students must complete the Qualifying Examination processes by the end of their second year of enrollment.

Abstracts – Each student is expected to submit one abstract to the Qualifying Examination Committee by August 1 of their second year. The abstract should cover a topic that the student is considering for development into a dissertation project. Students should submit an electronic document containing the following to the Program office:

1. Background and Significance – Introduce the proposed research problem and highlight the gap in the field that the research proposal would fill. ~ 1 page
2. Hypothesis to be Tested – Clearly define the specific hypothesis that the proposal will address. ~ 1 paragraph
3. Specific Aims – List the specific question that the proposal will address and basic statement of the experimental procedures you plan to utilize to pursue answer to the hypothesis. ~ 3 to 5 Specific Aims

Quantitative and Computational Biology 2018-19

Curriculum is designed to meet the specific needs of students with B.S. degrees in biology, math, physics, chemistry, computer science, or engineering. The overall philosophy of the course requirements is to prepare the students in both the specialized areas of research and cell and molecular biology. All classes must be completed with a grade of B or better.

Note: Courses at Baylor College of Medicine (BCM) are scheduled in eight-week terms. Courses at the University of Houston (UH), Rice University (Rice), and The University of Texas – Houston Health Science Center (UTHSC) are based on 16-week semesters.

- Advanced Topics in SCB (GS-SB-430) Terms 1, 2, 4 - Cr: 1 each term: Fridays, Noon-1pm
- Method and Logic (GS-GS-523) Term 2 – Cr: 3: Tuesdays/Thursdays, 10:00-Noon
- Molecular Biophysics: Methods and Principles (GS-SB-408) Fall Semester at Rice – Cr: 3 each Terms 1 & 2
- Current Topics in Computational Biomedicine (GS-SB-407) Terms 1-4- Cr: 1 ea semester: Wednesdays, 12-1pm
- Computational Mathematics for Quantitative Biomedicine (GS-SB-401) Term 1-2- Cr: 8: Tuesdays/Thursdays, Noon-2pm
- Responsible Conduct of Research – Year 1 (GS-GS-528), Term 1 - Cr: 1: See GSBS website for schedule
- Structural Basis of Human Diseases (GS-SB-423J) Term 4 - Cr: 1: Thursdays, Noon-1pm
- Research Design (GS-GS-522), Term 4 – Cr: 3: Tuesdays, 1:15-4pm
- A computational course at Rice or UH (upon Director's approval) – 1 semester
- Electives:
    - Any course in the Graduate School Service Curriculum
    - Electron Cryomicroscopy for Molecules and Cells (GS-SB-410), Term 4 – Cr: 3 (taught odd years only): Thursdays, 9-10:30am
    - Advanced X-ray Crystallography (GS-SB-403), Term 4 - Cr: 3 (taught even years only): Mondays/Wednesdays, 2-4pm
    - Practical Introduction to Programming (GS-SB-406), Term 3 – Cr: 3: Mondays/Wednesdays, 10:30-Noon
    - Computer-Aided Discovery Methods (GS-SB-405), Term 3– Cr: 2: Wednesdays/Fridays, 10:00-Noon
    - Courses offered at Rice, UH, or UTH as approved by the Directors (must be 500 level or above)

The following is an example of coursework for a first-year student:

TERM 1 Advanced Topics in SCB (GS-SB-430)
Responsible Conduct of Research – Year 1 (GS-GS-528)
Molecular Biophysics: Methods & Principles (GS-SB-408)
Current Topics in Computational Biomedicine (GS-SB-407)
Research Rotation (GS-SB-549)
Computational Mathematics for Quantitative Biomedicine (GS-SB-401)
1 or 2 Electives

TERM 2 Advanced Topics in SCB (GS-SB-430)
Computational Mathematics for Quantitative Biomedicine (GS-SB-401)
Method and Logic (GS-GS-523)
Molecular Biophysics: Methods & Principles (GS-SB-408)
Current Topics in Computational Biomedicine (GS-SB-407)
Research Rotation (GS-SB-549)
1 or 2 Electives

TERM 3 Current Topics in Computational Biomedicine (GS-SB-407)
Research Rotation (GS-SB-549)
1 or 2 Electives

TERM 4 Advanced Topics in SCB (GS-SB-430)
Research Design (GS-GS-522)
Structural Basis of Human Diseases (GS-SB-423J)
Current Topics in Computational Biomedicine (GS-SB-407)
Research Rotation (GS-SB-549)
Elective

TERM 5 Research Rotation (GS-SB-549)
Elective

Translational Biology and Molecular Medicine

TBMM Standard Graduate Curriculum – Year 1

The academic calendar for the Program in Translational Biology and Molecular Medicine is divided into five terms of nine weeks each. In the first year, each term is followed by a one-week break. Course work is required in the following subjects:

- Molecular Methods
- Genetics A and B
- Human Physiology I & II
- Immunology
- Gene Regulation
- Organization of the Cell
- Method & Logic of Translational Biology
- Pathophysiology & Mechanisms of Human Disease
- Animal Models of Human Disease
- Introductory Biostatistics for Translational Research
- Cells Tissues & Organs
- Ethics, Conduct & Practical Aspects of Clinical Research

First year students also participate in laboratory rotations and the Bench-to-Bedside journal club. In general, all required courses are taken in the first year of residence.

TBMM Graduate Curriculum - Year 2 and above

In the 2nd year of the TBMM program, students begin their **Thesis Research Projects**, engage in **Leadership training** and work on their **Clinical Projects**. **Clinical projects** continue in year 3, for a total of ten terms. The goal of the Clinical Projects, which are focused on the area of each student's thesis project, is to provide students with direct observation of clinical medicine in practice in an in-patient or out-patient setting, and with practical knowledge regarding the methodologies by which patient encounters are systematically transformed into useful research data. Typically the mentor for this rotation is the student's clinical co-mentor. Clinical projects include: exposure to clinical medicine, attendance at clinical meetings such as diagnostic consensus conferences or clinical research meetings and exposure to at least one clinical research project. To begin clinical projects, all students are required to complete a yearly background check administered through BCM. This allows the program to establish medical malpractice insurance to our students to protect them if legal concerns arise while participating in clinical projects.

In general, all the required courses are taken in the first year of residence. Electives that do not fit in year one are generally completed in the second year.

In addition, TBMM students are required to complete BCM-required human research subjects (CITI) training and animal training

Human

"Biomedical Research – Basic/Refresher, Basic Course"

a. Complete The Integrity Assurance Statement before beginning the course
b. Belmont Report and CITI Course Introduction
c. History and Ethical Principles
d. Basic Institutional Review Board (IRB) Regulations and Review Process
e. Informed Consent
f. Social and Behavioral Research for Biomedical Researchers
g. Records-Based Research
h. Genetic Research in Human Populations
i. Research With Protected Populations - Vulnerable Subjects: An Overview
j. FDA-Regulated Research
k. Conflicts of Interest in Research Involving Human Subjects
l. The IRB Member Module - "What Every New IRB Member Needs to Know"
m. Baylor College of Medicine

Animal

- "CCM Mandates and Guidelines"
  a. Guide to the Care and Use of Laboratory Animals
  b. Public Health Service policy on humane care and use of laboratory animals
- "BCM USDA Covered Species: Mandates and Guidelines"
  a. Animal Welfare Act regulations
  b. Public Health Service policy on humane care and use of laboratory animals
  c. Pain recognition and alleviation in laboratory animals