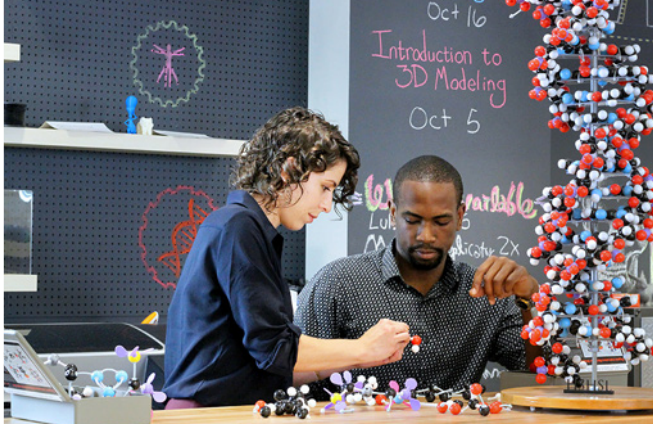

2018-2019

GRADUATE SCHOOL CATALOG

UNIVERSITY *of* MARYLAND
GRADUATE SCHOOL

UNIVERSITY OF MARYLAND, BALTIMORE
GRADUATE SCHOOL

2018-2019

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Every effort is made to ensure that the information in this publication is accurate; however, information including phone numbers, web addresses, policies, and fees is subject to change subsequent to publishing. If you need this publication in an alternative form, please contact the Graduate School.

See UMB's Notice of Nondiscrimination in the Policies section of this catalog.

Mission and Vision Statements, Accreditation, and State Authorization

Mission

The mission of the Graduate School is to empower scholars, practitioners, and researchers to become agents of innovation and leaders of change through distinctive, relevant, and rigorous education.

Vision

The Graduate School aspires to be the global leader in health and biomedical graduate education and research by cultivating students who solve critical world problems.

Accreditation

The University of Maryland, Baltimore is accredited by the Middle States Commission on Higher Education. The Middle States Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

Middle States Commission on Higher Education

3624 Market St.
Philadelphia, PA 19104
267-284-5000

www.msche.org

State Authorization

The Graduate School at the University of Maryland, Baltimore is authorized by the Maryland Higher Education Commission (MHEC), the State Licensing Authority, to confer degrees.

Maryland Higher Education Commission

6 North Liberty St., 10th Floor
Baltimore, MD 21201
410-767-3300; 410-332-0270 (fax)

www.mhec.state.md.us

General Information

Degrees Offered

PhD, MS, Postbaccalaureate Certificates

Location and Contact Information

Graduate School
University of Maryland, Baltimore
620 W. Lexington St., Suite 5110
Baltimore, MD 21201

410-706-7131; 410-706-3473 (fax)
gradinfo@umaryland.edu

The Graduate School

The Graduate School works in concert with the University of Maryland schools of dentistry, medicine, nursing, pharmacy, and social work by developing and applying Universitywide standards and policies for graduate programs, faculty, and students. Graduate studies began at the Baltimore campus of the University of Maryland in 1918. Today, the Graduate School offers 40 postbaccalaureate certificate (PBC), Master of Science (MS) and Doctor of Philosophy (PhD) degree programs in biomedical, health, human service, and life sciences. The Graduate School also offers formal dual-degree programs with the University's professional schools and facilitates interinstitutional studies and cooperative degree programs in several fields with other University System of Maryland (USM) campuses and graduate programs.

Our website, *www.graduate.umaryland.edu*, includes the *Graduate School Catalog*, program information, links to program and school web pages and email addresses, the online application for admission, and forms and polices for current graduate students.

The University of Maryland Graduate School, Baltimore (UMGSB)

Created in 1985, UMGSB represents the combined graduate and research programs at the University of Maryland, Baltimore County (UMBC) and UMB — the University System of Maryland (USM) doctoral research campuses in the Baltimore area. Several joint programs with UMBC permit UMB graduate students to take advantage of the association of faculty and the wide variety of courses offered at UMBC. All UMB and UMBC graduate programs are reviewed by a joint Graduate Council of the UMGSB.

University of Maryland — Downtown Baltimore campus

The University of Maryland, Baltimore (UMB) is the state's public health, law, and human services university devoted to excellence in professional and graduate education, research, patient care, and public service. As a diverse community of outstanding faculty, staff, and students, and using state-of-the-art technological support, we educate leaders in health care delivery, biomedical science, global health, social work, and the law. We emphasize interdisciplinary education and research in an atmosphere that explicitly values civility, diversity, collaboration, teamwork, and accountability. By conducting internationally recognized research to cure disease and to improve the health, social functioning, and just treatment of the people we serve, we foster economic development in the city, state, and nation. We are committed to ensuring that the knowledge we generate provides maximum benefit to society and directly enhances our communities.

With 6,703 students, 2,743 faculty members, and 4,460 staff, UMB is an economic engine yielding more than $13 for every general fund dollar appropriated by the state of Maryland. In addition to UMB's mandates of teaching and research, members of the University community donate more than 2 million hours each year in service to the public. More than $497.5 million in grants and contracts was awarded in Fiscal Year 2016, and faculty contributed to important advances in basic science and applied research. Located in Baltimore, the campus consists of 71 acres with almost 7.5 million gross square feet of space in 67 buildings.

Baltimore and Surrounding Area

Beyond offering outstanding professional opportunities, Baltimore is a great place to live. In addition to a diversity of affordable housing, Baltimore's world-renowned Inner Harbor area, lively entertainment, world-class museums, fine music, and professional theater make city living exciting and culturally rewarding. For sports lovers, Orioles baseball and Ravens football are within walking distance of the campus. The city also offers access to the Chesapeake Bay and Atlantic Ocean beaches, ski resorts in Western Maryland and Pennsylvania, and the nation's capital, Washington, D.C.

Admissions

Determination of Admissibility

Responsibility for admission to graduate study at the University of Maryland, Baltimore resides with the Office of the Dean, Graduate School. The Graduate School relies on recommendations from the degree-granting programs to determine the admissibility of applicants. The University of Maryland, Baltimore does not discriminate in its admissions, educational services, or supporting services because of race, religion, age, national origin, sex, sexual orientation, or disability.

Minimum Standards and Requirements

The minimum academic standard for full admission to the Graduate School is a B average, or 3.0 on a 4.0 scale, in a program resulting in the award of a bachelor's degree from a regionally accredited college or university, or an equivalent degree and standing from a comparable foreign institution. Standards for admission to a PhD program are generally higher than those for admission to a certificate or an MS program. Applicants also must document successful completion of undergraduate prerequisites for graduate study in the chosen field. Applicants must meet the minimum requirements set by the Graduate School and must meet departmental and/or program-specific requirements that may exceed the minimum.

Application Procedures and Required Items

The Graduate School requires a completed application for admission, official transcripts of all prior undergraduate and graduate study, three letters of recommendation (exception for certificate program and nondegree applications), and an essay or statement of academic goals and research interests. In addition, the Graduate School normally requires scores from Graduate Record Examinations for admission to its graduate programs. Some graduate programs may recommend or require other standardized tests. Applicants whose native language or language of the home is not English must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) exam.

The completed application form must be signed (hand signature or electronic certification) by the candidate for admission to receive consideration. A completed application file includes the application for admission, the required, nonrefundable application fee, and all accompanying documents required for the given degree program or status.

Failure to comply with all Graduate School and departmental or program requirements for admission, or failure to provide a completed application file by the published application deadline date, may result in the application not being considered.

Program-Specific Requirements

Some programs require additional evidence of ability to succeed before granting admission. Such evidence may include an interview, documentation of prior work experience (a resume or CV), a GRE subject test, or other supplementary materials. Applicants should contact the office of the program to which they are applying about additional admission requirements.

Application Deadline Dates

Each graduate program has its own deadline date for submission of the completed application and accompanying documents. These dates are posted on the Graduate School website and are regularly published by the graduate programs. Students applying to programs that do not publish program-specific deadlines must adhere to the Graduate School's deadline dates. The Graduate School deadlines for the receipt of all application materials are as follows:

- U.S. citizens and U.S.-educated permanent residents: July 1 for fall semester and Dec. 1 for spring semester.
- International students: Jan. 15 for fall semester and May 1 of the prior year for spring semester.
- Nondegree applicants: No later than two weeks before the start of the respective semester.

Admission to our graduate programs is highly competitive. For best consideration, applicants should submit accurate and complete credentials by the specified deadline.

Applicants are encouraged to begin preparing their application files (collecting recommendations, obtaining transcripts, and taking standardized tests) well in advance of the published deadline dates.

Candidates for admission to Graduate School programs (except as noted below) must direct their applications and accompanying materials to:

University of Maryland, Baltimore
Graduate School
620 W. Lexington St., Fifth Floor
Baltimore, MD 21201

Applicants to nursing master's and nursing nondegree graduate study must direct their applications to:

University of Maryland School of Nursing
Office of Admissions and Student Affairs
655 W. Lombard St., Suite 102
Baltimore, MD 21201

Transcripts

Applicants must submit one set of official transcripts from each undergraduate and graduate institution attended. Each transcript should bear the signature of the registrar and the seal of the granting institution, and it should include the years of attendance, courses taken, grades received, and class standing, and the degree, diploma, or certificate conferred.

Transcripts of work in progress are required at the time of application; final transcripts certifying degree completion are required upon degree completion. Delays in the receipt of academic credentials could cause delays in the admission review process. It is the applicant's responsibility to ensure that the Graduate School receives all required application materials.

Applicants must provide the cumulative grade-point average (GPA) for each degree pursued or completed. Some applicants may be requested to provide a separate GPA calculation for the undergraduate major. To calculate a cumulative GPA, applicants must convert all grades to a four-point grading system. Pass or fail, satisfactory, incomplete credit, or similar grades are not included in these calculations. All numerical, alphabetical, or equivalent grades, except as already noted, must be calculated as follows:

1. Multiply quarter credit hours by (0.66) to convert to semester credit hours.
2. Multiply the number of semester credit hours for each course by the number of quality or honor points earned, as follows: A=4, B=3, C=2, D=1, F=0.
3. Divide the total number of quality points by total semester credit hours.

Letters of Recommendation

Applicants to MS and PhD programs must provide three letters of recommendation, preferably from professors or others who can attest to the quality of the applicant's academic performance and scholastic potential. The applicant's full name, the semester or session for which admission is desired, and the program to which they are applying must be indicated on the letter or form provided for this purpose. These letters must be sent directly to the program to which they are applying.

Letters of recommendation are not required for applicants to postbaccalaureate certificate programs and those seeking approval to enroll on a nondegree/coursework-only basis.

Essay/Statement of Goals and Objectives

Applicants must write and submit a 300- to 500-word statement outlining their goals and objectives in pursuing graduate study.

Standardized Test Scores

The Graduate School normally requires the submission of scores earned on the Graduate Record Examinations (GREs) — verbal, quantitative, and analytical writing. Information about registering for the GREs and having test scores sent to UMB is available from the testing agency:

Graduate Record Examinations
Educational Testing Service
Princeton, NJ 08540
609-771-7670
www.gre.org

The Graduate School's GRE institution code number for this campus is 5848. GRE department codes are published by GRE/ETS.

A few graduate programs do not require the GREs, and GREs are not required for postbaccalaureate certificate programs. Some programs also may require scores earned on the GRE Advanced (subject-specific) test.

Official Score Reports

Applicants for admission must have the respective testing agency — Educational Testing Service or the International English Language Testing System (IELTS) — provide the Graduate School with official score reports to be considered for admission.

Time Limitations of Standardized Tests

Graduate Record Examinations must have been taken within five years of the start of the desired admission term, and English language proficiency exams — Test of English as a Foreign Language (TOEFL) or the IELTS exam — must have been taken within two years of the start of the desired admission term to be considered valid scores for admission consideration.

Transfer of Credit

No more than 6 credits (or two courses) of graduate-level coursework taken from other regionally accredited institutions may apply toward a master's degree at UMB. The courses being requested for transfer must have been completed within the five-year limit for completing the master's degree at UMB. The UMB graduate program must agree (approve and certify) that the requested transfer credit is appropriate to, and acceptable in, the student's program. Students must have earned grades of B or better in such courses to be considered for transfer, and the course(s) may not have been used to complete a prior degree. Approved courses and related credits are transferred, grades are not.

The Graduate School does not require or accept transfer of credit for courses taken at other institutions for doctoral students. Courses taken at other regionally accredited institutions that are approved by the UMB graduate program are listed on the Application for Admission to PhD Candidacy at the time of admission to candidacy. These courses do not appear on the University of Maryland, Baltimore transcript but, if approved by the program or department, may be used as partial fulfillment of the doctoral student's degree program completion requirements.

The Graduate School does not accept transfer credit for postbaccalaureate certificate programs at UMB.

International Applicants

International applicants must adhere to application deadline dates and submit all required documents as early as possible. The Graduate School or an individual graduate program may request that a credential evaluation be done by an outside agency. In addition to meeting the requirements for all applicants cited previously, international applicants must: (1) hold a degree that is equivalent or comparable to a four-year U.S. bachelor's degree and have a cumulative grade-point average equivalent to a B or 3.0 GPA, or the first- or high-second division or comparable class ranking, and (2) provide proof of financial sponsorship for immigration and visa status purposes.

Transcripts and Mark Sheets

International applicants must provide one official set of transcripts in English and one set of official native-language transcripts or mark sheets from each college or university attended. Each set of documents must list subjects studied, grades or marks received, and rank in class or division.

Language Requirements

Applicants whose native language or language of the home is not English must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) exam. The TOEFL and the IELTS exam are the only measures of English language proficiency accepted by the Graduate School. The minimum acceptable TOEFL score for admission is 80 for the Internet-based test (IBT). IELTS test takers must score no less than Band 7 (total). The same IBT TOEFL and IELTS requirements apply for applicants to online, hybrid, and campus-based programs. Some graduate programs have higher minimum score requirements.

TOEFL information and applications are available from:
Test of English as a Foreign Language
Educational Testing Service
P.O. Box 899
Princeton, NJ 08540
www.toefl.org

The Graduate School's TOEFL institution code number for this campus is 5848. TOEFL department codes are published by ETS.

IELTS test center, exam, and scoring information is available from:
IELTS International
100 E. Corson St., Suite 200
Pasadena, CA 91103
626-564-2954; 626-564-2981 (fax)
www.ielts.org

Graduate students whose work suggests English language deficiencies may need to take remedial English courses at their own expense.

Students who have received a degree from an accredited institution in the United States or who completed their studies in another approved English-speaking country may be exempt from providing TOEFL IBT or IELTS scores. The candidate must have studied in the country and not at a foreign branch campus to be granted an exemption. The Graduate School maintains a list of countries from which such a candidate may be TOEFL or IELTS exempt.

NONDEGREE (COURSEWORK ONLY) STUDENT STATUS

Students who desire to take graduate-level courses for personal or professional enrichment but who do not necessarily want to enter a graduate degree program at UMB may apply to enroll as a nondegree (coursework only) student. Students must complete an application for nondegree admission accompanied by unofficial transcripts, a professional vita/resume, and the application fee. Official transcripts, letters of recommendation, and GRE score reports are not required.

Applicants for admission for nondegree status must hold a bachelor's degree from a regionally accredited institution and have a B or 3.0 grade-point average or hold equivalent education and training from a foreign college or university. International applicants in the United States whose immigration status permits them to enroll on a nondegree basis must meet the language proficiency requirements of the Graduate School (i.e., the TOEFL or IELTS exam). Students applying for nondegree status also must obtain approval to enroll from the graduate program offering the applicant's desired course(s). Some degree and certificate programs do not permit students to enroll in program courses as nondegree students. Students admitted under this status may enroll for and complete a maximum of two graduate-level courses. Exceptions to this two-course limit may be considered only by the Graduate School and the program/department in which the student desires to study.

Enrollment for nondegree status does not guarantee future admission into a degree program. In the event that a student is admitted to a Graduate School degree program at a later date, courses completed in the nondegree status may be applied to the degree program contingent upon program approval. Nondegree students must maintain a 3.0 GPA and abide by UMB rules, regulations, and policies related to academic and student conduct. Students in this status are not eligible for financial aid, fellowships, or appointments as graduate teaching or research assistants. Other services, such as parking and library privileges, are the same as those accorded to other graduate students. The nondegree status includes the subcategory of "visiting students." Visiting students are degree-seeking graduate students at other universities. Besides the application for nondegree admission and the fee, visiting students must provide written certification from their home institution's graduate dean that they are in good standing in a graduate-degree program. This certification must accompany the application form.

FRAUDULENT REPORTING

Applicants must provide accurate and complete information on all application documents. Intentional omission or falsification of information during the application process will result in the immediate rejection of the application and dismissal of the student if they have enrolled at UMB. Application misrepresentation includes, but is not limited to: (1) false, omitted, or misleading information on the application, medical or immunization forms, financial aid disclosures, or information provided during the personal interview, (2) fake, forged, or altered transcripts, standardized test scores, or letters of recommendation.

OFFERS OF ADMISSION

The Graduate School offers admission based on program recommendations. Each offer specifies the time (semester and year) and program of admittance. Each offer requires an immediate, written response. The applicant may accept or decline the offer, or request to change the effective date of the offer. Failure to respond to the Graduate School's offer before the first day of class, or failure to register for the authorized semester or session, voids the offer of admission. The applicant must then submit a written request to be considered for a subsequent semester or session and may need to submit additional credentials. Students are admitted only to a specified academic program and only for the specified objective — i.e., certificate, or Master of Science, or Doctor of Philosophy degree. Students who are offered admission to more than one program must notify the Graduate School of their choice. Students may matriculate in only one graduate program at a time unless admitted to an approved dual-degree program or admitted to programs that permit dual enrollment. Students who accept the admission offer and enroll agree to abide by the rules and regulations of the University of Maryland, Baltimore.

An offer of admission made to students enrolled in their final semester of work toward a bachelor's degree is contingent upon their completion of that degree at or above their academic standing at the time the offer was made. The offer may be rescinded if the student's final academic standing is below the standing at the time the offer of admission was made, or the student may be admitted on a probationary basis. Applicants engaged in graduate study at another institution also are subject to this policy. Students admitted pending receipt of a bachelor's degree must submit an official transcript reflecting all coursework and award of the degree before their first semester of enrollment at UMB.

Admitted students who supplied unofficial documents and credentials for review must provide official versions of all academic documents (i.e., transcripts, test score reports) before their first semester of enrollment. These items become part of the student's permanent record at the University, and the student's continued matriculation is contingent upon having these items on file.

Regular Admission Status

Students admitted to full or regular graduate status must have submitted official documents showing a completed bachelor's degree from a regionally accredited institution and must qualify without terms or conditions in the judgment of admissions officials of the individual program and the Graduate School.

Provisional and Conditional Admission Status

Provisional or conditional admission may be offered to a student who does not meet regular standards for admission or does not possess the desired academic preparation but shows promise for academic success in graduate studies. The stipulations for either status may be defined by the program and/or by the Graduate School. Determination for either status is made on a case-by-case basis.

Provisional Admission

The offer of admission stipulates, upon the student's enrollment, a specific academic requirement or requirements that must be met to progress in a degree program. The offer will stipulate a defined time period (typically the first semester of study) in which the requirement(s) must be met. Essentially, the candidate is admitted on academic probation. The Graduate School grants regular status to the student when they satisfy the provision(s) stated in their admission letter. Failure to meet the stated stipulations within the defined time period will result in academic dismissal.

Conditional Admission

The offer of admission stipulates conditions, terms, requirements, etc., that must be satisfied or met before the student's enrollment at UMB. The Graduate School grants regular status to the student when they satisfy the conditions stated in their admission letter. The student must present evidence or verification of having satisfied the stated condition(s) before their enrollment at UMB. If the conditions are not met, the admission offer is rescinded and the student is not eligible to enroll.

Immigration Requirements for International Students

International students who receive an offer of admission must obtain the immigration form required for the appropriate visa. Accordingly, each international student must certify that they have sufficient funds (exclusive of travel expenses) for University tuition, fees, books, supplies, and living expenses. The total amount required for educational and living expenses (based on current tuition and fees) is available from the campus Office of International Services (OIS). Acceptable sources of and documents for certifying financial support include: a notarized letter with the full name, occupation, and address of a parent or sponsor who will assume the financial responsibility for the applicant's education and living expenses; an original, current statement from a bank confirming that sufficient funds are available to cover educational and living expenses; or official notification of grant, loan, or scholarship funds showing the name and address of the awarding institution, amount of funds, extent of expenses covered, and number of years the grant runs. New international students at UMB must report to the OIS upon arrival.

Visiting International Students

A visiting international student is a non-U.S. citizen who is pursuing a graduate degree at a university outside the United States and has been invited to UMB to conduct research with a UMB faculty member. A visiting international student must submit the following documents in addition to the application:

- A signed memorandum of understanding between UMB, the international university, the visiting student, and the UMB mentor.
- Evidence of English language proficiency. See Language Requirements on Page 7.
- Written certification from the student's home institution's graduate dean that the student is in good standing in a graduate-degree program.

Upon the student's admission to the UMB Graduate School, the student will be enrolled and billed for 1 research credit. The Office of International Services (OIS) will communicate directly with the student regarding required documents for the visa process. Students will be required to show sufficient funds to support their tuition, fees, and living expenses to receive J-1 visa sponsorship.

Once issued visa documents by the OIS, the visiting student will apply for a J-1 visa at a U.S. embassy or consulate overseas. Upon arrival, the student will be required to check in with the OIS.

If the student is paid by UMB, the hiring department must submit a student contract to the Office of Student Employment. Visiting international graduate students are limited to 20 hours per week of employment during the academic year and 29 hours per week of employment during the summer.

Other Enrollment Programs

Golden ID Program

The Golden ID program extends enrollment privileges to Maryland's senior citizens based on a space-available basis. Those who qualify receive a waiver of graduate tuition for up to three courses per semester. Fees are not waived. Eligible candidates must be at least 60, retired, not employed full time, and dependent upon retirement income benefits as their chief source of income. Beyond the waiver of tuition, benefits include use of library and other University facilities.

Interinstitutional Enrollment

The University System of Maryland encourages graduate students enrolled at one institution to avail themselves of course offerings, research facilities, and special faculty expertise at the other institutions. The home institution retains responsibility for admission, academic advising, the collection of tuition and fees, grants of financial aid, the academic transcript, and awarding of the graduate degree.

Additional Guidelines

Applicant/Student Records

Application materials of admitted students become part of the student's official file and property of the Graduate School upon the student's enrollment. Under no circumstances will the Graduate School provide photocopies of official transcripts or score reports received from other institutions. The Family Educational Rights and Privacy Act (Buckley Amendment), published in the University's *Student Answer Book*, outlines the terms by which students may review their records once enrolled. Credentials of applicants who do not register for courses for the term for which they have been admitted, whose application has been disapproved, who do not respond to requests for additional information, or whose application is not complete with respect to the receipt of all transcripts or test results are retained for only one academic year.

Immunization and Health Policy
All UMB graduate students are expected to satisfy the University's immunization policy requirements. Health care coverage also is required for all students. The University's complete immunization policy — including citations for waivers or exceptions — may be obtained from the student health office and can be read at *www.umaryland.edu/studenthealth*.

Student Identification Numbers
The Graduate School assigns an identification number to each applicant. This number becomes the student number for those who are admitted and subsequently enroll. The student's Social Security number, if supplied on the application, is used only for federal aid, payroll, and other University-related purposes permitted by law.

All students must hold a valid photo identification card during their studies. The Graduate School provides information on obtaining a photo ID to students upon their admission or arrival on campus.

Mandatory Drug and Criminal Background Check Requirements for Certain Study or Research Areas
Certain study or research activities of students may require access to biological or chemical materials that are subject to special restrictions under federal law. Individuals who wish to be authorized to have access to such materials must comply with UMB policy, state law, and federally mandated drug and criminal background checks. Students who cannot maintain eligibility to engage in study or research with biological or chemical materials have no assurance that UMB will provide an alternative path of study or research. Therefore, students may not be able to enroll or to continue enrollment and advancement at UMB. Because of the serious financial and academic consequences of failure to obtain and maintain ongoing eligibility with legal requirements, students should plan in advance to ask advisors, faculty, and mentors about authorization for access to biological and chemical materials. Students should carefully consider the drug and criminal background check requirements before selecting a course of study or research that may be subject to special restrictions.

Special Services/Accommodations
Individuals who are offered admission and who need accommodation under the Americans with Disabilities Act should contact the University's Office of Student Services and the respective graduate program director in a timely manner. Accommodations will not be made retroactively.

UMB Office of Student Services
Southern Management Corporation Campus Center
621 W. Lombard St., Suite 302
Baltimore, MD 21201
410-706-3171
Hearing impaired-Maryland Relay Service: 711 in Maryland or 800-735-2258 elsewhere.

Registration, Enrollment, and Grades

Abidance of Guidelines

All students, including visiting, inter-institutional, and professional school students, enrolled in Graduate School courses at UMB are subject to Graduate School grading and registration guidelines and policies.

Students must have been approved for admission by the Graduate School to be eligible for registration and enrollment; only those who have been approved to enroll may attend classes.

Students are not officially enrolled without an active course registration entered into the University's student information management system (SIMS). If a student does not register for at least one course in each semester (fall and spring), their registration eligibility is interrupted; they may request a leave of absence or must request re-entry and permission to re-enroll.

Full- and Part-Time Enrollment

Graduate students must be registered for a minimum of 9 total credit hours per semester to be considered a full-time student or to be enrolled on a full-time basis.

Students receiving a graduate assistantship must be enrolled on a full-time basis. Graduate assistants must register for 7 credits of ABGA 900, 901, or 902, whether receiving a half-time or a full-time assistantship. Thus, graduate assistants must register for an additional (minimum) 2 credits to be enrolled on a full-time basis. Additional information regarding the terms of enrollment for a graduate assistant are cited in the Financial Assistance/Graduate Assistantships part of this publication.

Students receiving need-based assistance (federal Title IV funds) need to be registered for at least 6 credit hours to be eligible for federal aid. Enrollment must include "regular" credit-bearing courses; courses taken for audit do not count.

Summer Term Registration

In general, degree students are not required to be registered during the summer term as part of the Graduate School's Continuous Enrollment policy. And, with the exception of first-term international students, there is no full-time enrollment requirement in the summer term. Full-time enrollment in the summer is defined as at least 9 credit hours of course registration. Summer term registration, however, is expected for certain student groups, such as 12-month graduate assistants and students attempting to qualify for need-based federal financial assistance.

Changing a Schedule or Course Registration(s)

Students must register for coursework each term (except summer and winter) to maintain eligibility for a degree. Adjustments to course registrations should only be made before the start of the semester and should be undertaken in consultation with the students' instructors and/or advisors. After the start of the term, changes may be made only in accordance with stated timetables. Further, students must file the necessary form(s) for registration changes with the appropriate University officials' signature(s) of approval before changes are complete or official.

Add

Week 1: Fall, spring, or summer term – Students may add course(s) through the end of Week 1 only. (Winter term — Students may add a course through the end of Day 2 only.) Complete an Add/Drop form.

Drop

Weeks 1-3: Fall, spring, or summer term (winter term: through the end of Day 2) – Students may drop course(s) through the end of Week 3 with proper approvals and with no notation on the transcript. Complete an Add/Drop form with the instructor and advisor or program director. Partial (80 percent) or no refund depending upon drop date.

Weeks 4-8: Fall and spring term (through end of Day 18 in the summer term) – Students may drop course(s) through the end of Week 8 with instructor and advisor or program director approval. A notation of WD will appear on the transcript. Complete an Add/Drop form with the instructor and advisor or program director. Course(s) dropped counts as an attempt. There is no refund.

Beginning the ninth week of the fall and spring terms (or beginning Day 19 of the summer term, or from Day 3 to the end of the winter term), students are not permitted to drop a course. The student must complete the course, negotiate/request an Incomplete, or request the instructor to grant a Withdraw Pass or Withdraw Fail (WP/WF – use the Course Withdraw Form). There is no refund.

Graduate nursing students — i.e., nondegree/CWO, PhD, MS, and DNP students — are expected to abide by the registration change (add/drop) timelines, rules, and guidelines established by the School of Nursing.

Withdrawing from a Course — Withdraw Pass/Withdraw Fail

If a student withdraws from a course after the first eight weeks of a fall or spring semester course or the first two weeks of a summer course, and the Course Withdrawal Request form is appropriately completed and filed with signature approvals, the student will receive a withdrawal mark of WP or WF for each course attempted. A withdrawal mark of WP means that the student was passing the course at the time of withdrawal; a withdrawal mark of WF means the student was failing at the time of withdrawal. Each WP and WF mark will appear on the official transcript. WP/WF marks are not included in the calculation of semester, term, or cumulative grade-point averages. However, WF marks are included as course failures when determinations of academic probation or academic failure are made. There are no refunds for WP/WF marks.

Cancellation of Registration

Registered students compelled to leave the University before the start of a term must file a notice of cancellation of registration with the Graduate School. Failure to file this notice and obtain approval by the Graduate School will result in loss of refund. Once the semester begins, students are subject to the other schedule adjustment guidelines, policies, and procedures (add/drop, withdrawing, etc.) cited herein.

Leave of Absence

Students who wish to continue in a degree program but cannot study in a particular semester, session, or year must take a leave of absence with the approval of their academic advisor and the Graduate School. Students must complete a Leave of Absence Request form and present it to their program director and the Graduate School for approval. The Graduate School notifies students of leave approvals and the terms of re-enrollment. While there is no limit to the number of times a student may request a leave of absence, leaves do not extend the time required to complete degree requirements. Leaves of absence are not required for the summer term and are not required of nondegree/coursework-only students.

A student who is in academic jeopardy (academic probation) or who is otherwise not making satisfactory progress toward their degree – and who is granted an approved leave of absence – may be subject to additional review and modified terms of enrollment upon their return.

Withdrawing from the Graduate School

Once admitted to a graduate program, students are obligated to continue their course of studies. Students who desire or need to cease pursuing their degrees after registration and after the start of the term must submit a notice of withdrawal from the University, bearing the proper (program/department) signatures, to the Graduate School. The date used in computing a refund is the filing date of the document for withdrawal. Students who withdraw during a semester and do not file an application for withdrawal receive marks of failure in all courses and forfeit the right to any refund that they would otherwise receive. Students seeking to re-enter graduate study after withdrawal must reapply for admission and compete with a new entering class.

REINSTATEMENT

Students who "stop out" — that is, leave their studies for a period of time without formally withdrawing or taking an approved leave of absence — must request to be reinstated as returning students. The request may be made directly to the program/department for review, with accompanying notification to the Graduate School. A student who has been away from studies (i.e., no active enrollment or registration) for more than two years must appeal for reinstatement to the student's program and the Graduate School. This request must be made in writing and addressed to the program director and the Graduate School. Depending upon the student's academic standing at the time of departure and/or the length of departure, the student may be required to reapply and compete with a new entering class. The department is under no obligation to readmit the student. For students reinstated, a reassessment of the relevancy and applicability of prior courses toward the degree may be undertaken. Students in graduate studies in the School of Nursing must comply with its Policy on Students Who Stop-Out.

CHANGE OF DEGREE INTENT

An enrolled student who needs or desires a change of degree intent (master's to PhD or vice versa) must submit a written request to their advisor and program director. The request should include the reason(s) for the request and the effective semester of change. The request must be approved by the advisor and the program director and forwarded to the Graduate School for final approval.

CHANGE OF PROGRAM

An enrolled student who desires to change their program of study within the Graduate School must submit a written request to the program director of the desired program. The request must include the reason(s) for the request and the effective semester of change. The request also must be copied to the director and advisor from the program the student is leaving and to the Graduate School. In most cases, a new application for admission and supplemental documentation may be required.

UNDERGRADUATES TAKING GRADUATE COURSES FOR UNDERGRADUATE CREDIT

Subject to requirements decided by the program offering the course, undergraduate students may register for graduate-level courses — i.e., those numbered from 600 to 898 (except 799) — for undergraduate credit. A student seeking this option normally will be in their senior year; have earned an accumulated grade-point average of 3.0; have successfully completed, with a grade of B or better, the prerequisite and correlative courses; and be majoring in an appropriate department. Enrollment in a graduate-level course does not in any way imply subsequent Graduate School or program approval for credit for a graduate degree at the University of Maryland except in relation to approved five-year bachelor's or master's programs.

UNDERGRADUATES TAKING COURSES FOR GRADUATE CREDIT

UMB undergraduate students who have a grade-point average of at least 3.0 in the discipline in which they wish to take the course, and are within 7 credits of graduation, may register for some 400- to 600-level-and-above courses, which may later count for credit toward a graduate degree at UMB. Except in approved bachelor's or master's programs, the credits must be beyond those required for the student's undergraduate degree. Credits in the senior year over those required for graduation cannot count for graduate credit without prior, written approval of the instructor in the course, the director of the respective graduate program, and the Graduate School dean.

Grades

The Graduate School permits instructors to assign final grades using the "plus or minus" grading system. The available letter grades and corresponding quality point values used for grade-point average calculations are as follows:

A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
C-	1.67
D+	1.33
D	1.00
D-	0.67
F	0.00

All graduate students must have a cumulative GPA of 3.0 or better to remain in good academic standing and to graduate.

If no grade is given to a student, the student automatically receives a No Mark (NM) on their record at the end of the term. The NM remains on the record until a final letter grade is submitted. All No Marks and Incompletes on a student's record must be reconciled (i.e., given the appropriate terminal grade) before the student graduates. Since graduate students must maintain an overall B grade-point average (a B- average does not constitute satisfactory academic progress), every credit hour of C in coursework must be balanced by a credit hour of A. However, a grade of A in master's thesis or doctoral dissertation research will not balance a grade of C in a course.

Repeating a Course

Students must repeat courses in their designated degree program in which they receive a D or F. No student may graduate with an unresolved or unrepeated F on the record. Students who earn a grade lower than a B may repeat the course. The grade on any repeated course, whether it is higher or lower than the original grade, takes the place of the original grade. Students may repeat a course only once, unless the course has been designated or approved as a multiple repeat course for degree completion (e.g., lab rotations, special topics, thesis/dissertation registrations).

Pass/Fail

Programs may use a Pass/Fail (P/F) grading system at their discretion for independent field work, special projects, independent study, seminars, workshops, and departmental courses in instructional methods.

Audit

Courses taken for Audit (AU) do not count toward the minimum credit requirement for degree or postbaccalaureate certificate completion. Charges for audit courses are the same as credit courses, except for ABGA courses.

Changes to Grade Method

Changes to the method used for a student's final course grade (i.e., letter grade to pass/fail or letter grade to audit) may not be made after the last day to drop a course (end of Week 8) for the term.

TEMPORARY AND FINAL GRADES (INCOMPLETES AND NO MARKS)

Students should complete all the requirements of graduate coursework during the semester in which they take the course. The graduate faculty should issue final grades by the date listed on the final report of grades. No student may graduate with an Incomplete (I), No Mark (NM), or failing grade (F) in courses required for their degree program.

INCOMPLETE GRADES

An Incomplete grade (I) is appropriate (i.e., may be assigned by the instructor) when a student has an unexpected inability to complete a final assignment in a class. Students should not re-register for a course when an Incomplete has been assigned. The student and the instructor/faculty member should create and sign a contract that facilitates completion of the outstanding assignment(s). Graduate faculty must change Incomplete (I) grades to final letter grades for all courses required for the degree. They must assign letter grades within one academic year of the time at which the required course ended. This policy does not apply to the 799 and 899 research grades, where the graduate faculty may assign letter grades, Pass/Fail (P/F) grades, or Incomplete grades. Incomplete grades should be replaced by appropriate terminal grades before the examining committee approves the applicable research.

NO MARK GRADES

A No Mark grade (NM) is put in place opposite courses in which no final grade has been posted (i.e., when a faculty member is unable to submit a grade by the grade deadline). Students should not re-register for a course when a No Mark has been assigned except in the case of lab rotations and thesis/dissertation research.

APPEAL OF GRADE

A student who thinks that a final grade in a course is the result of arbitrary or capricious grading may appeal to the Graduate School dean. The procedural guidelines for handling allegations of arbitrary and capricious grading appear in the Policies section of this catalog.

CREDIT BY EXAMINATION

A graduate student may obtain graduate credit by examination in courses at the 400 level previously identified as acceptable by the appropriate program. Generally, credit by examination is not available for courses at the 600, 700, or 800 levels for courses that, in the judgment of the Graduate Council, require a continuing interaction between faculty and students to achieve the educational goals of advanced study. Students may receive credit by examination only for a course in which they are otherwise eligible to receive graduate credit. Programs may establish limits on the number of credits students may earn through credit by examination. Graduate students seeking this option must obtain the consent of their advisors. The fee for each examination is equivalent to the cost of graduate tuition for 1 credit. Students must pay the nonrefundable fee upon application for the examination.

ACADEMIC RECORD (TRANSCRIPT)

A graduate student's academic record (transcript) serves as a complete, official history of their academic progress at the University of Maryland, Baltimore. As such, it will not change except in accordance with stated Graduate School policies. Under no circumstances will the academic records change because of dissatisfaction with a grade or other academic accomplishment.

Course Numbering System

Course levels are designated as follows:

- 100-399: Undergraduate courses not acceptable for credit toward graduate degrees.
- 400-499: Junior and senior courses acceptable for credit toward some graduate degrees if specifically approved by the Graduate Council.
- 500-599: Professional school courses and certain postbaccalaureate courses acceptable for graduate degree credit only if approved by the Graduate Council.
- 600-898: Courses normally reserved for graduate students.
- 799: Master's thesis research.
- 899: Doctoral dissertation research.
- 901-999: Interprofessional courses acceptable for graduate degree credit only if approved by the Graduate Council.

Credit Hour Definition

(1) An in-state institution shall award 1 credit hour for:

(a) A minimum of 15 hours, of 50 minutes each of actual class time, exclusive of registration, study days, and holidays;

(b) A minimum of 30 hours, of 50 minutes each of supervised laboratory or studio time, exclusive of registration, study days, and holidays;

(c) A minimum of 45 hours, of 50 minutes each of instructional situations such as practica, internships, and cooperative education placements, when supervision is ensured and learning is documented; or

(d) Instruction delivered by electronic media based on the equivalent outcomes in student learning of this regulation, and may include a combination of telelessons, classroom instruction, student consultation with instructors, and readings, when supervision is ensured and learning is documented.

COMAR - 13B.02.02.16 - *http://www.dsd.state.md.us/comar/comarhtml/13b/13b.02.02.16.htm*

Academic Standards, Policies, and Degree Requirements

Responsibility for progress in a graduate degree program is shared by the student, faculty advisor, program, and Graduate School administration. Students are responsible for compliance with the Graduate School's rules and procedures and all other program requirements. Students should actively seek the advice of their faculty mentors, graduate program directors, and Graduate School staff members.

Complete information on the special requirements for degrees is found in the publications of the individual programs. The general requirements common to all graduate programs are as follows.

Advisement

Program faculty coordinate academic advising for graduate students. Students are encouraged to seek the advice and counsel of graduate advisors and program directors in planning their curriculum. In addition, the Graduate School provides graduate assistants with the Graduate Assistant Guide, which describes relevant policies and guidelines. Other policies related to student enrollment activities are in the University's *Student Answer Book*.

Minimum Grade-Point Average

The Graduate School requires all graduate students to maintain a minimum, cumulative grade-point average (GPA) of 3.0 on a 4.0 scale during their studies to remain enrolled. The Graduate School reviews students' academic performances each semester. Failure to maintain the minimum GPA requirements may result in academic dismissal. No student may graduate with a cumulative grade-point average of less than 3.00.

The Graduate School expects students to meet the highest standards of academic integrity — the success of the entire academic enterprise depends on them doing so. Cheating, plagiarism, fabrication, falsification, or abetting the academic dishonesty of another will result in sanction and may lead to academic dismissal.

Continuous Enrollment

Once admitted to a graduate program, each student has the obligation to continue a course of study and must register every semester in the academic year (fall and spring semesters) unless on an approved leave of absence. Failure to comply with the requirement to register every semester will be taken as evidence that the student has terminated their program and admission status in the Graduate School.

Notice of Dismissal

If a student fails to meet Graduate School standards of satisfactory academic performance and progress, they shall be given written notice of academic dismissal by the Graduate School. The notice will include the reason for the dismissal. A copy of the notice will be provided to the student's graduate program director. Notice of dismissal will be mailed to the student's address of record as noted on file with the UMB registrar. Notice is deemed received by the student within 10 calendar days from the date of the notice. Each student is expected to notify the Graduate School and the graduate program of changes in address and to check for correspondence at their address of record in a timely fashion.

Appeal of Academic Dismissal

The Appeal of Academic Dismissal policy outlines the appeal procedures for a student dismissed for poor academic performance. Students dismissed for cheating or plagiarism may appeal under the guidelines provided by the Student Academic Misconduct policy. Both documents are on file with the office of the dean of the Graduate School and are printed in the Policies section of this catalog.

Academic Performance and Progress in Postbachelor's Certificate Programs

Satisfactory academic performance and progress within the UMB certificate programs is a responsibility shared by the Graduate School, the certificate program, and students. Certificate programs with additional criteria and requirements approved by the Graduate School are covered under this policy. Students should review all graduate program handbooks and standards.

Satisfactory performance and progress is demonstrated by adherence to the following Graduate School standards:

- Graduate students must maintain a minimum, cumulative grade-point average (GPA) of 3.0 on a 4.0 scale. Further, two or more grades of C or lower denote unsatisfactory progress in a certificate program and subject the student to academic dismissal regardless of cumulative GPA.
- All courses must be taken for letter grade; courses taken as pass/fail (P/F) or audit (AU) may not be counted toward the certificate.
- The course of study undertaken for a postbaccalaureate certificate must be ascertained from an approved program consisting of at least 12 graduate-level credit hours.
- All requirements for the certificate must be completed within three years after admission. Periods of nonregistration ("stopping out" or approved leaves of absence) are included within this three-year period.
- All credits for a certificate must be completed at the University of Maryland, Baltimore.
- Students are expected to meet the highest standards of integrity; cheating, plagiarism, fabrication, or abetting the academic dishonesty of another will result in sanction and may lead to academic dismissal.

These guidelines are applicable to all UMB graduate students regardless of instructional delivery mode (i.e., traditional, online, or hybrid).

Failure to satisfy the Graduate School's standards of satisfactory academic performance and progress — or nonadherence to program-specific policies and requirements — subjects a student to possible academic probation and/or dismissal.

Academic Performance and Progress in Master of Science Programs

Satisfactory academic performance and progress within the UMB Master of Science (MS) programs is a responsibility shared by the Graduate School, the graduate programs, and students. This policy specifies the elements of satisfactory academic performance and progress for students in UMB programs required by the Graduate School. MS programs with additional criteria and requirements approved by the Graduate School are covered under this policy. Students should review all graduate program handbooks and standards.

Failure to satisfy the Graduate School's standards of satisfactory academic performance and progress subjects a student to possible academic dismissal, as does nonadherence to program-specific policies and requirements.

Satisfactory performance and progress is demonstrated by adherence to the following Graduate School standards:

- All graduate students must maintain a minimum, cumulative grade-point average (GPA) of 3.0 on a 4.0 scale. The Graduate School reviews students' academic performances each semester and session. Failure to maintain the minimum GPA requirement may result in academic dismissal.
- Once admitted to a graduate program, a student has the obligation to continue a course of study and must register every semester in the academic year (fall and spring semesters) unless on an approved leave of absence. Failure to comply with the requirement to register every semester will be taken as evidence that the student has terminated their program and admission status in the Graduate School.

- Any student admitted provisionally will be granted full graduate status when the provisions have been satisfied. Provisionally admitted students who fail to meet the terms of their admission may be dismissed.
- The entire course of study undertaken for the Master of Science degree must form a unified, coherent program approved by the student's advisor and the Graduate School. Students inadequately prepared for the required graduate courses may need to take additional courses to supplement their undergraduate work. These courses may not be considered as part of the graduate program.
- The minimum number of credits required by the University and the Graduate School for the master's degree is 30. Some programs or degree specializations require more credits. Students in a thesis option program must complete a minimum of 6 credits of master's thesis research.
- No more than 6 credits or two courses of graduate coursework taken as a nondegree student or at other regionally accredited institutions before matriculation in the Graduate School may apply toward the master's degree. A request for transfer of credit should be completed shortly after matriculation. The student's advisor and graduate program director must approve the form and submit it to the Graduate School. Official transcripts of the courses for which credit is requested must accompany the Transfer Request form. The student is subject to final examination in all work offered for the degree.
- The Graduate School does not allow transfer credit for any courses applied to any other degree. The Graduate School does not grant credit for correspondence courses or "credit by examination" courses taken at other universities. Also, note that the Graduate School only transfers credit, not grades, from other universities.
- Students must satisfactorily complete coursework and the required curriculum in a timely fashion. All requirements for the master's degree must be completed within a five-year period. Courses completed more than five years before the expected date for receiving the master's degree will not count toward that degree. The period of an approved leave of absence is included within the five-year period.
- Students must adhere to the appropriate thesis or nonthesis guidelines outlined by the Graduate School and the program.
- Students in an MS program with clinical or experimental requirements are expected to meet the requirements, standards, and expectations of those experiences.
- Students are expected to meet the highest standards of integrity; the success of the entire academic enterprise depends on them doing so. Cheating, plagiarism, fabrication, or abetting the academic dishonesty of another will result in sanction and may lead to academic dismissal.

Master of Science Thesis Option Requirements

Students must complete a minimum of 30 credits, including 6 credits of master's thesis research (799), for the Master of Science degree. Of the remaining 24 credit hours required in graduate courses, no fewer than 12 must be selected from courses numbered 600 or above.

Examination of the master's thesis is conducted by the candidate's master's examination committee. This committee comprises a minimum of three and a maximum of five voting members, all of whom must hold the doctoral degree or the highest degree for the discipline. The committee must include the candidate's master's thesis advisor. One or two members may be from programs separate from the candidate's. At least three of the committee members must be graduate faculty members. The Graduate School dean selects one committee member as the Graduate School representative. The Graduate School representative, who must be a member of the graduate faculty and not the committee chair, is responsible for ensuring that the examination is conducted according to established procedures.

The committee chair must be a member of the graduate faculty and is normally the candidate's advisor. The chair is responsible for nominating the committee members to the Graduate School dean. If a candidate's advisor is not a member of the graduate faculty, the candidate's program director is responsible for appointing a graduate faculty member from within the program to serve as chair. Nomination of committee members must be made by the chair at least two months before the date of the final master's examination. After receiving the completed nomination form, the dean of the Graduate School appoints the committee and designates the Graduate School representative.

The chair must sign the Certification of Completion of Master's Thesis form and return it to the Graduate School at least two weeks (a minimum of 10 working days) before the proposed examination date. The signature of the chair certifies that the master's thesis is ready to be defended. Any minor or typographical corrections or amendments resulting from the master's examination must be incorporated in the master's thesis by the student before the student turns in/uploads a final master's thesis to the Graduate School. The signature of the student's advisor on the approval sheet certifies that the student has made all required corrections. Beyond the oral master's examination, the program committee may require a comprehensive written examination.

Complete final examination policies and procedures, including a description of the conduct and outcomes of the examination, are in the Procedures for Examination of the Master's Thesis section. This document is available from the Graduate School and online.

Master of Science Nonthesis Option

The requirements for the Master of Science degree without thesis vary among programs in which this option is available. Standards for admission, however, are identical to those for admission to any master's program. The quality of the work expected of the student also is identical to that expected in the thesis programs. The general requirements for students choosing the nonthesis option are: an overall average grade of B in all coursework taken; of the total credits required by a program, a total of 18 numbered 600 or above; and a passing grade on a written comprehensive examination. The program must certify, on the form provided for that purpose, that the student has completed all requirements for the degree.

Academic Performance and Satisfactory Progress in PhD Programs

The Graduate School has established standards and requirements regarding minimum grade-point average, continuous enrollment, time to degree, advancement to candidacy, academic integrity, and other elements of satisfactory academic progress and degree completion. All doctoral degree candidates are expected to review and comply with these standards and requirements.

The Doctor of Philosophy degree (PhD) is the highest degree awarded by the University. The degree is granted to those candidates who demonstrate a high level of scholarship and the ability to conduct independent research. It is not awarded for the completion of course and seminar requirements alone. Beyond the following requirements, the program may have special requirements. Consult the program descriptions in this catalog and the program director for more information.

Satisfactory academic performance and progress within the UMB Doctor of Philosophy (PhD) programs is a shared responsibility of the Graduate School, the doctoral programs, and graduate students. This policy specifies the elements of satisfactory academic performance and progress for students in UMB Graduate School PhD programs.

Satisfactory performance and progress in a UMB Graduate School doctoral program is demonstrated by adherence to the following Graduate School standards:

- After admission to a doctoral program, each student must continue a course of study and register for fall and spring semesters unless on an approved leave of absence. Failure to comply with the requirement to register every semester will be taken as evidence that the student has terminated their program and admission status in the Graduate School.

- Students accepted provisionally will have provisional admission status removed only after all provisions have been satisfied and the student has fulfilled all other Graduate School and doctoral program requirements for nonprovisional admission. This determination will be made by the Graduate Program director and the Graduate School.
- Graduate students must maintain a minimum cumulative grade-point average (GPA) of 3.0 on a 4.0 scale during the course of their studies.
- The UMB Graduate School does not impose a uniform protocol for preliminary, qualifying, or comprehensive examinations. Admission to candidacy occurs after fulfilling the respective doctoral program requirements.
- Students must establish and maintain a professional relationship with a faculty research advisor. The advisor must hold regular membership in the graduate faculty with the appropriate knowledge and expertise to serve as a research advisor.
- Students must demonstrate the ability to conduct independent research by developing, presenting, and defending an original dissertation on a topic approved by the doctoral program. Evidence of completion of this requirement is submission of the committee-approved dissertation to the Graduate School.
- The Graduate School requires that students take and pass a doctoral examination of the dissertation composed of an open presentation and a formal examination. The formal examination can only be attempted twice. A failure on the second attempt means the PhD degree is forfeited.
- Students must be admitted to candidacy within five academic years of the first term of enrollment in the doctoral program and at least two full sequential semesters or sessions (spring, summer, or fall) before graduation. All degree requirements, including the final examination of the dissertation, must be completed within four years of admission to candidacy and no more than nine years after admission into the doctoral program.
- Students are expected to meet the highest standards of academic integrity. Plagiarism, fabrication, falsification, cheating, and other acts of academic dishonesty, or abetting the academic dishonesty of another, will result in sanctions and may lead to academic dismissal.

Students must meet all doctoral program requirements for satisfactory academic performance and progress as well as Graduate School requirements. Students are advised to be familiar with all handbooks, requirements, and standards of their doctoral program:

- Doctoral programs may have requirements that are in addition to the Graduate School standards listed previously. Examples of additional graduate program requirements are laboratory rotations, journal clubs, presentation of papers/abstracts, and publication(s).
- Doctoral programs may have more stringent standards than the Graduate School. Examples of more stringent standards are higher than the 3.0 minimum GPA required by the Graduate School, advancement to candidacy within four years instead of five, and program completion within seven instead of nine years.

The student is expected to meet the most stringent standard for each requirement, whether it is a standard of the UMB Graduate School or the doctoral program.

Failure to meet any of the Graduate School and doctoral program standards of academic performance and progress subjects a student to automatic academic probation and the possibility of dismissal.

Placement on Academic Probation or Dismissal

If a student does not meet the Graduate School and the doctoral program's standards of satisfactory academic performance or progress, the student will automatically be placed on probation or be dismissed. Written notice of this action, including the reason for the action, is provided by the Graduate School. A copy of the notice is provided to the student's doctoral program director. Notice is mailed to the student's address of record as noted on file with the UMB registrar. Notice is deemed received by the student within 10 calendar days from the date of the notice. Each student is expected to notify the registrar, the Graduate School, and the doctoral program of changes in address and check for correspondence at his or her address of record in a timely fashion.

For information on Graduate School policy and procedures for appeal of probation or academic dismissal, go to *http://graduate.umaryland.edu/Policies*.

Doctoral Program Course Requirements

There is no Graduate School requirement on the number of courses students must take in either the major or minor fields. The Graduate School policy encourages the development of individualized programs for students who seek the doctoral degree. The academic departments and interdisciplinary programs have been directed to decide major and minor requirements, levels or sequences of required courses, and similar requirements for submission to the Graduate Council for approval.

Courses taken at other institutions approved by the graduate program for partial fulfillment of requirements for the degree at UMB are listed on the Application for Admission to PhD Candidacy at the time of admission to candidacy (see the Admission to Candidacy section that follows).

Doctoral Program Time Required

The Graduate School requires a minimum of three years or its equivalent of full-time graduate study and research. Of the three years, at least one year or its equivalent must be spent at the University of Maryland, Baltimore. Students must submit all work at other institutions in partial fulfillment of the requirements for a doctoral degree to the Graduate School with the program recommendation for approval at the time of admission to candidacy. Official transcripts of this work must be on file in the Graduate School.

Students must be admitted to candidacy within five years of admission to the doctoral program and at least two full sequential semesters or sessions (spring, summer, or fall) before graduating. All degree requirements, including the doctoral dissertation and final doctoral examination, must be completed within four years of admission to candidacy and no more than nine years after admission into the doctoral program. Failure to complete all requirements within the time allotted requires another application for admission to the Graduate School with the usual requisites as decided by the program committee. The Graduate School grants extensions of time only under the most unusual circumstances.

Doctoral Program Registration Requirements

Doctoral students may not enroll for 899 research credits (if/when conducting research) until reaching candidacy; before candidacy, they may enroll in Pre-candidacy Research 898 (1 to 8 variable credits) in preparation for candidacy and to ensure full-time enrollment at that stage in their studies. Students should enroll in the appropriate number of credits to reflect their work toward the dissertation before reaching candidacy. 898 credits are not counted as part of the 899 credits required for graduation and are only offered as a pass/fail grading option.

Once admitted to candidacy, doctoral students must successfully complete a minimum of 12 credit hours of doctoral dissertation research (899).

Admission to Candidacy

Doctoral students must complete an application for admission to candidacy when they fulfill all requirements for candidacy. Preliminary examinations, grant writing, or other substantial tests as the program/department may elect are frequently prerequisites for admission to candidacy.

Students must submit the following to the major advisor and program director for review: the application, an unofficial UMB transcript, and official transcript(s) showing relevant external graduate coursework to be used in partial fulfillment of the UMB degree (if applicable). The advisor and program director indicate which courses are to be used to fulfill degree requirements. The student must forward the application and attachments to the Graduate School for final review.

Courses taken at other regionally accredited institutions that are approved by the UMB graduate program are listed on the Application for Admission to Candidacy at the time of admission to candidacy. These courses do not appear on the UMB transcript, but, if approved by the program or department, may be used as partial fulfillment of the doctoral student's degree program completion requirements.

Doctoral Dissertation

Students must prove the ability to do independent research by an original dissertation on a topic approved by the department or program graduate committee. During the preparation of the dissertation, all candidates for the doctoral degree must complete a minimum of 12 credit hours of doctoral dissertation research (899) at the University of Maryland, Baltimore.

A PhD student must establish and maintain a professional relationship with a member of the graduate faculty with the appropriate knowledge and expertise to serve as their research advisor. If no appropriate graduate faculty member is available or no appropriate graduate faculty member agrees to be the student's research advisor, the student cannot continue in the PhD program.

Students also must have a doctoral examination committee nominated by the graduate program. The doctoral examination committee comprises a minimum of five scholars: the advisor, who is a regular member of the graduate faculty; at least two additional regular members of the graduate faculty; and at least one individual from outside the program, department, or discipline. Two committee members are designated as readers.

The student must submit their dissertation to the chair and two other readers at least one month before the defense date. When the dissertation is completed to the satisfaction of this committee and at least 10 days before the defense, the advisor and both readers sign the form verifying that the dissertation is ready for defense.

Often, students will submit the results of their dissertation research for publication. Students should obtain authorization from research advisors for publication of all or part of the dissertation before its defense. A manual to help students in the preparation of their doctoral dissertations, *Electronic Dissertation and Thesis Style Guide*, is available online and from the Graduate School.

Procedures for Examination of the Candidate's Doctoral Dissertation

The purpose of the defense is to allow the candidate to demonstrate that they:

- Have mastered a field of knowledge.
- Have successfully completed a program of research in their chosen field.
- Are able to discuss and defend a research question and the results of the research project with colleagues and the general public.

The examination of the doctoral dissertation is conducted by the doctoral examination committee. Described below are the:

1. Composition of the doctoral examination committee.
2. Documentation and actions required before the doctoral examination.
3. Conduct of the doctoral examination.

1. Composition of the Doctoral Examination Committee

The committee must have a minimum of five and a maximum of seven voting members, all of whom must hold a doctoral degree or the terminal degree in their discipline. The committee must include the candidate's dissertation advisor, two readers, and one member who is external to the candidate's program, department, or discipline. One of the committee members (other than the chair) is appointed by the dean of the Graduate School as graduate school representative and serves as the dean's surrogate. At least three of the members of the committee must be regular members of the graduate faculty.

At least six months before the proposed defense date, the committee chair will prepare and send a list of potential committee members to the dean of the Graduate School (Nomination of Members of Final Doctoral Examination Committee) for approval. If changes need to be made in committee composition, the committee chair must request approval from the dean of the Graduate School. If last-minute changes need to be made to the membership of the committee, the chair is to contact the office of the dean of the Graduate School and inform the office of the needed change and the reason for the change.

- **Chair:** The committee chair must be a regular member of the graduate faculty and is normally the candidate's advisor. If a candidate's advisor is not a member of the graduate faculty, the candidate's program director is responsible for appointing a regular graduate faculty member from within the program to serve as the chair. In this case, it is expected that the dissertation advisor would serve on the committee as one of the other members.
- **Readers:** In addition to the chair, two members of the committee must be identified as readers. The chair and readers serve to certify that the dissertation is ready to be defended and do so by signing the Certification of Completion of the Doctoral Dissertation. This form must be returned to the Graduate School at least two weeks before the proposed examination date (see the Documentation and Actions Required Prior to the Doctoral Examination section that follows). The candidate will provide the chair and the readers a copy of the dissertation at least two weeks before the deadline for submitting the Certification of Completion of the Doctoral Dissertation. By signing the certification, the readers and the chair are indicating that the dissertation is a presentable, interpretable, and complete document. The three signatures attest that the dissertation conforms to these criteria; however, they do not indicate a determination of the ultimate acceptability or approval of the dissertation, which can only occur after the final examination session. The candidate's program director also must sign the Certificate of Completion form. By signing, the program director indicates that all other University and program criteria pertaining to completion of the PhD are satisfied and that the exam may go forward.

- **External Member of the Examination Committee:** One of the members of the committee must be an external member. This individual must be from a separate program, department, or discipline from that of the candidate. The role of the external member is to provide a broader perspective within the examination process. The external member must hold a doctoral degree or a terminal degree in their field. The individual may be from within the University or may be a scholar from another institution. If the external member is a member of the graduate faculty, the individual may also serve as the Graduate School representative or as a reader. If the external member is not a member of the graduate faculty, a curriculum vitae must accompany the nomination.
- **Graduate School Representative:** One member of the committee, designated by the office of the dean of the Graduate School, serves as the dean's surrogate. The representative must be a regular member of the graduate faculty and cannot be the committee chair. In addition to the normal responsibilities as a member of the committee, the representative has the responsibility of ensuring that the examination is conducted according to established procedures. Any questions or disagreement over the examination procedure are referred to the Graduate School representative for a decision. Upon designation, the Graduate School representative will receive from the Graduate School a copy of the Procedures for Examination of the Doctoral Dissertation.
- **Other Committee Members:** There may be up to seven members on the committee. Beyond the five required members described previously, up to two additional individuals may be appointed to the committee. These members may be individuals within or outside the candidate's program and may include scholars from other institutions or other components of the UMB Graduate School. All such members must hold a doctoral degree or a terminal degree in their field. A curriculum vitae must accompany the nomination form submitted by the committee chair to the dean of the Graduate School for any committee nominees who are not members of the graduate faculty.

2. Documentation and Actions Required Prior to the Doctoral Examination

Prior to the doctoral examination, the following actions need to be completed:

- **Nomination of Final Doctoral Examination Committee members:** Must be submitted to the dean's office.
- **Certification of Completion of the Doctoral Dissertation:** Must be submitted to the dean's office.
- **Announcement of Doctoral Dissertation Defense:** a) The dean of the Graduate School has the responsibility for making all members of the graduate faculty aware of the candidate's doctoral examination at least one week before the examination date. b) Graduate programs are responsible for notifying their students about the examination. The time and place of the examination will be established by the chair.
- **Submission of the Doctoral Dissertation:** All members of the committee must receive a final version of the dissertation, as described previously, two weeks (i.e., a minimum of 10 working days) before the proposed examination date. This version of the dissertation should be substantially the same as that which was certified by the chair and the two readers as ready to be defended.

3. Conduct of the Doctoral Examination

The doctoral examination normally comprises two components: an open presentation by the doctoral candidate and a formal examination by members of the committee.

- **Open Presentation by the Doctoral Candidate:** Each candidate is expected to give a presentation of their dissertation in a forum open to the general public and moderated by the committee chair. The open presentation should take place as close as possible to the time scheduled for the doctoral examination. In many cases the open presentation will immediately precede the formal doctoral examination; however, the exact timing and notice of the presentation will be in keeping with the usual policy of the candidate's program. All members of the committee must be present (see the following for definition of "present") at the open presentation. Those attending the open presentation may ask questions of the candidate within a reasonable time interval set by the candidate's committee.
- **Formal Doctoral Examination Procedures:** The formal doctoral examination is open only to members of the candidate's committee and other members of the graduate faculty who wish to be present and is conducted under the direction of the examination committee's chair. All members of the committee must be present for the examination. Committee members may participate by video conference or by telephone, if necessary. In such cases, arrangements for the member not physically present should be made such that their participation can be interactive and they have access to all audio and visual materials used by the candidate or committee members during the formal doctoral examination, can ask questions and hear the candidate's answers, and can fully participate in the committee's discussions. This may require that the member not physically present participate by a video connection or have access to presentation slides (sent in advance to the member), or that other appropriate arrangements are made to allow the member to be an active member of the committee's deliberations. The dean of the Graduate School must be notified of an absence and the accommodations made. The formal examination is moderated by the committee chair, and only committee members may ask questions of the candidate. Other members of the graduate faculty who attend the examination do so only as observers. They are not permitted to participate verbally or otherwise in the proceedings.

The formal doctoral examination has the following components:

1. An initial private discussion among the members of the committee only (the candidate and other graduate faculty members are not present during the discussion). This discussion should determine whether the written document is presentable as a dissertation and hence defensible. If a majority of the committee agrees that the dissertation is not defensible, the examination is canceled. Otherwise, the examination proceeds. The committee then determines procedures for the examination, including the order and manner of questioning.
2. A presentation of the dissertation by the candidate (if required by the committee) is followed by questions from the committee members. At the discretion of the candidate's program and the Doctoral Examination Committee, the open presentation may serve as the doctoral examination presentation. In this case, no further formal presentation by the candidate will be required and committee members may immediately begin questioning the candidate. No time limit is set for this period, but it would be considered unusual if the entire period exceeded three hours.

4. Outcome of the Examination

At the end of the examination, the candidate and any others in attendance who are not part of the committee withdraw, and the committee deliberates in private on the acceptability of the written dissertation and the oral performance of the candidate. The chair asks each member for an opinion, and after these deliberations, the members vote on whether the candidate has passed or failed. There are two levels of pass: 1) the dissertation is accepted with very minor changes, if any; or 2) the dissertation requires significant, nontrivial revisions. In the latter case, the committee sets a timeline for completion of revisions and names the committee members who will certify satisfactory completion of the revisions. The members sign the report of the committee and register their votes. The affirmative votes of a majority plus one of the committee members constitute a successful defense of the dissertation; this means that the required number of affirmative votes is four from a five-member committee or five from a six- or seven-member committee.

The candidate may be failed if the committee finds that the quality of the written dissertation or the candidate's presentation is wanting. The committee may find that, despite a decision that the dissertation document was defensible, it has defects that prevent it from being accepted. If these defects are minor in nature, the committee may vote to accept the dissertation pending remedial modifications. If the defects are more serious, the committee may decide to fail the candidate and require a new examination. Alternatively, the dissertation document may be determined to be sound but the candidate's defense inadequate. In this case, the committee must decide on a date for a new examination.

The Report of the Examination Committee form signed by the committee must be returned by the Graduate School representative to the Graduate School office no later than two working days after the examination. The candidate's program director also must be provided with a copy of the report.

The candidate should be informed of the decision as soon as possible. If the candidate fails the examination, the Graduate School representative will submit a letter within two working days to the dean of the Graduate School stating that the candidate has failed, the reasons for the failure, the decisions concerning necessary remedial action, and approximately when a new examination will be held. The Graduate School representative must return the letter with the signed Report of the Examination Committee. Copies of the letter must be provided to the candidate, the chair, and the Graduate Program director. The new examination must be conducted within one year from the date of the defense of the first examination. The chair must notify the Graduate School of the date of the second examination so that the necessary paperwork may be sent to the Graduate School representative. The candidate may present himself or herself for the doctoral examination at most twice.

Degree Certification and Awarding of Diploma

The Graduate School publishes a calendar each year showing dates by which students who are in the last semester of their programs must submit forms and meet requirements for graduation. Graduate students are responsible for meeting these deadlines. Students must file their applications for diplomas with the University registrar by the published diploma application deadline date.

The University issues diplomas at the end of the summer, fall, and spring terms. Students who have applied for a diploma but are not able to complete degree requirements as planned must inform the Graduate School as soon as it is determined they will not finish. These students must reapply and complete all remaining requirements for the semester in which they expect to graduate. Students do not need to pay another diploma fee, but they must register for at least 1 credit per semester or session until graduation.

Financial Information

Tuition

Tuition is charged to students and applied to all instructional programs. Students admitted to the Graduate School must pay graduate tuition and fees whether the credits satisfy program requirements or not. Notwithstanding any other provisions of this or any other University publication, the University reserves the right to change tuition, fees, and other charges at any time such changes are deemed necessary by the University or the University System of Maryland Board of Regents. The Graduate School tuition and fees schedule is located at *www.umaryland.edu/financialservices/student-accounting/*.

According to University regulations, graduate students dropping courses receive a full refund of tuition if they drop courses before the first day of the semester. The University publishes the full refund schedule for withdrawal.

Fees

In addition to tuition, graduate students are charged mandatory technology, auxiliary, and other fees. Auxiliary fees include University Student Government Association, supporting facilities, student activity, and shuttle fees. Some online programs are exempt from the supporting facilities and shuttle fees.

Indebtedness to the University

Students must pay debts before registration can be completed for the following semester or session. Students may not receive transcripts or diplomas until they pay their debts. The University applies refunds due to students against their outstanding debts to the University. Uncollected debts are forwarded to the State Central Collection Unit with an additional 17 percent collection fee.

Payment of Tuition and Fees

Credit card payments — Visa, MasterCard, Discover, and American Express — and checks are accepted via the internet by using the link *http://umaryland.edu/surfs*. Credit card payment may only be used for those charges not covered by financial aid. Payments from any financial proceeds that create a credit balance because of prior credit card payments will be credited to the cardholder's account to the extent of the original amount paid by that credit card.

An installment payment plan is available for the fall or spring semesters as provided by the University Policy for Payment of Tuition and Fees. Details and access to the plan may be obtained in the Student Accounting Office. The fee for setting up an installment plan is $10 per semester.

Due Date

If payment is postmarked or paid in person or via the internet after the due date, you will be subject to a late payment fee of $100 or 5 percent of the balance, whichever is less. Any amount referred to the State Central Collection Unit for collection will be subject to an additional 17 percent collection fee.

Returned Check Policy

A service charge of $25 is assessed for each check that is returned unpaid by the bank for any reason.

Health Insurance Coverage

Full-time students are required to have health insurance coverage. Students are billed each fall and spring semester for student health insurance. If a student has comparable coverage and does not want the UMB health insurance policy, it is their responsibility to provide proof of coverage to the Student and Employee Health Office (29 S. Paca St.) and obtain a waiver that authorizes removal of the charge from the bill. Waivers are valid for one academic year. Waiver deadline dates are Sept. 15 for

the fall semester and Feb. 15 for the spring semester. The waiver form is located at *www.umaryland.edu/financialservices/student-accounting/health-insurance-waiver/*.

UP-TO-DATE ACCOUNT INFORMATION

Students may view current information at *http://umaryland.edu/surfs* by choosing Student Services, Student Records, and Account Summary by Term.

DETERMINATION OF RESIDENCY FOR TUITION PURPOSES

Applicants seeking classification as a Maryland resident for tuition and charge-differential purposes must complete a Maryland In-State Status form that accompanies the application for admission. It is important that all questions be answered on the form; omitting information will result in out-of-state classification. The statement of residency determination, as defined by the University System of Maryland Board of Regents, and the procedures and policies of in-state residency determination may be found on the Office of the Registrar's website, *www.umaryland.edu/orr/*. An initial determination of in-state status for admission, tuition, and charge-differential purposes is made by the registrar when a student's application for admission is under consideration. The determination made at that time and any determination made thereafter shall prevail for each subsequent semester until the determination is challenged successfully in a timely manner. Students may request a re-evaluation of their status by filing a petition for in-state classification for admission, tuition, and charge-differential purposes. Students must meet the requirements for in-state status and submit a completed petition (including all documents required therein) by the last day of late registration for the semester in which they wish to be classified as in-state. The burden rests upon students to demonstrate to the satisfaction of the University that an in-state classification is appropriate. No change in status requested by students shall be given retroactively. A determination of in-state status is valid only if a student enrolls in the semester for which they applied. Determinations made in cases in which students do not enroll are not valid for a subsequent semester (all requirements must be satisfied independently and a new and timely petition must be submitted).

GRADUATE ASSISTANTSHIPS

Graduate assistantships are available to qualified, full-time, degree-seeking graduate students. An assistantship is awarded to students to enable them to make progress toward a graduate degree and obtain academic or research experience. The duties of a graduate assistant must be consistent with the teaching and research missions of the University. Assistantships are awarded by the program in which the student is enrolled. The assignment depends on the program's needs and the experience and qualifications of the student. Applicants should apply for an assistantship directly to the program in which they wish to study. Programs offer assistantships based on the availability of funds and admission of the student to degree-seeking status at the University. Graduate assistants must register as full-time students, enroll in degree programs, and make satisfactory progress toward their degrees. Programs normally award assistantships to students who have shown superior aptitude in their fields of study and appear likely to render a high quality of service to the University with their teaching and research activities. All graduate assistants are eligible for tuition remission. A full assistantship carries up to 10 credits of tuition remission each semester — fall and spring. All other fees are the responsibility of the graduate student. Graduate assistantships are awarded with the intent of providing financial support and contributing to the recipient's professional development. In all instances, it is understood that the graduate student's priority should be their studies and research, and that 100 percent of their effort will be devoted to this endeavor. Therefore, graduate assistants are ineligible for additional awards or employment that includes a work component. A graduate assistant who receives external support for their research will be expected to end their graduate assistantship. These principles also will apply during the summer months for graduate assistants with a 12-month appointment. Exceptions to this policy require the prior approval of the Graduate School. The Graduate School produces the *Graduate Assistant Policies and Guidelines* handbook, which is available from the Graduate School and is on the Graduate School website.

Other Funding Opportunities

Funding opportunities also are available to graduate students through National Science Foundation and National Institutes of Health programs and many other public and private foundations. Students must apply directly to these programs or foundations. Students eligible for federal Veterans Affairs (VA) benefits should contact the VA representative in the School of Nursing or the Graduate School regarding processing requirements and services for VA benefits.

Need-Based Financial Assistance - Office of Student Financial Assistance and Education

Students may apply for need-based assistance to help meet the costs of tuition, fees, books, supplies, and normal living expenses not covered by tuition remission or other resources. Need-based assistance includes Federal Direct Stafford loans and Federal Direct Grad PLUS. Students seeking assistance from these programs must file a Free Application for Federal Student Aid (FAFSA) for the enrollment year. Students may apply online at *www.fafsa.ed.gov*. More information is available from the Office of Student Financial Assistance and Education, which may be reached at 410-706-7347, via email at *aidtalk@umaryland.edu*, or by viewing the eligibility for need-based assistance at *www.umaryland.edu/fin*.

Aging and Applied Thanatology

http://graduate.umaryland.edu/thanatology/

Degree Offered

Postbaccalaureate Certificate

Program Description

Aging and Applied Thanatology is a one-year, 12-credit, online postbaccalaureate certificate program. Students learn about the key issues, theories, research, and clinical practices related to aging, dying, death, and grieving. Students work with leaders in the field, studying topics such as psychosocial perspectives in aging, ethical and legal issues in death and dying, palliative care, and caring for the bereaved.

This program was designed with three guiding principles in mind: translating knowledge into action, taking a holistic and personal approach to learning, and making education available to all. These principles allow students to be better prepared to achieve success in the program while working in the thanatology field.

Three Guiding Principles

- **Translating Knowledge into Action:** We believe it is important that a student's educational experience is relevant, applicable, and practical. As such, course material and experiences focus on skill-based learning and application, particularly in professional contexts.
- **Taking a Holistic and Personal Approach to Learning:** Our integrative and interdisciplinary stance is that the professional is an instrument, be that a healing instrument, an educational instrument, a service instrument, or otherwise. Our motto is to prepare the participant, not just their mind, to work effectively and compassionately in a chosen vocation. We believe that to effectively work with others who are dealing with dying, death, and grief, the professional needs to have addressed their own personal issues related to these areas. As such, courses include relevant self-awareness and self-reflection exercises to prepare the individual personally and professionally.
- **Making Education Available to All:** We believe the most effective way to ensure availability to all interested individuals is to use online delivery methods. This allows participants from across the nation, and even across the world, to participate in a flexible and convenient manner.

Certificate Objectives

Our goal is to provide our students with advanced knowledge and practical training to ensure that learning is relevant and applicable to each student's professional goals. The program is designed to ensure students gain a greater sense of comfort and competence in addressing the sensitive and complex issues of aging, dying, death, and grieving.

Learning Outcomes

Upon completion of this certificate, students will be able to do the following:

- Recognize common responses to aging, death, dying, and grief as experienced by adults and children.
- Demonstrate sensitivity to individual, developmental, and cultural variations in addressing and coping with aging, dying, death, and grief.
- Communicate effectively with those who are dying and grieving, as well as recognize barriers that can impede effective communication with these populations.
- Use patient-sensitive methods of palliative care based upon an interdisciplinary perspective.
- Describe and apply empirically based methods of therapeutic grief intervention.
- Analyze and evaluate legal and ethical principles and dilemmas regarding death, dying, and end-of-life choices.
- Work effectively as an interprofessional team member around issues related to aging, dying, and grief by developing and applying the competencies of interprofessional practices.
- Evaluate the societal, cultural, and religious/spiritual influences on responses to death and dying.

- Develop greater self-awareness of and coping skills for one's own experiences of and attitudes toward aging, death, and grief.
- Apply this training for certification through the Association for Death Education and Counseling (ADEC).

Program Admission

Candidates for admission must meet the minimum standards of admission established by the Graduate School and provide the requisite credentials. Admission to the certificate program is selective. A U.S. bachelor's degree or its equivalent from a non-U.S. educational institution is required. No specific undergraduate course of study is required or recommended. The Graduate Record Examination is not required for admission.

Degree Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guideline and requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Required Courses

Completion of these four courses (3 credits each) is required to obtain a certificate in Aging and Applied Thanatology:

THAN 609 — Psychosocial Perspectives in Aging

THAN 604 — Death and Dying: Ethical and Legal Considerations

THAN 605 — Palliative Care

THAN 606 — Caring for the Bereaved

Biomedical Sciences-Dental School

https://www.dental.umaryland.edu/research/graduate-programs/biomedical-phd-program/

Degrees Offered

BMS-PhD, DDS/PhD, BMS-MS, DDS/MS

Program Description

This program provides specialized training for individuals with a background in the oral health professions through the offerings described below.

The Doctor of Philosophy degree (BMS-PhD) offered through this program is designed for dental professionals who wish to develop a career in science. The doctoral program includes directed coursework, seminars, and research experiences. Scholarly activities within the program prepare students to become independent research investigators and competent teachers.

The Doctor of Dental Surgery/PhD dual degree is for students who want to pursue their undergraduate dental education with in-depth research training in specific biological science disciplines. The program is based on a seven-year design. In Years 1 and 2, DDS/PhD students complete the dental program's predoctoral requirements with the addition of graduate-level basic science courses, weekly research seminars, biostatistics, and laboratory rotations. In Years 3 through 5, students complete elective coursework tailored to a selected research area, progressing through doctoral degree candidacy and doctoral dissertation. The student's dental preclinical skills are reassessed in the spring semester of Year 5, followed by appropriate training before returning to the dental training program in Years 6 and 7. Upon completion of the dental clinical requirements, students receive the DDS and PhD degrees simultaneously.

The Master of Science degree (BMS-MS) is designed to complement training undertaken by students in the dental school's certificate programs, i.e., dental postgraduate trainees. This stand-alone degree is offered exclusively to residents in the dental school's clinical specialty programs who wish to earn the MS degree as part of their advanced training. The BMS-MS prepares dentists for careers in dental education and research. Trainees receive graduate training in the basic sciences, oral biology, and dentistry. Although lecture courses comprise most of the curriculum, many basic science courses include a laboratory component. A significant portion of the program focuses on the design and completion of a master's thesis research project — a requirement of the program. Students may select research advisors from several disciplines and topics from many basic science and clinical research areas. Specialty certificate programs that offer the master's degree in oral biology include:

- Endodontics
- Prosthodontics
- Orthodontics
- Pediatric dentistry
- Periodontics
- Advanced general dentistry

The objective of the DDS/MS dual-degree program is to graduate outstanding individuals with a combination of excellence in clinical skills and training in clinical research to prepare them for an academic career in dentistry. Graduates of this program will understand the scientific principles that form the basis of clinical practice, be able to identify significant problems in oral health, and have the requisite tools to develop testable hypotheses that address these problems. Motivated and talented dental students are admitted into the program early during the first year of dental school with the requirement that they stay for a fifth year to complete the combined program. UMB master's program courses will be substituted for DDS program courses as appropriate to fulfill didactic requirements of both programs (DDS and master's) during the program's third year. Development of a research project and formulation of the mentoring team will occur during the summer before that year (third-year program and the DDS junior year). Additional coursework and the research project or practicum experience will comprise the fourth year to complete the master's degree requirements. Elective credits from the DDS curriculum during the program's fifth year (DDS senior year) are available for students completing their research and will be used toward time to prepare and submit research

results. Through this five-year program, graduates will be appropriately prepared clinical research scientists.

The PhD, MS, and dual degrees are offered in conjunction with the Graduate School. They are interdepartmental programs.

Program Admission

Applicants to the BMS-PhD program must meet all minimum admission requirements and should have a dental background with courses in biology, physics, chemistry, and mathematics through calculus. Applicants should apply directly to the Graduate School online. Non-U.S. residents also must include the results of the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) exams. The Graduate School requires a minimum score of 80 on the TOEFL or a minimum score of Band 7 on the IELTS.

Information about the BMS-MS program is presented during the July orientation for new postgraduate dental students. To be eligible for the BMS-MS, applicants must have a professional degree in dentistry and acceptance into one of the specialty certificate programs listed previously. In addition, they must meet the Graduate School's minimum requirements for admission. Interested students must complete the Graduate School's application before Aug. 15. The program coordinator at the School of Dentistry will obtain copies of the necessary documents (e.g., transcripts, TOEFL scores) from the applications to the certificate program and submit them to the Graduate School. The graduate application fee is waived for dental residents. Non-U.S. residents also must include their results of the TOEFL or IELTS exams. The Graduate School requires a minimum score of 80 on the TOEFL or a minimum score of Band 7 on the IELTS.

Applicants to the dual-degree programs (DDS/PhD; DDS/MS) must apply and first be accepted to the DDS program. Outstanding students will be considered for admission to the combined degree program after they have been accepted to the dental program.

Degree Requirements

Students seeking a doctoral degree are required to complete a minimum of 30 credits, which includes 4 credits of core coursework before admission to candidacy. PhD candidates must complete an additional 12 credits of doctoral dissertation research. Doctoral students also must show sufficient evidence of high attainment in scholarship and the ability to engage in independent research.

Students pursuing a master's thesis degree must successfully complete a minimum of 30 credits, which includes 4 credits of core courses and 6 credits of master's thesis research.

Required Courses

DBMS 605 — Scientific Method, Writing, and Ethics

DBMS 638 — Biostatistics

DBMS 799 — Master's Thesis Research (Master's)

DBMS 899 — Doctoral Dissertation Research (PhD)

Available Electives

See DBMS and other GPLS courses in the Course Descriptions part of this catalog.

Forensic Medicine

http://www.graduate.umaryland.edu/forensicmedicine/

Degree Offered

MS

Program Description

Forensic medicine applies the principles and knowledge of medical sciences and technologies to the purposes of the law, as in determining the cause of death. This program is designed to give its graduates the knowledge and skills to allow them to contribute to the medico-legal death investigation system and to the legal justice systems. These contributions include the generation of knowledge in the field through submission of a manuscript for publication. Students also may be seeking enhanced professional training or may desire a career in the following areas:

- Death investigation supporting forensic pathologists
- Assistance for pathologists in autopsy performance
- Forensic pathologist
- Police organizations
- Prosecutors' offices
- Departments/divisions of forensic medicine/science in medical colleges and universities
- Government or private forensic medical societies

The Master of Science (MS) in Forensic Medicine is a full-time, nonthesis, 12- to 18-month graduate degree program that prepares students for careers in forensic medicine. Students participate in classroom and online lectures, case discussions, and laboratory training. The curriculum focuses on forensic pathology, forensic autopsy, medico-legal death investigation, postmortem radiology, forensic odontology, and forensic anthropology. The state's Office of the Chief Medical Examiner and the University of Maryland, Baltimore offer this program collaboratively, giving students the opportunity to study in one of the nation's best medical examination facilities under the guidance of licensed and board-certified forensic pathologists at a University renowned for biomedical science research. Graduates will be prepared for job opportunities such as death investigation, assisting the pathologists in autopsy performance, and working in police organizations, prosecutors' offices, and departments of forensic medicine. The program also offers preparation for medical school and a specialization in forensic pathology.

In addition to the 30-credit full-time program, a dual-degree MS/JM is offered with the China University of Political Science and Law (CUPL). Through a sharing of credits between the two universities, students may earn a Master of Science from UMB and a Juris Masters from CUPL. This is a nonthesis, full-time, one-year program available to UMB and CUPL Juris Masters (JM) students only. Students in this option earn 20 credits at UMB and 65 credits at CUPL and are awarded the MS by UMB and the JM by CUPL. Specifically, 10 credits of coursework from the CUPL are applied to the MS degree.

Program Admission

The Master of Science in Forensic Medicine program is designed for individuals who have an undergraduate degree and a background in health or biological sciences. Candidates with backgrounds in other areas such as forensic studies, criminal justice, and legal studies also may be considered, provided they have the prerequisite coursework cited below.

Candidates who wish to enter the MS in Forensic Medicine program must have a bachelor's degree (BA or BS) from an accredited U.S. institution. The students' undergraduate program must reflect the successful completion of the following coursework: biology, general chemistry, organic chemistry, biochemistry, microbiology, mathematics, and English composition. International candidates with a bachelor's degree in medicine (BM) or a similar degree who possess adequate preparation for the graduate program also may be considered. An outstanding candidate will demonstrate proficiency in anatomy and physiology.

In addition to qualifications previously noted, candidates for admission must meet the minimum qualifications and standards established by the Graduate School. Graduate Record Examinations scores are required to be considered for admission. In addition, an interview may be requested. International students must provide current, official results of the Test of English as a Foreign Language (minimum score of 80 for the internet-based test) or the International English Language Testing System

(minimum score of Band 7). Application deadlines and required credentials are regularly published by the Graduate School and the Forensic Medicine program.

Degree Requirements

The master's degree program requires a minimum of 30 credits. Students must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog.

Required Courses

FMED 710 — Forensic Pathology

FMED 720 — Forensic Autopsy

FMED 730 — Medicolegal Death Scene Investigation

FMED 740 — Epidemiological Data Research-Capstone Project

PATH 602 — Systemic Pathology
or PATH 603 — General Pathology

TOXI 607 — Forensic Toxicology

FMED 610 — Forensic Toxicology Laboratory

FMED 830 — Forensic Radiology

FMED 840 — Forensic Odontology and Forensic Anthropology

LAW515S — Evidence Law

Courses offered by CUPL (Beijing) before enrollment at UMB:

Introduction to Forensic Science

Evidence Investigation

Forensic Biological Evidence

Clinical Forensic Medicine

Available Electives

MHS 652 — Leadership and Communication

DBMS 638 — Biostatistics

MEDT 631 — Research Design

Details are given in the Course Descriptions part of this catalog.

Global Health Systems and Services

http://graduate.umaryland.edu/globalhealth/

Degree Offered

Postbaccalaureate Certificate

Program Description

The online postbaccalaureate certificate in Global Health Systems and Services (PBC in Global Health Systems and Services or PBC in GHSS) is a partnership between the University of Maryland, Baltimore and the University of Maryland University College (UMUC).

This 12-credit program draws students primarily from UMB alumni and other practicing health care professionals. Taught online, its focus is to introduce basic global health systems and services to health professionals interested in short- or medium-term consultation/projects overseas and subsequent opportunities. Most students are trained/licensed and experienced practitioners.

This program is offered in partnership with UMUC's online postbaccalaureate certificate in Global Health Management (PBC Global Management). Both certificates share two common core courses. UMUC and UMB have drafted a memorandum of understanding to articulate shared delivery of the first two courses, including hosting of courses, faculty, student enrollment in each program, and confidentiality of student information.

This UMB-UMUC partnership takes advantage of UMB's extensive graduate health professional, clinical, practice, and global expertise and UMUC's extensive online and health management expertise. It offers UMB and UMUC graduates and students interested in global health management and global health systems and services options that are unavailable through their home institutions.

It is the goal of this program to apply skills to improve delivery of global health systems, policies, and services.

Global health systems and services also is a concentration of study within the Master of Science in Health Science (MSHS) program. Credits earned in the stand-alone Global Health Systems and Services certificate program may be applied toward the MSHS degree requirements.

Certificate Objectives

- Formulate global health systems and services.
- Improve systems for quality of care and service delivery within different national health systems.
- Plan health programs within diverse cultures that may have differing ethical values.
- Produce global health policy and systems practitioners with understanding of global health ethics, women's and children's health, health implications of mass violence and disaster and/or infectious disease epidemiology.

Learning Outcomes

- Understand the international health organizations and their roles in promulgating global health systems, policies, and procedures and organizing health services.
- Assess and design global health programs within different national contexts.
- Implement and evaluate global health programs to maximize contributions to effective policy, enhanced practice, and improved and sustainable health outcomes.
- Work effectively within diverse cultural settings and across national and international political landscapes to maximize contributions to effective policy and enhanced practice.
- Build interdisciplinary teams and communicate with clinical providers, administrators, and patients using appropriate cultural practices.
- Use a systems approach to health services management, including strategic planning, budgeting, and resource allocation.

Evaluation and assessment for the program will take place in the required courses, including regular course evaluations, review of grade distributions, and faculty review of student performance on embedded course assessments. Additional review includes tracking student completion rates.

Program Admission

General application requirements for admission to postbaccalaureate certificate programs are outlined in the Admissions section of this catalog. UMB recognizes that the coursework designed for the GHSS certificate has the potential to benefit learners who are pursuing multiple clinical and professional degrees and credentials. Thus, the program considers applicants who hold a bachelor's degree and who are co-enrolled in, or have graduated from, a UMB health professional discipline. To apply for this postbaccalaureate certificate, individuals must (1) have a bachelor's or master's degree in health, or (2) three to five years of health care experience and a bachelor's degree, or (3) be a current UMUC or UMB graduate student.

Graduates with postbaccalaureate certificates in global health systems and services may volunteer for global assignments through their current health workplace or go to work for:

- In-country field consultants
- Disaster relief organizations
- Immigrant/refugee health organizations
- Research and academic institutions
- International agencies
- Other nongovernmental organizations (NGOs)
- Lending agencies that do work in developing countries
- Multilateral agencies (such as the World Health Organization)
- Governmental agencies (U.S. Agency for International Development, in-country ministry of health, etc.)

Degree Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guidelines and requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Required Courses

MHS 605 — Perspectives on Global Health (3 credits)

MHS 610 — National and International Approaches to Health Care Delivery (3 credits)

Once students have completed the core introductory courses, they can choose to specialize further in health outcomes related to women and children in low-resourced environments, infectious diseases, mass violence and disasters, or health delivery ethics and law.

Select two from these three courses:

CIPP 960 — Critical Issues in Global Women's and Children's Health (3 credits)

MHS 639 — Health Implications of Mass Violence and Disaster (3 credits)

MHS 630 — Essentials of Chronic and Infectious Disease Epidemiology (3 credits)

Details are given in the Course Descriptions part of this catalog.

Graduate Program In Life Sciences

http://lifesciences.umaryland.edu/

Degrees Offered

PhD, MS, Postbaccalaureate Certificate, MD/PhD

Overview

The Graduate Program in Life Sciences (GPILS) in the School of Medicine offers cutting-edge research training in basic, biomedical, translational, clinical, and population sciences. Our graduate programs in biochemistry and molecular biology, epidemiology and human genetics, gerontology, molecular medicine, molecular microbiology and immunology, neuroscience, and physical rehabilitation science award the PhD degree emphasizing the continuum from bench to bedside to population. Additionally, there are three MS programs: cellular and molecular biomedical science, epidemiology and preventive medicine, and toxicology. GPILS hosts a postbaccalaureate certificate program in clinical research as well. In all of these programs, students are provided integrative training that will meet the demands of the era that now follows the structural elucidation of the genome and the urgent need to translate biomedical advances to patients and communities. Students are well-prepared for careers in academia, industry, or government. Our ideal location within the nexus of biomedical research on the East Coast provides students with an unparalleled breadth and depth of expertise.

Program Admission

In addition to meeting the Graduate School's minimum admission requirements, applicants should have a bachelor's degree with training in an appropriate major field of biology or biomedical sciences. All supporting documents for admission are shared with the respective GPILS programs. While each GPILS program has its own admissions criteria, the quality of students each program aims to enroll is of a high caliber. A competitive applicant achieves upper-percentile scores on the Graduate Record Examinations, a cumulative grade-point average above 3.0 (on a 4.0 scale), and some degree of research experience. While all elements of an applicant's background are considered, letters of recommendation and practical experience weigh heavily in admissions decisions. Interested applicants are encouraged to contact the appropriate program staff. Contact information can be found on each program's website at *http://lifesciences.umaryland.edu/*.

Courses

See listings under GPILS in the Course Descriptions part of this catalog.

Biochemistry and Molecular Biology

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/biochemistry/

Degrees Offered

PhD, MD/PhD, MS

Program Description

The combined graduate program in biochemistry and molecular biology is an intercampus program combining training opportunities at the University of Maryland, Baltimore (UMB) and the University of Maryland, Baltimore County (UMBC). Students in this joint program benefit from the extensive facilities and resources of both campuses and the opportunity to interact with a large pool of scientists.

The program offers a wide range of research training opportunities with particular strengths in molecular biology, protein structure and function, membrane biochemistry, and physical biochemistry. These areas include but are not limited to: mechanisms and regulation of gene expression, DNA packaging and repair, protein and RNA structural biology, cancer and epithelial cell biology, stem cell biology, calcium and signal transduction pathways, metabolism and bioenergetics, the cellular matrix and migration, fluorescence spectroscopy, membrane and cytoskeletal biology, retrovirus structure and function, prion structure and function, computational biology, and bacterial pathogenesis.

Program Admission

Applicants must receive the approval of the Biochemistry and Molecular Biology Graduate Governing Committee for admission. Approval is normally based upon undergraduate courses and grades, letters of recommendation, Graduate Record Examinations scores, and, wherever possible, personal interviews. Previous success in graduate education also is taken into consideration. In addition to meeting the Graduate School's requirements for admission, each entering student is expected to satisfy minimum requirements in the fields of biochemistry, organic chemistry, and physical chemistry or molecular/cell biology. Students with deficiencies in these areas will not ordinarily be considered for admission.

Degree Requirements

The MS and PhD degrees in biochemistry and molecular biology require the completion of 30 course credits. For thesis-master's students, master's thesis research under the supervision of a faculty mentor, culminating in the preparation and defense of the research thesis, replaces 6 of these credits. PhD candidates must successfully complete a minimum of 12 credits of doctoral dissertation research in addition to all required coursework.

1. Qualifying exam: PhD students are required to pass an oral qualifying exam no later than six months after the completion of their course requirements. Two weeks before the exam, students are required to submit a National Institutes of Health-style research proposal to their advisory committee that is based on their proposed PhD research. The format of this proposal must follow the page limits and any other rules and regulations of an actual NIH predoctoral fellowship proposal. Students may submit this proposal to the NIH or another appropriate granting agency (e.g., the American Heart Association), although this is not required. The research proposal must be defended orally to the student's advisory committee as part of the exam.

During the oral qualifying exam, students also are tested on their general knowledge of biochemistry and molecular biology, including: molecular biology, enzymology and bioorganic chemistry, physical and structural biochemistry, and metabolism and regulation.

The outcome of the oral exam can be: pass; fail, with retake within three months; or fail, with the possibility of being awarded a terminal MS (MS is awarded only if in good academic standing with a 3.0 or better grade-point average). In cases in which a student fails and cannot retake the exam, the program director will determine whether the student qualifies for a terminal master's degree.

In addition to meeting the Graduate School's GPA requirement, PhD students must achieve at least a B average (GPA of 3.0 or higher) over the first two years of enrollment. The program generally dismisses students who

have a GPA below 3.0 at this time. At the discretion of the Graduate Governing Committee, students who do not meet the GPA requirement may be permitted to take an additional course if they are doing well in the program and it would mathematically allow them to achieve an overall GPA of 3.0 or better (i.e., for students whose GPA is nearly 3.0). Such decisions are made on a case-by-case basis by the Graduate Governing Committee.

2. Core course requirement: Students have the option to choose from the GPILS core course (GPLS 601; 8 credits) or the two-semester biochemistry course at UMBC (CHEM 437, CHEM 638; 8 credits). The decision regarding the core course(s) for a student is based upon their undergraduate record in biochemistry and other advanced science courses.

3. Additional Courses

GPLS 709 — Advanced Biochemistry

GPLS 701 — Advanced Molecular Biology

GPLS 713 — Biochemistry Student Seminar (two semesters)

GPLS 608 — Biochemistry Seminar (three semesters)

GPLS 609 — Laboratory Rotations

6 credits of general electives, including at least one course at UMBC, are also required.

Details are given in the Course Descriptions part of this catalog.

Cellular and Molecular Biomedical Science

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/CMBS/

Degree Offered

MS

Program Description

The goal of the Master of Science in Cellular and Molecular Biomedical Science (CMBS-MS) program at the University of Maryland, Baltimore is to provide education and training using state-of-the-art resources that emphasize medically relevant scientific research and education. The program is designed as a two-year curriculum for full-time students but may be completed within five years by part-time, working students.

The CMBS-MS program combines traditional areas of biomedical study — including cancer biology, human genetics, stem cell biology, molecular and cell biology, pathology, neuroscience, pharmacology, and physiology — into a unique interdisciplinary graduate training program. It is specifically designed to develop scientists for the postgenomic era, and CMBS-MS students will gain knowledge, research skills, and familiarity with state-of-the-art biomedical tools and methodologies to solve important and timely questions in biomedical science. Students may select a thesis or nonthesis track.

Students become fluent in the study and implementation of biomedical research and will be well-prepared for further graduate training or the pursuit of other postgraduate professional school opportunities. Graduates of this program frequently continue their studies in PhD programs, medical school, dental school, or other professional programs, or they accept positions as laboratory managers or skilled researchers in laboratories in academia, government, and industry, including biotechnology firms and pharmaceutical companies. This program also is an excellent opportunity for industry employees and professional degree holders (MD, RN, PharmD, DDS) looking to advance their careers in research.

Program Admission

Applicants should have a bachelor's degree with training in an appropriate major field. The program is particularly interested in applicants with strong undergraduate training in the biological sciences, chemistry, mathematics, and general physics, as well as research experience in the biomedical sciences. The Admissions Committee evaluates the entire application package. Applicants are encouraged to have strong letters of recommendation, Graduate Record Examinations scores above the 50th percentile, and a cumulative grade-point average of 3.0 or above.

Additionally, all international students must meet the Graduate School's minimum requirements for scores from the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) exam. International applicants are strongly encouraged to apply by Jan. 15; all others should apply before June 1. Admission to the program is highly competitive, and acceptances are made as qualified candidates are identified.

Degree Requirements

In the first semester, students participate in an innovative core course, Mechanisms in Biomedical Sciences: From Genes to Disease (GPLS 601), or an online version of this course, Cellular and Molecular Basis of Translational Research (GPLS 600). These courses are supplemented with material in one of the following: Current Topics in Vascular/Stem Cell Biology (GPLS 690), Molecular Neuroscience /Biophysics (GPLS 691), or Current Topics in Genetics/Genomics (GPLS 692).

Students in the program also must complete a course in bioethics and one in biostatistics. Subsequent coursework and laboratory rotations are tailored to meet each student's research interests and career goals from the rich opportunities available. Students can pursue a thesis or nonthesis track.

Students pursuing an MS degree in the CMBS program must maintain a GPA of 3.0 or better in a total of 30 credit hours. Of the 30 credits, approximately 20 to 25 will be directly from coursework (see below). A minimum of 3, and a maximum of 6, credits are generated from laboratory research rotations (graded as pass/fail) lasting approximately six to eight weeks each. Journal clubs and seminars are not to exceed 4 credits. For students pursuing the thesis MS, one of the rotation labs usually becomes the thesis lab. Completion of the CMBS-MS requires two years (four semesters) for the nonthesis MS

and may take up to three years for a thesis MS. Selection of courses, rotations, and thesis labs should be in consultation with the program director.

For students seeking a thesis MS, a faculty mentor is selected in consultation with the program director. The mentor, who must be a member of the graduate faculty, is responsible for supervising the research, writing of the thesis, and creating a thesis defense committee. The thesis defense consists of a public presentation of the thesis work followed by a closed oral examination by the thesis defense committee, which determines whether the student has presented an acceptable thesis.

To facilitate success in the program, GPILS offers an optional bridge course in the summer preceding matriculation for students who may be concerned about their academic preparation or transitioning to graduate school.

Laboratory Rotations

Graduate faculty in many GPLS programs are interested in mentoring CMBS-MS students for rotations and thesis research. To facilitate selection of rotation and/or thesis laboratories, and to ensure student exposure to the range of research opportunities, students attend weekly informal luncheon meetings during the first semester during which members of the graduate faculty give brief presentations describing the research activities of their labs.

In addition, a pilot collaboration has been established between the Edgewood Chemical Biological Center and the GPILS master's programs. Mentored research in this competitive, paid internship program accrues graduate credit and can become the subject of a master's degree thesis with GPILS/UMB approval.

Required Courses

GPLS 600 — Cellular and Molecular Basis of Translational Research
or GPLS 601 — Mechanisms in Biomedical Sciences

and one of the following:

GPLS 690 — Current Topics in Vascular/Stem Cell Biology

GPLS 691 — Molecular Neuroscience/Biophysics

GPLS 692 — Current Topics in Genetics/Genomics

CIPP 901 — Responsible Conduct of Research

Details are given in the Course Descriptions part of this catalog.

Epidemiology and Human Genetics

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/epidemiology/

Degrees Offered

PhD, PhD/MD, MS, MS/MD, Certificate

Program Description

The graduate program in Epidemiology and Human Genetics (EHG) within GPILS at the School of Medicine offers a diverse array of integrated opportunities to develop skills for discovering how population, molecular, and genetic variations relate to health and disease. These skills are essential for translating new basic research findings into clinical practice and applying them to public health. New findings from epidemiology and human genetics research consistently make the news. Students in this program become leaders in improving the health of local, regional, and global populations. The program combines traditional areas of biomedical, genetic, clinical, and community studies with opportunities to learn and apply observational, biostatistical, molecular, and genomic tools in their investigations.

The PhD program consists of three tracks: epidemiology, molecular epidemiology, and human genetics, each with a tailored program of study. There are two MS degrees, the MS in Epidemiology and Clinical Research with two tracks (one in epidemiology and one in clinical research) and the MS in Human Genetics. Dual-degree programs enable students to earn an MS degree in combination with one of several PhD programs.

The **PhD in Epidemiology and Human Genetics (Epidemiology Track)** allows students to acquire advanced knowledge, skills, and experience in completing independent epidemiological research in a biomedical setting. This track has a strong quantitative focus, necessary for providing students with the tools needed to conduct world-class research on epidemiologic topics and to participate in multidisciplinary research in a broad range of specialties.

The **PhD in Epidemiology and Human Genetics (Molecular Epidemiology Track)** is designed for students who wish to undertake research that combines molecular, genetic, and epidemiologic techniques and to apply these technologies to the understanding of risk factors for disease transmission or acquisition. Students in this track are provided with a solid knowledge base in epidemiology and biostatistics while gaining the laboratory and informatics skills needed to incorporate genomic data into their research.

The **PhD in Epidemiology and Human Genetics (Human Genetics Track)** provides broad training for students wanting to understand human genetic variation and its relation to health and disease. Students receive an overview of human genetics (molecular, biochemical, clinical, cytogenetics, and genetic epidemiology/genomics) and then specialize in their areas of interest.

The **MS in Epidemiology and Clinical Research (Epidemiology Track)** is designed to offer an MS degree to students pursuing a PhD in Gerontology or in Pharmaceutical Health Services Research as part of our dual-degree programs. Also, students wishing to leave the Epidemiology and Human Genetics PhD program can opt to get the MS in lieu of their PhD.

The **MS in Epidemiology and Clinical Research (Clinical Research Track)** is designed specifically to meet the needs of the clinician or clinician-in-training by providing a combination of coursework and research experiences needed for a successful career in clinical investigation. Students may select from multiple concentration areas: epidemiologic research, patient-oriented research, outcomes/health services research, human genetics, and research ethics.

The **MS in Human Genetics** is designed for students contemplating careers in human genetics, especially as it relates to health and disease. This track includes coursework, seminars, and supervised research culminating in a thesis.

The **Certificate in Clinical Research** is designed specifically to meet the needs of clinicians and scientists who wish to work in clinical research and often need additional didactic training to gain analytic skills that are not covered in their health professional or graduate education. Many faculty and fellows are not able to take the entire MS in Clinical Research track but would like evidence that they have successfully completed training in clinical research. This 12-credit certificate in clinical research program provides training in the

core competencies of clinical research, including study design, biostatistics, data management, scientific communication, and the ethical, legal, and regulatory issues in clinical research.

PROGRAM ADMISSION

Degree-seeking students are admitted into the program during the fall semester only, and the Graduate School must receive PhD application materials by Jan. 15 and MS applications by Feb. 15 (March 1 for internal candidates) of the year in which the student intends to enroll. All international applications must be received by Jan. 1. Graduate Record Examinations (GREs) are mandatory; Medical College Admission Test scores may replace GRE scores for physician applicants. In addition to meeting the minimum requirements of the Graduate School and the Graduate Program in Life Sciences (GPILS), applicants should have completed coursework in biology relevant to understanding health and disease processes, and college algebra. The program evaluates each applicant individually with attention to areas of strength that relate to the skills and background necessary to succeed in graduate study in epidemiology and human genetics.

DEGREE REQUIREMENTS

Doctoral students in the human genetics track are required to take 32 course credits. The doctoral degree in the epidemiology and molecular epidemiology tracks requires up to 44 course credits, depending on the student's research interests and previously completed coursework. Students may need to take additional coursework as background preparation or in preparation for an area of specialization. PhD candidates must successfully complete a minimum of 12 credits of doctoral dissertation research.

The master's degree for the epidemiology and clinical research track requires a total of 30 credits. A thesis is optional for students in this track; however, students who opt out of the thesis must complete Research Practicum I and II. Students in the human genetics track are required to develop a thesis project in addition to completing a minimum of 24 course credits and 6 research credits.

REQUIRED COURSES: PHD EPIDEMIOLOGY TRACK

PREV 600 — Principles of Epidemiology

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 659 — Observational Studies in Epidemiology

PREV 716 — Chronic Disease Epidemiology

PREV 720 — Statistical Methods in Epidemiology

PREV 747 — Research Practicum I

PREV 748 — Research Practicum II

PREV 749 — Infectious Disease Epidemiology: A Global Perspective

PREV 758 — Health Survey Research Methods

PREV 803 — Clinical Trials and Experimental Epidemiology

CIPP 907 — Research Ethics (or equivalent)

Select three of these statistical analyses courses:

PREV 721 — Regression Analysis

PREV 723 — Survival Analysis

PREV 801 — Longitudinal Data Analysis

PREV 802 — Statistics for Molecular Biology

PREV 899 — Dissertation Research (12 credits minimum)

8 credits of general electives

REQUIRED COURSES: PHD MOLECULAR EPIDEMIOLOGY TRACK

PREV 600 — Principles of Epidemiology

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 659 — Observational Studies in Epidemiology

PREV 711 — Genetic Epidemiology

GPLS 716 — Genomics and Bioinformatics

PREV 720 — Statistical Methods in Epidemiology

PREV 721 — Regression Analysis

PREV 723 — Survival Analysis

PREV 747 — Research Practicum I

PREV 748 — Research Practicum II

PREV 780 — Molecular Epidemiology

PREV 802 — Statistics for Molecular Biology

CIPP 907 — Research Ethics (or equivalent)

PREV 899 — Dissertation Research (12 credits minimum)

11 credits of general electives

Required Courses: PhD Human Genetics Track

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease

GPLS 716 — Genomics and Bioinformatics

HGEN 601 — Basic Human Genetics

HGEN 602 — Basic Human Genetics II

HGEN 608 — Human Genetics seminar (four semesters)

PREV 619 — Introduction to SAS

and

PREV 620 — Principles of Biostatistics
or PREV 621 — Biostatistical Methods

Select two or more of the following:

HGEN 701 — Human Cytogenetics

PREV 711 — Genetic Epidemiology

GPLS 717 — Molecular Genetics and Development in Model Organisms

GPLS 718 — Programming for Bioinformatics

HGEN 720 — Metabolic Genetics

HGEN 728 — Clinical Genetics I

HGEN 731 — Clinical Genetics II

HGEN 750 — Advanced Topics in Genetic Counseling

HGEN 760 — Clinical Cancer Genetics

PREV 600 — Principles of Epidemiology

PREV 780 — Molecular Epidemiology

CIPP 907 — Research Ethics (or equivalent)

PREV 899 — Dissertation Research (12 credits minimum)

Required Courses: MS in Epidemiology and Clinical Research (Epidemiology Track)

PREV 600 — Principles of Epidemiology

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 648 — Introduction to Health System and Health Policy Management

PREV 659 — Observational Studies in Epidemiology

PREV 668 — Environmental and Occupational Health

PREV 720 — Statistical Methods in Epidemiology

PREV 747 — Research Practicum I (or MS thesis)

PREV 748 — Research Practicum II (or MS Thesis)

CIPP 907 — Research Ethics (or equivalent)

PREV 799 — Thesis Research (6 credits minimum if master's thesis option)

Electives as needed to meet 30-credit requirement

Required Courses: MS Epidemiology/ PhD Gerontology joint degree

(open only to students in the Gerontology PhD program)

PREV 600 — Principles of Epidemiology

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 659 — Observational Studies in Epidemiology

PREV 720 — Statistical Methods in Epidemiology

PREV 721 — Regression Analysis

PREV 723 — Survival Analysis
or PREV 801 — Longitudinal Data Analysis

PREV 758 — Health Survey Research Methods

PREV 803 — Clinical Trials and Experimental Epidemiology

3 credits of Epidemiology electives from among PREV courses not already taken

CIPP 909 — Responsible Conduct of Research

Other courses required for the Gerontology PhD

REQUIRED COURSES: MS EPIDEMIOLOGY/ PHD PHARMACEUTICAL HEALTH SERVICES RESEARCH JOINT DEGREE

(open only to students in the Pharmaceutical Health Services Research PhD program)

PREV 600 — Principles of Epidemiology

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 659 — Observational Studies in Epidemiology

PREV 720 — Statistical Methods in Epidemiology

PREV 721 — Regression Analysis

PREV 723 — Survival Analysis

PREV 803 — Clinical Trials and Experimental Epidemiology

6 credits of Epidemiology electives from among PREV courses not already taken

Other courses required for the Pharmaceutical Health Services Research PhD

REQUIRED COURSES: MS IN EPIDEMIOLOGY AND CLINICAL RESEARCH (CLINICAL RESEARCH TRACK)

PREV 600 — Principles of Epidemiology

PREV 616 — Introduction to Clinical and Translational Research at UMB

PREV 619 — Introduction to SAS

PREV 620 — Principles of Biostatistics

PREV 633 — Application of Legal and Regulatory Issues in Clinical Research

PREV 706 — Research Informatics: Data Management in Clinical Research

PREV 710 — Clinical and Translational Research Project Design and Implementation

PREV 720 — Statistical Methods in Epidemiology

PREV 747 — Research Practicum I (or MS thesis)

PREV 748 — Research Practicum II (or MS thesis)

CIPP 907 — Research Ethics
or CIPP 909 — Responsible Conduct of Research

PREV 799 Thesis Research (6 credits minimum if master's thesis option)

Electives as needed to meet 30-credit requirement

REQUIRED COURSES: MS IN HUMAN GENETICS

HGEN 601 — Basic Human Genetics I

HGEN 602 — Basic Human Genetics II

HGEN 608 — Human Genetics Seminar (every semester)

GPLS 716 — Genomics and Bioinformatics

PREV 619 — Introduction to SAS

and

PREV 620 — Principles of Biostatistics
or PREV 621 — Biostatistical Methods

Select two or more of the following:

PREV 600 — Principles of Epidemiology

HGEN 701 — Human Cytogenetics

PREV 711 — Genetic Epidemiology

GPLS 717 — Molecular Genetics and Development in Model Organisms

GPLS 718 — Programming for Bioinformatics

HGEN 720 — Metabolic Genetics

HGEN 728 — Clinical Genetics I

HGEN 731 — Clinical Genetics II

HGEN 750 — Advanced Topics in Genetic Counseling

HGEN 760 — Clinical Cancer Genetics

PREV 780 — Molecular Epidemiology

CIPP 907 — Research Ethics (or equivalent)

PREV 799 — Thesis Research (6 credits minimum)

Electives as needed to meet 30-credit requirement

Required Courses: Certificate in Clinical Research

PREV 600 — Principles of Epidemiology

PREV 616 — Introduction to Clinical and Translational Research at UMB

PREV 620 — Principles of Biostatistics
or PREV 621 — Biostatistical Methods

PREV 633 — Application of Legal and Regulatory Issues in Clinical Research

PREV 706 — Research Informatics: Data Management in Clinical Research

CIPP 909 — Responsible Conduct of Research

Available Electives

See PREV and other GPLS courses in the Course Descriptions part of this catalog.

GERONTOLOGY

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/gerontologyphd/

Degrees Offered

PhD, PhD/MS with Epidemiology, PhD/MA with Applied Sociology (UMBC)

Program Description

The doctoral program in gerontology at the University of Maryland, Baltimore and the University of Maryland, Baltimore County (UMBC) provides an interdisciplinary and integrative perspective on the process of human aging and the experiences of growing old. The approach acknowledges the complex, dynamic, and bidirectional relationship between individuals and the historical, political, economic, environmental, psychological, social, cultural, and biological contexts in which aging occurs. The goal of the program is to train a new generation of scholars conversant with interdisciplinary and integrative paradigms and research designs to examine the unique, reciprocal, and dynamic nature of aging in context. UMB's six professional schools (dental, law, medicine, nursing, pharmacy, and social work) and UMBC's College of Arts, Humanities and Social Sciences departments (public policy, psychology, and sociology/anthropology) combine to make this mission possible by offering three tracks of study:

1. Aging policy issues
2. Epidemiology of aging
3. Social, cultural, and behavioral sciences.

The program also offers a dual-degree program between gerontology and epidemiology and a combined degree program between gerontology and applied sociology. Students earn a PhD in gerontology and a master's degree in epidemiology or applied sociology.

Students train for careers in research, academia, government, and private organizations. We have embraced nonacademic positions as valuable venues for contribution by our alumni.

Program Admission

Applications are accepted for fall admission only. All application materials must be received by Jan. 15 of the year in which the student intends to enroll. Three letters of recommendation, highly competitive Graduation Record Examinations scores (suggested combined score of 300 or better), transcripts, and a goals statement are required of all applicants. The Test of English as a Foreign Language or the International English Language Testing System exam is required for all international students who do not have a bachelor's or master's degree from a U.S. institution and/or whose native language or language of the home is not English. The program encourages the application of candidates from racial and ethnic minorities under-represented in the sciences. The program offers graduate research assistantships that provide a stipend, tuition remission, and student health insurance.

Degree Requirements

The PhD program consists of a minimum of 49 course credits (21 core course credits, 12 research methods and statistics course credits, 9 track specialization course credits, 6 elective course credits, and 1 ethics course credit). Comprehensive exams are required to be admitted to doctoral status. These exams take place the summer between the second and third year for full-time students. All students must complete at least 12 credits of dissertation research and successfully defend a dissertation. In addition, students attend a bimonthly aging forum and required seminars.

Required Courses at UMB

GERO 672 — Issues in Aging Policy

GERO 681 — Epidemiology of Aging

GERO 711 — Biology of Aging

GERO 750 — Theories and Methods I

GERO 751 — Theories and Methods II

GERO 899 — Doctoral Dissertation Research

CIPP 909 — Responsible Conduct of Research

Required Courses at UMBC

GERO 700 — Sociocultural Gerontology

GERO 786 — Psychological Aspects of Aging

Available Electives

Electives are selected from available courses for each track as well as from courses offered on each campus that contribute to the student's area of research in consultation with the student's advisor.

Molecular Medicine

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/molecularmedicine/

Degrees Offered

PhD, PhD/MD, PhD/DDS

PhD Program Description

Molecular Medicine combines traditional areas of biomedical study – including cancer biology, molecular genetics, genomics and bioinformatics, molecular and cell biology, pathology, toxicology, pharmacology, and physiology – into a unique interdisciplinary research and graduate training program. Specifically designed to develop scientists for the postgenomic era, students gain knowledge, research skills, and familiarity with the state-of-the-art biomedical tools and methodologies needed to solve important and timely questions in biomedical science. The program is organized into four tracks: Molecular and Cell Physiology; Cancer Biology; Genome Biology; Toxicology and Pharmacology. The more than 170 faculty in the Molecular Medicine graduate program are internationally recognized for their research in genomics and computational biology, cancer, vascular and renal cell biology, evolutionary genomics and genetics, membrane biology, muscle biology, neuroscience and neurotoxicology, molecular and environmental toxicology, pharmacology, reproduction, and cardiovascular disease.

PhD Program Admissions

In addition to meeting the Graduate School's minimum admission requirements, applicants should have a bachelor's degree with training in an appropriate major field. The program is particularly interested in applicants with strong undergraduate training in the biological sciences, chemistry, biochemistry, mathematics, and general physics, as well as research experience in the biomedical sciences. Successful applicants have strong letters of recommendation, Graduation Record Examinations scores above the 50th percentile, and high cumulative grade-point averages. Additionally, all international students must meet the Graduate School's requirements for scores from the Test of English as a Foreign Language or the International English Language Testing System exam. Applications should be received no later than Jan. 10 for fall admission. Applications received by Dec. 1 are reviewed for early decision. Admission to the program is highly competitive and acceptances are made as qualified candidates are identified. Students accepted into the PhD program receive graduate fellowships or assistantships that consist of an annual stipend, tuition remission, and health insurance.

PhD Degree Requirements

In the fall of the first year, students participate in an innovative core course: Mechanisms in Biomedical Sciences: From Genes to Disease (GPLS 601). Students then complete track-specific coursework and three laboratory rotations, tailored to meet each student's research interests and career goals. A professional development skills course is offered in the second year to address areas such as public speaking and presentations, critical evaluation of scientific data, grant writing, and development of teaching skills. During the second year of study, students prepare for a qualifying examination in which they are tested on their fundamental understanding of topics in molecular medicine and their ability to design a coherent series of experiments addressing an original research question, usually related to the student's research interests. The qualifying exam consists of a written grant proposal and an oral defense. After successful completion of the exam, students advance to candidacy for the PhD degree. As a PhD candidate, the student's primary focus is their dissertation research, with participation in advanced elective courses as recommended by the mentor and research track leader and continued attendance and participation in journal clubs and seminars.

Molecular Medicine Track Descriptions

1. Molecular and Cell Physiology: Research in this track seeks to uncover the mechanisms and develop novel therapies for human diseases, including Alzheimer's, cancer, cystic fibrosis, diabetes, inflammatory bowel disease, cardiovascular disease, kidney disease, infertility, osteoporosis, muscular dystrophy, and brain injury. Faculty interests focus on systems integration of cells and tissues in physiological and pathophysiological states. The diversity of research interests and the availability of sophisticated imaging, electrophysiology, molecular, genomic, and structural analyses allow students to gain expertise in cutting-edge techniques. The track is highly integrative, and collaborations occur with

other basic science and clinical faculty at the University of Maryland, many of whom are associated with organized research centers, as well as with other institutions across the United States and around the world. The goal of the Molecular and Cell Physiology track is to provide an outstanding intellectual and physical environment that is tailored to each student's professional goals.

Study and Research Focus Areas — Molecular and Cell Physiology

- Cardiac and vascular biology
- Cellular imaging
- Developmental biology
- Metabolism and endocrinology
- Mucosal biology
- Stem cell biology
- Protein and vesicle trafficking
- Cytoskeleton
- Protein structure and interactions
- Membrane biology
- Infectious disease
- Functional genomics
- Receptor biology
- Reproductive biology
- Signal transduction mechanisms
- Gene regulation
- Synaptic transmission
- Epithelial biology
- Radiation biology
- Integrative physiology
- Muscle biology
- Physiological genomics
- Ion channels and electrophysiology
- Molecular imaging

2. Cancer Biology: Cancer is a complex group of diseases that cause more than 600,000 deaths in the United States each year. Our understanding of cancer has reached new heights with the discovery of fundamental aspects of cell and molecular biology combined with significant advances in our understanding of the process of tumorigenesis. The identification of oncogenes, tumor suppressor genes, pathways of DNA damage and repair, growth and cell cycle regulatory factors, and cellular responses to tissue hypoxia have provided exciting new insights into the development and progression of cancer. Technological advancements in genomics, proteomics, and tissue arrays have refined cancer diagnoses and led to the development of successful cancer therapies that target specific molecules driving tumor growth and metastasis. The Cancer Biology graduate track offers an exciting and stimulating academic environment to pursue interdisciplinary cancer research. The primary objective of the Cancer Biology track is to provide students with a strong educational experience combined with modern research training that will enable them to make significant contributions to our understanding of this complex disease. The University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center, a National Cancer Institute-designated center, and its core facilities, researchers, and physicians provide a state-of-the-art environment for conducting basic and clinical cancer research.

Study and Research Focus Areas — Cancer Biology

- Breast and prostate cancer
- Leukemia and lymphoma
- Cytokine and growth factor biology
- Hormonal control of tumor growth
- Molecular and structural biology
- Mechanisms of signal transduction
- Tumor immunology and immunotherapy
- DNA replication, damage, and repair
- Carcinogenesis
- Cancer genetics
- Viral and cellular oncogenes
- Tumor suppressor genes
- Genome instability and genetic mutations
- Apoptotic cell death

- Tumor invasion and metastasis
- Proteases and tumor biology
- Cytoskeleton and cell motility
- Angiogenesis and blood vessel formation
- Cancer drug resistance
- Cancer stem cells
- Diagnostic and prognostic markers
- Experimental therapeutics

3. Genome Biology: Recent advances in next-generation DNA sequencing and bioinformatics are transforming the biomedical sciences. These technologies are being used to sequence and analyze genomes at unprecedented rates, and we are rapidly approaching an era in which human genome sequences will be used routinely to diagnose diseases and predict the future health of individuals. The Genome Biology track offers doctoral and postdoctoral training in this rapidly evolving area. This track is part of a Universitywide graduate program, with participating faculty drawn from diverse departments, centers, and institutes at the University of Maryland, Baltimore. The track is affiliated with the Institute for Genome Sciences (IGS), which has established an exceptional environment for conducting genomics and computational biology studies on campus. The IGS has made significant investments in genome sequencing platforms (Sanger, 454, Illumina HiSeq, and PacBioRS) and an extensive computational grid. Students can gain hands-on experience with these tools and learn how to apply these platforms to biological questions. Affiliated faculty study a range of research topics with an emphasis on exploring questions related to human health and disease. Researchers use model systems such as mouse, zebra fish, fruit fly, worm, mustard plant, and microorganisms that are instrumental in understanding the mechanistic bases of diseases and fundamental processes in biology. The up-to-date curriculum incorporates many cutting-edge tools of genetics, genomics, bioinformatics, and systems biology. Dissertation research projects may employ technologies such as genetic knockouts, high-throughput DNA sequencing, and postgenomic approaches to address problems central to molecular medicine. Thesis topics include microbial pathogenesis and the human microbiome, tumor genetics, diseases of hematopoiesis and the cardiovascular system, muscular dystrophies, skeletal diseases, neurodegenerative diseases, DNA replication and cell division, DNA repair and mutation, and gene regulation and development, which are of fundamental biological importance. The approaches used in genome biology laboratories are broad in terms of systems, organisms, and technologies employed. The genome biology track leads to outstanding PhD-level training and employment opportunities in leading academic, government, and industrial settings.

Study and Research Focus Areas — Genome Biology

- **Cancer genomics:** Tumor genome and transcriptome sequencing; genome mutagenesis, instability, and repair; tumor suppressors and oncogenes; gene networks; signaling pathways; genomics-based drug discovery and treatment.
- **Human genomics:** Human genome and transcriptome sequencing; genetic variation; GWAS studies; predictive health and personalized medicine.
- **Microbial genomics:** The human microbiome in health and disease; pathogenic microorganisms (including yeast and bacteria); host/pathogen interactions; archaea; extremophiles; viruses and phages; bioterrorism.
- **Model organism genomics:** Studies conducted in yeast, flies, worms, and mice exploiting the outstanding genomics resources that have been developed for these organisms (genome sequences, gene annotations, gene knockout collections, plasmid collections, etc.).
- **Evolutionary and comparative genomics:** Sequence comparisons across species to study gene, protein, and genome evolution.
- **Genetics, molecular biology, biochemistry:** Basic molecular processes surrounding gene and genome function, such as RNA transcription, gene regulation, DNA damage and repair, DNA folding/packaging, and chromosome function.

4. Toxicology and Pharmacology: The Toxicology and Pharmacology track offers a unique interdisciplinary graduate education, which provides training in the following areas: molecular and mechanistic toxicology, toxicology and environmental health, and molecular pharmacology. Research in molecular and mechanistic toxicology focuses on mechanisms of cellular responses to drugs, environmental chemicals, and radiation in mammalian systems. Research in toxicology and environmental health focuses on health

effects of ambient air particulate matter in urban and rural areas, toxicology of marine and estuary waters, and the role of genetic polymorphisms in individual susceptibility to adverse health effects of environmental and occupational chemicals. Molecular pharmacology studies the effects on cells and their components of acute and chronic exposure to drugs and toxins. Research focuses on the mechanism and integration of gene function and the development of drug and molecular therapeutics. Model systems include breast, prostate, and skin cancer, chronic and acute neurodegenerative diseases, viral and toxin-induced disorders.

Study and Research Focus Areas — Toxicology

- Neurotoxicology
- Cancer toxicology
- Developmental toxicology
- Molecular mechanisms of cell injury
- Environmental toxicology
- Oxidative stress and signaling
- Aquatic toxicology

Study and Research Focus Areas — Pharmacology

- Oncopharmacology
- Neuropharmacology
- Cellular senescence and telomerase activation
- Cell injury and apoptosis
- Clinical chemistry and pharmacology
- Splicing and post-transcriptional control
- Brain development and behavior
- Modulation of neuronal plasticity
- Pharmacology of ion channels
- Glial cell function and endocrine disruptors

Molecular Microbiology and Immunology

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/microbiology/

Degrees Offered

PhD, PhD/MD, PhD/DDS

Program Description

The Doctor of Philosophy program in molecular microbiology and immunology provides training opportunities in a variety of subdisciplines, including tracks in immunology, cancer immunology, bacteriology, virology, parasitology, fungal pathogenesis, microbial genomics, and cell biology. The program emphasizes molecular aspects of host defense and host-pathogen relationships. A rigorous curriculum and advanced research training prepare students for careers in biomedical research. Students accepted into the program receive graduate fellowships or assistantships that consist of an annual stipend, tuition remission, and health insurance.

Program Admission

In addition to meeting the Graduate School's minimum admission requirements, applicants generally have strong undergraduate training in the biological sciences, chemistry, mathematics, and general physics. Applicants should have A or B grades in undergraduate science courses. Strong preference goes to applicants with combined verbal and quantitative Graduate Record Examinations scores of 310 or above. The program encourages the application of women and candidates from racial and ethnic minorities under-represented in the sciences. Applications are due by Jan. 15 for the fall semester. The program only admits students for the fall semester. International applicants must score at least 100 on the Test of English as a Foreign Language or a comparable score on the International English Language Testing System exam assessment to be considered for admission.

Degree Requirements

First-year students participate in an innovative core course, Mechanisms in Biomedical Sciences: From Genes to Disease (GPLS 601), in the first semester, followed by a period allotted for laboratory rotations. Students then take required, program-specific courses that include: immunology; microbial pathogenesis; virology; an elective advanced course (several options available); and an introduction to scientific thought and ethics. All students participate in program or schoolwide seminars, discipline-specific journal clubs, and a series of three laboratory rotations to familiarize them with faculty research. Elective courses may be added. Students take an oral qualifying exam after finishing their coursework. Qualified students then choose a doctoral dissertation advisor and begin thesis research. Students must pass a thesis proposal defense by the end of their third year, then continue with full-time thesis research.

Required Courses

(In addition to GPLS 601)

GPLS 710 — Microbial Pathogenesis

GPLS 702 — Basic Immunology

GPLS 704 — Principles of Virology

One elective from the courses below or others (listed in GPILS Program Description):

GPLS 769 — Advances in Immunology

GPLS 725 — Advanced Microbial Pathogenesis

GPLS 719 — Advanced Parasitology

NEUROSCIENCE

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/neuroscience/

DEGREES OFFERED

PhD, PhD/MD, PhD/DDS

PROGRAM DESCRIPTION

The Graduate Program in Neuroscience (PIN) is dedicated to providing a center of excellence for the training of outstanding graduate students in the field of neuroscience. Our graduate program is an interdisciplinary program of study leading to a PhD degree in neuroscience. We look to prepare the next generation of scientists who will advance our understanding of the brain/nervous system. Neuroscience faculty expertise and research interests range from the genome to the clinical. Our program enhances interaction among our internationally renowned faculty and enables graduate students to take advantage of the full depth and breadth of neuroscience research conducted at the University of Maryland, Baltimore. Our PhD students are highly sought after, routinely being appointed as postdoctoral fellows at prestigious institutions.

PROGRAM ADMISSION

In addition to meeting the Graduate School's minimum admission requirements, applicants should have a bachelor's degree with training in an appropriate major field of biology or biomedical sciences such as psychology, biochemistry, neuroscience, or bioengineering. The program is particularly interested in candidates with independent research experience. Applicants should have grades of A or B in undergraduate science courses. Competitive applicants have strong verbal and quantitative Graduate Record Examinations scores. The program encourages the application of women and candidates from racial and ethnic minorities under-represented in the sciences. Our application deadline is Dec. 1 for best consideration and Dec. 15 for final consideration. Admission to the program is highly competitive, and, after interviews, acceptances are made as qualified candidates are identified. Additional information is available from the program manager at *http://lifesciences.umaryland.edu/neuroscience/*.

DEGREE REQUIREMENTS

PhD candidates must successfully complete a minimum of 12 credits of doctoral dissertation research. All students are required to do three laboratory rotations and required courses. Additionally, students must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog.

REQUIRED COURSES

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease

GPLS 691 — Molecular Neuroscience and Biophysics

GPLS 620 — Synaptic Physiology and Pharmacology

GPLS 641 — Systems and Cognitive Neuroscience

GPLS 630 — Fundamentals of Biostatistics

GPLS 737 — Proseminar in Experimental Design

GPLS 609 — Laboratory Rotations (three)

GPLS 629 — Journal Club

GPLS 608 — Seminar (for proposal and defense presentations)

CIPP 909 — Responsible Conduct of Research

AVAILABLE ELECTIVES

GPLS 781 — Translational Psychiatry

GPLS 780 — CNS Diseases

GPLS 627 — Developmental Neurobiology

GPLS 613 — Neuroendocrinology

GPLS 642 — Nociception of Pain

GPLS 721 — Microscopy Fundamentals and Modern Imaging Applications

COURSES

See course listings under GPLS program descriptions.

Physical Rehabilitation Science

Graduate Program in Life Sciences

http://pt.umaryland.edu/

Degree Offered

PhD

Program Description

The Department of Physical Therapy and Rehabilitation Science offers a Doctor of Philosophy degree in physical rehabilitation science. The concentration area is neuromotor control and rehabilitation. Related cognate or complementary areas are usually one of the following: applied physiology, cognitive motor neuroscience, epidemiology, human-centered computing, rehabilitation biomechanics, or rehabilitation engineering. Note that some of these courses are not available on the UMB campus but require travel to the University of Maryland, College Park or the University of Maryland, Baltimore County.

A combined Doctor of Physical Therapy/Doctor of Philosophy (DPT/PhD) option also is offered and should be discussed with the PhD and a DPT program director before making a formal application. This option can be applied for only after an individual is accepted into the DPT program.

Research Areas

The nationally and internationally recognized interdepartmental faculty includes 34 PhDs, nine MDs, and nine PTs. Major research interests include balance stability and falls in older adults, motor control and rehabilitation after stroke and in people with Parkinson's disease, neuroplasticity, and technologies including neuroimaging and rehabilitation robotics. A variety of contemporary and innovative approaches is used to understand the neuromotor, physiological, biomechanical, and behavioral bases of movement problems that lead to dysfunction and disability, and to develop rehabilitation approaches for maximizing movement function and promoting independence. Studies employ three-dimensional motion analysis and kinetic and electromyographic (EMG) recording techniques to evaluate localized and whole-body movements.Other methodologies may include functional/structural magnetic resonance imaging (MRI), transcranial magnetic stimulation (TMS), electroencephalographic (EEG) recording, computed tomography (CT), acoustic startle, peripheral nerve and muscle stimulation, and clinical testing. Robotics applications are employed to study and rehabilitate upper and lower limb movement problems and to test and train balance and gait disorders.

The program combines faculty, physical, and financial resources from several departments within the School of Medicine and the Baltimore Veterans Affairs Medical Center and from related graduate programs within the University System of Maryland. The program trains researchers so they may advance the field of physical rehabilitation and ultimately improve the lives of people with functional deficits and disability. Individual courses of study serve the interests and educational needs of the student and the principal faculty advisor. The program educates students with the systemic biological, physical, and behavioral sciences and conceptual models of current biomedical thought, and trains them in the application of pertinent disciplines to the field of rehabilitation. Graduates of the program can find careers in academia, research, and industry.

Program Admission

Beyond the Graduate School's minimum admission requirements, applicants must hold a bachelor's or master's degree in a health- or rehabilitation-related discipline or a related biological science. Experience in rehabilitation is preferred but not essential. Potential candidates are encouraged to contact a potential advisor before applying to the program. Three letters of recommendation, Graduate Record Examinations (GRE) scores, transcripts, and a written statement of interests and career goals are required of all applicants. Strong preference goes to applicants with exceptional GRE scores. All international students must meet the Graduate School's requirements for scores from the Test of English as a Foreign Language or the International English Language Testing System exam. Other selection criteria may be used independently by specific advisors. All application materials must be received by Feb. 1 if seeking a graduate assistantship. Otherwise, applications are accepted throughout the year. The program encourages the application of women and candidates from racial and ethnic minorities under-represented in the sciences. For more information, visit *http://lifesciences.umaryland.edu/rehabscience/*.

Degree Requirements

Students must complete at least 60 credits of supervised work beyond the bachelor's degree to receive the doctoral degree in physical rehabilitation science. The 60 credits must include a minimum of 10 credits of interdisciplinary science foundation, 12 credits of tools, 22 credits of concentration/cognate, 12 credits of doctoral dissertation research, and 4 credits that can be distributed in any area. The program may waive some credit requirements if there is evidence that an accredited graduate school or program verifies academic competency in pertinent coursework. The advisor and program administration must approve the waiving of credit requirements. Other requirements include passing the (a) plan of study meeting (typically at the end of the first year), (b) written and oral comprehensive exams (typically at the end of the second year); and (c) the dissertation proposal (six months after passing the comprehensive exams). At this stage, the student advances to candidacy for the PhD degree, ideally during the third year. Once candidacy has been achieved, the student's primary focus is on dissertation research, with progress monitored and advice on executing the research program provided by the dissertation committee. The doctoral dissertation must be an original scientific and scholarly work consisting of at least two empirical papers of publishable quality, completed according to Graduate School guidelines and program policies.

Students pursuing the doctoral degree in physical rehabilitation science participate in research throughout their studies. They are expected to demonstrate continuous evidence of scholarship through an average of three presentations a year and at least two submitted papers before the dissertation. Graduate research and teaching assistantships may be available to highly qualified applicants. Progress monitoring and academic/research planning are provided on an annual basis by the student's advisory committee and through ongoing interactions with the primary advisor.

Required Courses (credits)

PTRS 688-02 — Foundations of Rehabilitation Science 1 (3)

PTRS 688-03 — Foundations of Rehabilitation Science 2 (3)

PTRS 788 — Interdisciplinary Research Seminar (4 x 1) (4)

PTRS 702 — Graduate Seminar in Teaching 1 (1)

PTRS 703 — Graduate Seminar in Teaching 2 (1)

Statistics (at least 6 credits)

PTRS 899 — Doctoral Dissertation Research (12)

Remaining credits are electives (from PTRS or other departments/campuses).

Elective Courses (Available from PTRS)

PTRS 718 — Applied Human Anatomy, Trunk (3)

PTRS 719 — Applied Human Anatomy, UE (3)

PTRS 720 — Applied Human Anatomy, LE (3)

PTRS 798 — Independent Study (variable)

PTRS 898 — Pre-Candidacy Research (variable)

PTRS 899 — Doctoral Dissertation Research (variable)

Toxicology

Graduate Program in Life Sciences

http://lifesciences.umaryland.edu/toxicology/

Degree Offered

MS

Program Description

The program in Toxicology is a University of Maryland intercampus graduate program that offers a wide range of interdisciplinary training opportunities. On the University of Maryland, Baltimore campus, within the Graduate Program in Life Sciences, this program provides educational, professional, and research training in two areas: molecular and mechanistic toxicology, and toxicology and environmental health. The program encourages students to take advantage of appropriate graduate courses at other University System of Maryland campuses.

Molecular and Mechanistic Toxicology Track

Students in this track have the opportunity to conduct cutting-edge research in molecular mechanisms of cellular and organism responses to environmental and industrial chemicals, drugs, and radiation; the role of free radicals and chronic inflammation in the development of diseases such as cancer; chemoprevention; and the role of gene-environment interactions in the development of diseases.

Through coursework, laboratory rotations, and dissertation research, students receive basic training in cell biology, biochemistry, molecular biology, pathology, pharmacology, and biostatistics. Students use modern molecular biology, biochemical, and knockout animal model approaches to investigate complex biological processes, including oxidative and free radical stress, cell signaling in cell survival and death, cell cycle control, and cell proliferation and differentiation. Areas of research focus of the faculty include carcinogenesis; chemoprotection; developmental abnormalities; neurological, cardiovascular, and renal system toxicity and protection; aging and mechanisms of drug action; and drug development.

Toxicology and Environmental Health Track

Students in this track have the opportunity to conduct basic and public health research with a focus on chemical risk assessment, forensic toxicology, aquatic toxicology, and the development of biomarkers of exposure, susceptibility, and effect. In addition to research, students are trained to provide technical support to federal, state, and local governments and industry, and public interest groups in areas including the evaluation and testing of the harmful effects of chemical, physical, and biological agents on living organisms; prevention of chemical-induced diseases; and environmental protection through governmental regulations for the control and monitoring of hazardous chemicals.

Program Admission

In addition to the Graduate School's minimum admission requirements, toxicology applicants should have majored in biology, chemistry, biochemistry, molecular biology, pharmacy, or related fields. Applicants should have completed the following courses or equivalents: physiology, organic chemistry, biochemistry, molecular and cell biology, and quantitative analysis. Applicants should have A or B grades in undergraduate science courses. Strong preference is given to applicants with combined verbal and quantitative Graduate Record Examinations scores of 300 or above. The program encourages the application of women and candidates from racial and ethnic minorities under-represented in the sciences. The toxicology program admits students for the fall semester only. International applicants and applicants whose native language or language of the home is not English must take the Test of English as a Foreign Language or the International English Language Testing System exam.

Degree Requirements

Students pursuing a thesis-master's degree must successfully complete a minimum of 6 credits of master's thesis research.

Specific requirements for an MS degree in toxicology include a minimum of 30 course credits (24 required, 6 in elective courses) with track-specific distributions. All students are required to take the toxicology seminar and three laboratory rotations.

Required Courses — Molecular and Mechanistic Toxicology Track

(30 credits total)

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease

GPLS 623 — Molecularly Toxicology

GPLS 630 — Fundamentals of Biostatistics

TOXI 618 — Seminar in Toxicology

TOXI 609 — Methods in Toxicology

CIPP 907 — Research Ethics (credit or informal audit)

3 credits of pharmacology. Choose from:

GPLS 607 — Principles of Pharmacology

PHAR 600 — Principles of Drug Discovery

PHAR 601 — Principles of Drug Development

PHAR 602 — Applied Pharmacokinetics

5 credits of general electives

Required Courses — Toxicology and Environmental Health Track

(30 credits total)

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease

PATH 603 — General Pathology

PREV 621 — Biostatistical Methods
or GPLS 630 — Fundamentals of Biostatistics

TOXI 618 — Seminar in Toxicology

TOXI 609 — Methods in Toxicology

CIPP 907 — Research Ethics (credit or informal audit)

3 credits of Pharmacology. Choose from:

GPLS 607 — Principles of Pharmacology

PHAR 600 — Principles of Drug Discovery

PHAR 601 — Principles of Drug Development

PHAR 602 — Applied Pharmacokinetics

6 credits of general electives

Required Courses – MS (Thesis Option) and PhD Candidates

GPLS 799 — Master's Thesis Research

Available Electives

See TOXI, PREV, and other GPLS courses in the Course Descriptions part of this catalog.

Health Science

http://www.graduate.umaryland.edu/healthscience/

Degree Offered
MS

Program Description
The Master of Science in Health Science is a 30-credit online program designed to provide individuals with the education and training needed to engage with and respond to civic, social, environmental, and economic challenges at the local, national, and global levels. The program prepares students to search, interpret, and evaluate medical literature, including interpretation of biostatistical methods, by accessing common medical databases and using sampling methods. Upon completion of the program, students should be able to deliver instruction in health care delivery systems and health policy as well as provide instruction on the principles and practice of medical ethics. Students are provided an overview of health care system delivery, patient safety, and quality and risk management. The program thoroughly reviews public health as it relates to the prevention of disease, maintenance of public health, and participation in disease surveillance, reporting, and intervention.

Program Tracks

Physician Assistant (PA)
This track is a collaborative arrangement between Anne Arundel Community College (AACC) and the University of Maryland, Baltimore (UMB) Graduate School. It prepares students to become competent, ethical, and compassionate health care providers who are ready to fulfill the roles and duties of a primary care physician assistant. The program seeks those who recognize and promote the value of diversity and are committed to lifelong learning. Students who successfully complete all coursework from both institutions will receive a Master of Science in Health Science (MSHS) from UMB and a Certificate of Physician Assistant Studies from AACC. Graduates will be eligible to sit for the national certification exam for physician assistants. The Master of Science degree program at UMB is offered completely online. This full-time, 25-month program includes subjects in applied medical and behavioral sciences, patient assessment, clinical medicine, procedural skills, health policy, professional practice issues, and supervised clinical practice. The program is accredited by the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA).

*Non-PA track students specialize in one of seven concentrations, each of which culminates in a stackable certificate that can be applied to the master's program in Health Science.**

Aging and Applied Thanatology
This track is intended to meet the needs of individuals who are involved in any or all aspects of the dying, death, and grieving processes. It is, therefore, an interdisciplinary program intended to be of interest to a wide range of professionals with baccalaureate or advanced degrees, including physicians, nurses, psychologists, social workers, hospice professionals, bereavement counselors, clergy and chaplains, death educators, teachers, police, firefighters, paramedics, funeral directors, and others who provide support and assistance for those affected by death, as well as those who want to expand their own knowledge and skills on dying, death, and grieving.

Global Health Systems and Services
The focus of this track is to introduce basic global health systems and services to health professionals interested in short- or medium-term consultation/projects overseas and subsequent opportunities. Most students are already trained/licensed experienced practitioners. This online program and track is offered in partnership with the University of Maryland University College's (UMUC) Online Postbaccalaureate Certificate in Global Health Management. UMB's Global Health Systems and Services certificate and UMUC's Global Health Management certificate share two common core courses.

This UMB-UMUC partnership takes advantage of UMB's extensive graduate health professional, clinical, practice, and global expertise and UMUC's extensive online and health management expertise. It offers UMB and UMUC graduates and students interested in global health

management and global health systems and services options unavailable through their home institutions. This program's goal is to apply skills to improve delivery of global health systems, policies, and services.

Integrative Health and Wellness

Students in this track will study the differences between the philosophy, theory, and application of allopathic medicine and integrative medicine. Students will critically evaluate the benefits and drawbacks of both approaches as well as the strengths and limitations of the empirical evidence for the efficacy and safety of integrative health therapies. By participating in this program, students will have the chance to practice the key integrative skills they are learning, including popular forms of mind-body interventions, health coaching strategies, and integrative assessments and treatment plans. In addition to professional growth, students will have the opportunity to benefit personally from self-reflection exercises and guided experiential learning.

Research Administration

This track is designed to ensure that students have a greater understanding of the many behind-the-scenes aspects of research so they can successfully manage grants, understand legalities in research administration, and become familiar with the transfer of intellectual properties. Students in this track will gain advanced knowledge and practical training to ensure that learning is relevant and applicable to each student's professional goals.

Research Ethics

This track was created to provide individuals with an understanding of the ethical and regulatory aspects of human subjects research and give them the skills needed to analyze ethical issues that arise in the conduct of research in domestic and international arenas. The certificate program interrelates with the Fogarty International Center/National Institutes of Health training program that is focused in the Middle East (MERETI). The inclusion of these targeted audiences will ensure an interprofessional and global experience for all participants. The program is particularly designed for investigators, clinical research coordinators, nurses, and individuals from institutional review boards, contract research organizations, pharmaceutical industry representatives, and others involved in research. The exclusive use of distance learning technologies meets the needs of professionals worldwide who may have few opportunities to enroll in an on-site program

Research Implementation and Dissemination

This track's goal is to translate the results of clinical and population research into everyday clinical practice and public health. Additionally, research implementation and dissemination science seeks to ensure that the knowledge and materials produced by health research lead to improved individual and population health by reaching the people for whom they are intended; being adapted to local circumstances; and being implemented effectively, safely, equitably, and in a timely and patient-centered manner.

Students in this program will study methods that promote systematic uptake and will translate the results of clinical and population research into everyday clinical practice and public health. The program also is intended to help students ensure that the knowledge and materials produced by health research will improve individual and population health.

Science Communication

This track is designed to equip students to communicate effectively with a variety of audiences using different forms and styles of writing. By providing students with advanced knowledge and practical training, this program strives to ensure that learning is relevant and applicable to each student's professional goals. Students learn how to strategically plan, craft, edit, and execute their writing to communicate in an engaging, scientifically informed manner about health-related topics.

PROGRAM ADMISSIONS

PHYSICIAN ASSISTANT

All PA collaborative candidates must apply online through the Central Application Service for Physician Assistants (CASPA); the portal is open in mid-April each year. CASPA is a web-based application service that allows applicants to submit an application to the Physician Assistant Program, which is received by AACC's Health Professions Admissions Office. Complete application instructions and required credentials are published by CASPA and AACC at *http://www.aacc.edu/about/schools-of-study/health-sciences/physician-assistant/*.

In addition to meeting CASPA application requirements, candidates for admission must meet the minimum qualifications and standards established by the Graduate School.

NON-PA TRACKS

Applicants who are interested in the Master of Science in Health Science (MSHS) who wish to complete the UMB coursework can apply through the University of Maryland, Baltimore Graduate School. A letter of interest including personal goals and a CV should be sent to the MSHS administrative program director, with three letters of recommendation.

All candidates applying for admission must meet the minimum qualifications and standards established by the Graduate School, including the successful completion of a bachelor's degree program listed previously and a minimum, cumulative grade-point average (GPA) of 3.0 on a 4.0 scale. Graduate Record Examinations scores are required for admission, and completion of statistics is a prerequisite. International students must provide current, official results of the Test of English as a Foreign Language (minimum score of 80 for the internet-based test) or the International English Language Testing System exam (minimum Band 7).

DEGREE REQUIREMENTS

The Physician Assistant track of the MSHS degree program requires a minimum of 30 credits from UMB and 6 credits of approved AACC PA coursework, which is transferred into the master's program.

All admitted MSHS students must maintain a minimum GPA of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of the catalog.

*Descriptions of the non-PA tracks also are described as stand-alone certificate programs in this section of the catalog.

Integrative Health and Wellness

http://graduate.umaryland.edu/wellness/

Degree Offered

Postbaccalaureate Certificate

Program Description

The Integrative Health and Wellness postbaccalaureate certificate is a 12-credit program that can be completed entirely online.

This program teaches students about integrative therapies and how individuals can bring these therapies into their own professional and personal experiences. The Integrative Health and Wellness certificate is designed for students who are interested in learning more about an integrative, holistic approach to health and healing. This holistic approach appreciates and attends to the role of the body, mind, and spirit in creating and maintaining health and wellness. In this program, students study the differences between the philosophy, theory, and application of allopathic medicine and integrative medicine. Students critically evaluate the benefits and drawbacks of both approaches as well as the strengths and limitations of the empirical evidence for the efficacy and safety of integrative health therapies. In this program, students may practice the key integrative skills they are learning, including popular forms of mind-body interventions, health coaching strategies, and integrative assessments and treatment plans. In addition to professional growth, students can benefit personally from self-reflection exercises and guided experiential learning.

Individuals interested in this program will have backgrounds in health care, fitness, nutrition, or psychology. However, the concepts presented in this certificate are useful for students from a variety of backgrounds who are interested in integrative medicine and how it can benefit them professionally and personally. Graduates of this program will have the unique advantage of having studied with leading professionals in this field and possessing a sound knowledge of the empirical research in integrative medicine and basic proficiency in fundamental skills for the practice of integrative health and wellness.

Certificate Objectives

This certificate is designed to:

- Provide students with empirically based knowledge of holistic approaches to health and wellness.
- Improve the quality and breadth of care of health care practitioners.
- Plan and facilitate programs that will bring awareness to integrative health and wellness health care options.
- Work effectively within various health care facilities to provide complementary and integrative approaches for those seeking nonallopathic treatments.
- Build interdisciplinary teams and communicate with clinical providers, administrators, and patients using integrative approaches.

Learning Outcomes

At completion of the program, students will be able to:

- Describe the fundamental concepts of integrative health and wellness, including the history, philosophies, theories, and methods of prominent integrative therapies.
- Identify the differences between, and applications of, allopathic medicine and integrative medicine.
- Explain the interaction among emotional, physical, mental, social, and spiritual aspects of health and well-being.
- Describe the types, uses, benefits, and potential adverse effects of commonly used mind-body approaches in the United States.
- Critique the strengths and limitations of the empirical evidence for the efficacy, safety, and mechanisms of action of integrative health therapies.
- Demonstrate basic proficiency in skills for communicating and educating patients about integrative health and wellness approaches.
- Use scientific evidence for clinical decision-making, treatment recommendations, and outcome evaluation.
- Contrast integrative assessment with conventional medical assessment and develop an integrative treatment plan.
- Analyze case studies demonstrating the application of integrative approaches for the treatment and prevention of common and chronic diseases.

- Apply the philosophy and fundamental principles of health and wellness coaching in your chosen health care profession.
- Use knowledge of health behavioral change theories to inform coaching strategies and empower clients' change process.
- Experience and reflect upon the use of integrative approaches for health and healing through guided experiential learning and self-practice.

Program Admission

General application requirements for admission to postbaccalaureate certificate programs are outlined in the Admissions section of this catalog. UMB recognizes that the coursework designed for the Integrative Health and Wellness certificate has the potential to benefit learners who are pursuing multiple clinical and professional degrees and credentials. To apply for this postbaccalaureate certificate, individuals should have a bachelor's or master's degree in a health- or science-related discipline and/or at least three years' experience in a health care-related field.

Degree Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guidelines and requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Required Courses

All courses are eight weeks in length, 3 credits, and offered online.

MHS 612 — Introduction to Integrative Health and Biological and Body-Based Interventions

MHS 636 — Advanced Skills in Integrative Mind-Body Interventions

MHS 628 — Integrative Health and Wellness Coaching

MHS 619 — Clinical Application of Integrative Health and Wellness

Marine Estuarine Environmental Sciences

University System of Maryland

http://mees.umd.edu/

Degrees Offered

PhD, MS

Program Description

The specific objective of the systemwide University graduate program in Marine Estuarine Environmental Sciences (MEES) is the training of qualified graduate students, working toward an MS or PhD degree, who have research interests in fields of study that involve interactions between biological systems and physical or chemical systems in marine, estuarine, or terrestrial environments. The program comprises six areas of specialization: ecology, environmental chemistry, environmental molecular biology and biotechnology, environmental science, fisheries science, and oceanography. Students work with their advisory committee to develop a customized course of study based on research interests and previous experience.

Each student is required to complete a thesis or dissertation reporting the results of an original investigation. The research problem is selected and pursued under the guidance of the student's advisor and advisory committee.

Students may conduct their research in the laboratories and facilities of the University of Maryland, College Park; University of Maryland, Baltimore; University of Maryland, Baltimore County; or University of Maryland, Eastern Shore;or in a laboratory of the University of Maryland Center for Environmental Science: Chesapeake Biological Laboratory in Solomons, Md.; the Horn Point Laboratory in Cambridge, Md.; and the Appalachian Laboratory in Frostburg, Md.; or at the Center of Marine Biotechnology in Baltimore. The Chesapeake and Horn Point laboratories are located on the Chesapeake Bay. They include excellent facilities for the culture of estuarine organisms. The laboratories are provided with running saltwater, which may be heated or cooled and may be filtered. At Horn Point, there are extensive marshes, intertidal areas, oyster reefs, tidal creeks, and rock jetties. The Appalachian Laboratory, located in the mountains of Western Maryland, specializes in terrestrial and freshwater ecology.

Program Admission

Applications for admission in the fall semester must be filed by Feb. 1; however, to be considered for financial support, it is better to apply by Dec. 1. Some students will be admitted for the semester starting in January, for which the deadline is Sept. 1. Applicants must submit an official application to the Graduate School at the University of Maryland, College Park along with official transcripts of all previous collegiate work, three letters of recommendation, and scores on the general test (aptitude) of the Graduate Record Examinations. It is particularly important that a student articulate clearly in the application a statement of goals and objectives pertaining to their future work in the field. Because of the interdisciplinary and interdepartmental nature of the program, only students for whom a specific advisor is identified in advance can be admitted. Prior communication with individual members of the faculty is encouraged.

Courses

Students plan their courses under the direction of their academic advisors and an advisory committee. Students must complete graduate course requirements as determined by the area of specialization through which they are enrolled. Students may take courses from departments of several University System of Maryland institutions approved by the MEES program committee. Students conducting research for a master's or doctoral degree under the direction of a faculty member must enroll in one of the following:

MEES 799 — Master's Thesis Research

MEES 899 — Doctoral Dissertation Research

Students enrolled in the MEES program at UMB are encouraged to avail themselves of the course offerings (GPLS) of the school's Graduate Program in Life Sciences.

Medical and Research Technology

http://medschool.umaryland.edu/dmrt/

Degree Offered

MS

Program Description

The Medical and Research Technology Master of Science program provides medical technologists and laboratory scientists with advanced knowledge and skills to enhance their professional development. Graduates of the program hold a variety of jobs, including laboratory supervisors and managers, medical technology educators, academic and biotechnology researchers, technical representatives for industry, directors of marketing, clinical trial coordinators, and scientists in governmental regulatory agencies.

Designed for medical technologists and students with undergraduate life science degrees, the program offers two tracks: biomedical science (research track; thesis required) and laboratory management (management track; nonthesis option). In the biomedical science track, the student acquires the advanced training and skills needed for research in the biomedical field. The laboratory management track develops skills in laboratory administration. Students will find the program flexible and may tailor and arrange the program to fit individual interests and backgrounds.

Program Admissions

Beyond the Graduate School's minimum admission requirements, applicants must have a bachelor's degree in medical technology or a life science discipline related to laboratory sciences. Examples of related life science disciplines include biochemistry, microbiology, molecular biology, immunology, cell biology, and biotechnology.

Degree Requirements

The master's degree program requires a minimum of 24 credits and 6 master's thesis research credits (30 credits total) for the biomedical research track and a minimum of 36 credits for the laboratory management track. Courses are selected with the approval of the program director and graduate faculty committee, from the following categories:

Required Core Courses

MEDT 628 — Seminar (three semesters)

MEDT 630 — Scientific and Technical Writing

MEDT 635 — Teaching Practicum Minor

MEDT 687 — Quality Control and Regulations in Laboratory Sciences

CIPP 909 — Responsible Conduct of Research

DBMS 638 — Biostatistics
or PREV 620 — Principles of Biostatistics
or POSI 604 — Statistical Analysis*

Required Courses (Biomedical Research Track)

CHEM 437 — Comprehensive Biochemistry I*

MEDT 631 — Research Design

MEDT 799 — Master's Thesis Research

Suggested Elective Courses

MEDT 634 — Teaching Practicum Major

MEDT 638 — Special Topics

MEDT 654 — Advanced Topics in Laboratory Sciences

MEDT 671 — Molecular and Cell Biology

CHEM 638 — Comprehensive Biochemistry*

BIOL 614 — Genetics and Eukaryotic Molecular Biology*

GPLS 635 — Bacterial Genetics

GPLS 702 — Basic Immunology

GPLS 710 — Microbial Pathogenesis

GPLS 704 — Principles of Virology

Required Courses (Management Track)

MEDT 639 — Management Practices in Laboratory Sciences

ACCT 504 — Introduction to Accounting**
or ACCT 610 — Financial Accounting***

FIN 504 — Financial Management**
or MGMT 640 — Financial Decision-Making for Managers***

MGMT 600 — Leading With Integrity**
or MGMT 640 — Research Methods for Managers***

Suggested Elective Courses

MEDT 634 — Teaching Practicum Major

MEDT 638 — Special Topics

PREV 648 — Introduction to Health System and Health Policy Management

HCAD 640 — Financial Management for Health Care Organizations***

ECAD 489 — Seminar in Administration*

MGMT 610 — The Manager in a Technological Society***

PUBL 615 — Managerial Leadership and Communication Skills*

TMAN 633 — Managing People in Technology Based Organizations***

MGMT 650 — Research Methods for Managers***

HRMD 610 — Issues and Practices in Human Resource Management***

EDUC 601 — Human Learning and Cognition*

* University of Maryland, Baltimore County courses

** University of Baltimore courses

*** University of Maryland University College courses

Nursing

http://nursing.umaryland.edu/

Degrees Offered

PhD, DNP, MS, Postbaccalaureate Certificates

Program Description

The School of Nursing prepares students to positively impact and provide distinguished leadership in the health care field. Our rigorous programs provide opportunities for students seeking an entry into practice degree or those wishing to specialize in a variety of areas.

Postbaccalaureate Certificates

A certificate from the nursing school offers experience in emerging fields without completion of an entire degree program. All certificates are a minimum of 12 credits. Current students in a degree program are able to share two courses between the degree and certificate. There are four certificate options:

- Environmental Health: This certificate prepares nurses to take on environmental health duties within a wide range of health care settings from local and state health departments to regulatory agencies and nonprofit/advocacy organizations.
- Global Health: This certificate is an inclusive interprofessional certificate offered to nurses and other health professionals to build the competencies and skills needed for a global health career. Students will receive a practical global health travel experience as part of the certificate program.
- Nursing Informatics: Information technology innovations in health care have led to an increasing demand for nursing specialists with a firm grounding in informatics. This certificate was created to meet that need.
- Teaching in Nursing and Health Professions: The need for quality nursing and health care faculty has never been greater. This certificate concentrates on building essential knowledge and skills to prepare students in the most essential of roles: teacher.

Master's Degree

The Master of Science program offers specialization options for nurses who hold a baccalaureate degree in nursing and provides an entry into practice option for those who hold a baccalaureate degree in another field. All students complete 12 credits of graduate core courses with additional credits in their area. The curriculum, including core, specialty, research, and elective components, offers preparation in a variety of specialty areas, including:

- Clinical Nurse Leader: This option prepares students with a baccalaureate or higher degree in a field other than nursing for entry into nursing practice as a clinical nurse leader (CNL). The American Association of Colleges of Nursing, in collaboration with practice and academic leaders, developed the CNL role to better prepare nurses to participate in improving the quality of health care. The CNL provides direct patient care, assesses risks, collaborates in planning care for patients in a variety of settings, and evaluates patient outcomes.
- Community and Public Health Nursing: This master's specialty will prepare you for advanced practice in community/public health nursing with a focus on health promotion and disease prevention. Graduates of this program are able to implement core public health principles and practice in a variety of settings, including local and state health departments, federal, state, and nongovernmental agencies, and schools. Graduates also are eligible for certification as Advanced Public Health-Nurse Board Certified.
- Health Services Leadership and Management: The HSLM specialty prepares students to actively meet the complex and evolving challenges facing leaders in today's health care environment. Students will be taught to combine the business of health care with the compassion of nursing. Students have the option to select from one of the following concentrations: HSLM, HSLM Education, HSLM Business (MS/MBA dual degree).
- Nursing Informatics: Increasing demand for the adoption of electronic information systems is creating a growing need for nursing informatics in health care organizations and businesses that develop and sell health care information technology. This program prepares students to analyze nursing/health care information requirements, design system alternatives, manage information technology, identify and implement user-training

strategies, and evaluate the effectiveness of clinical and/or management information systems in health care. Students also will be prepared to be leaders in the conceptualization, design, and research of computer-based information systems in health care organizations and the informatics industry.

- Nursing and Public Health: The Master of Science/Master of Public Health (MS/MPH) dual-degree option will prepare students for a diverse range of careers in nursing and public health. It's available to students in all graduate nursing specialties. Students in the program have the opportunity to earn both degrees in less time — and at less cost — than if they pursued each degree separately. Students choose one of the MS nursing specialties and receive a MPH from the School of Medicine. Each school awards the degree separately.

Program Outcomes:

Graduates of the MS program are prepared to:

- Incorporate scientific inquiry and theoretical concepts into efforts to improve care to individuals and communities.
- Lead evidence-based and interprofessional approaches for the design and delivery of comprehensive, culturally competent care to individuals/families, communities, and populations.
- Participate in the design, implementation, and evaluation of health care systems to foster safety and excellence in health care delivery.
- Engage in ethically sound, culturally sensitive, and evidence-based practice to promote the health of individuals and communities.
- Commit to lifelong learning for self and promote lifelong learning to consumers.
- Practice advanced nursing roles in collaborative relationships across disciplines and in partnership with communities (i.e., nursing education, nursing administration, nursing informatics, advanced clinical practice, and clinical nursing leadership).

Doctoral Degrees

Two options are available for nurses seeking a terminal doctoral degree: Doctor of Philosophy (PhD) and Doctor of Nursing Practice (DNP). For information on the DNP, visit the University of Maryland School of Nursing website: *www.nursing.umaryland.edu/academics/doctoral/dnp/*.

Doctor of Philosophy in Nursing

This program is designed to meet the educational needs of students who are committed to playing a significant role in the continuing discovery, amplification, and refinement of nursing knowledge. The program's purpose is to prepare scholars and researchers who will advance the theoretical and empirical basis for nursing and expand research design and methodology. Specialty courses allow students to develop individualized programs of study.

Graduates from the PhD program will be prepared to:

- Design, conduct, analyze, and disseminate research findings to expand knowledge in nursing and related disciplines.
- Initiate, facilitate, and participate in interdisciplinary research with nurses and scholars from related disciplines.
- Assume leadership roles in academic and health care settings.

Ideal candidates for the PhD program are bachelor's- or master's-prepared nurses who are interested in a research career. Non-nurses will be considered based on their research interests and match with research faculty. Research areas include:

- Healthy aging
- Cardiovascular health
- Chronic pain and symptom management
- Health systems outcomes
- Occupational and environmental health
- Palliative and end-of-life care
- Biological and psychosocial health
- Substance abuse
- Maternal and neonatal outcomes
- Cellular and genetic disease mechanisms

Program Admissions

Admission requirements vary depending on the program. All admission criteria are located on the School of Nursing website: *http://www.nursing.umaryland.edu/admissions/*.

Degree Requirements

Student must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog. Students also must adhere to the policies and guidelines outline in the nursing school's student handbook.

Certificate Curriculum

Required Courses – Environmental Health

(12 total credits)

NURS 730 — Environmental Health I

NURS 735 — Applied Toxicology

NURS 764 — Advanced Environmental Health

NURS TBD — Environmental Health Elective

Required Courses – Global Health

(12 total credits)

PREV 664/NRSG 664 — Critical Issues in Global Health (interprofessional course)

NURS 769 — Society, Health, and Social Justice

NURS TBD — Global Health Option

NRSG 610 — Global Health Seminar

NRSG 611 — Global Health Field Experience

Required Courses – Nursing Informatics

(18-19 total credits)

NURS 786 — Systems Analysis and Design

NURS 736 — Technology Solutions for Generating Knowledge in Health Care

NURS 785 — Health Care Database Systems

NURS 784 — Information Technology Project Management

NURS 737 — Nursing Informatics Concepts and Practice in Systems Adoption

NURS 738 — Practicum and Health Informatics

Required Courses – Teaching in Nursing and Health Profession (12 total credits)

NURS 787 — Theoretical Foundations of Teaching and Learning in Nursing and Health Professions

NURS 791 — Instructional Strategies and Assessment of Learning in Nursing and Health Professions

NURS 792 — Practicum in Teaching in Nursing and Health Professions

NURS TBD — Elective

Master's Curriculum

Required Core (12 credits)

NRSG 780 — Health Promotion and Population Health

NURS 782 — Health Systems and Health Policy: Leadership and Quality Improvement

NRSG 790 — Methods for Research and Evidence-Based Practice

NRSG 795 — Biostatistics for Evidence-based Practice

Required Courses – Clinical Nurse Leader (65 total credits)

NURS 501 — Pathophysiological and Pharmacological Bases for Nursing Practice

NURS 503 — Health Assessment Across the Lifespan

NURS 505 — Introduction to Professional Nursing Practice

NURS 507 — Introduction to Nursing and the Clinical Nurse Leadership Role

NURS 514 — Adult Health Nursing

NURS 625 — Introduction to Gerontological Nursing

NRSG 736 — Technology Solutions for Generating Knowledge in Health Care

NURS 509 — Maternal and Newborn Nursing

NURS 517 — Pediatric Nursing

NURS 508 — Community/Public Health Nursing

NURS 511 — Psychiatric Mental Health Nursing

NURS 523 — Clinical Nurse Leader Emphasis Practicum

Required Courses – Community/Public Health Nursing (38 total credits)

NURS 761 — Populations at Risk in Community/Public Health

NURS 769 — Society, Health, and Social Justice

NURS 671 — Epidemiological Assessment Strategies

NURS 732 — Program Planning and Evaluation in Community/Public Health

NURS 762 — Program Planning and Evaluation in Community/Public Health

NURS 730 — Environmental Health

NURS 730 — Environmental Health

NURS 733 — Leadership in Community/Public Health

NURS 753 — Practicum in Leadership in Community/Public Health Nursing

Required Courses – Health Services Leadership and Management (38 total credits)

HSLM Core

NURS 690 — Managerial Health Finance

NURS 691 — Organizational Theories: Applications to Health Service Management

NURS 692 — Administration of Nursing and Health Care Services

NURS 695 — Practicum in Health Services, Leadership, and Management

NURS 736 — Technology Solutions for Generating Knowledge in Health Care

HSLM Focus

NURS TBD — Elective

NURS TBD — Elective

NURS TBD — Elective

HSLM Education Focus

NURS 787 — Theoretical Foundations of Teaching and Learning in Nursing and Health Professions

NURS 791 — Instructional Strategies and Assessment of Learning in Nursing and Health

NURS TBD — Elective

MS/MBA dual degree (68 total credits for both degrees)

NURS 691 — Organizational Theories: Applications to Health Service Management

NURS 692 — Administration of Nursing and Health Care Services

NURS 736 — Technology Solutions for Generating Knowledge in Health Care

NURS TBD — Elective

NURS TBD — Elective

Business course (at selected school of business)

Business course (at selected school of business)

NURS 695 — Practicum in Health Services, Leadership, and Management

Required Courses – Nursing Informatics

(40 total credits)

NURS 690 — Managerial Health Finance

NURS 691 — Organizational Theories: Applications to Health Service Management

NURS 736 — Technology Solutions for Generating Knowledge in Health Care

NURS 786 — Systems Analysis and Design

NURS 784 — Information Technology Project Management

NURS 785 — Health Care Database Systems

NURS 737 — Nursing Informatics Concepts and Practice in Systems Adoption

NURS 738 — Practicum in Nursing Informatics

NURS 770 — Human-Technology Interaction in Health Care

Required Courses – Nursing and Public Health

(total credits range*)

PH 600 — Principles of Epidemiology,
or NURS 671 —Epidemiological Assessment Strategies

PH 621 — Biostatistical Methods

PH 668 — Environmental and Occupational Health

PH 648 — Introduction to the Health System, Policy, and Management

PH 610 — Foundations of Public Health

PH 789 — Supervised Capstone Experience

PREV 803 — Clinical Trials and Experimental Epidemiology

PREV 659 — Observational Studies in Epidemiology

PREV 720 — Statistical Methods in Epidemiology

NURS TBD — Elective

** Depending on the specialty; additional credits maybe necessary to meet the core requirements.*

Doctor of Philosophy Curriculum

(60 total credits)

NURS 840 — Philosophy of Science and Development of Theory

NURS 850 — Experimental Nursing Research Designs

NURS 851 — Analysis for Experimental Nursing Research Designs

NURS 802 — Research and Scholarship Seminar

NURS 841 — Theory and Conceptualization in Nursing Science

NURS 814 — Design and Analysis for Non-Experimental Nursing Research

NURS 815 — Qualitative Methods in Nursing Research

NURS 818 — Special Topics: Nursing Research

NURS 819 — Research Practicum

NURS 811 — Measurement of Nursing Phenomena

NURS 816 — Multivariable Modeling Approaches in Health Sciences Research

NURS TBD — Elective

** Includes 12 dissertation credits*

TBD: Course numbers to be determined.

Oral and Experimental Pathology

www.dental.umaryland.edu/ods/education/

Degree Offered

PhD

Program Description

The PhD program in Oral and Experimental Pathology (Department of Oncology and Diagnostic Sciences in the School of Dentistry) provides broad training in oral and experimental pathology and requires some degree of specialization. Students admitted to the program have obtained at least a dental degree. During the first two years, the students participate in didactic courses in the basic and clinical sciences. They also are introduced to the department's clinical practice and research endeavors. For two semesters, the students function as prosectors and residents in surgical and anatomic pathology at the University of Maryland Medical Center. Students entering with marginal preparation may need additional coursework. The remaining two years include mastery of surgical oral pathology and research leading to a PhD dissertation. By the end of the third year, students should have completed all requirements for admission to candidacy for the PhD and obtain their PhD about one to two years later.

Program Admissions

Students admitted to the PhD program generally have a strong undergraduate background in the biological sciences and chemistry. Applicants lacking prerequisites will be required to correct these deficiencies by enrolling in undergraduate-level courses.

Minimum standards for admission to graduate programs at the University of Maryland, Baltimore are specified in the Graduate School catalog. The department requires an undergraduate grade-point average of at least 3.0 on a scale of 4.0, and grades of A or B in science courses are expected. Applicants are expected to take the Graduate Record Examinations (GRE). Students who hold degrees from foreign colleges or universities — or whose native language or language of the home is not English — must submit acceptable scores on the Test of English as a Foreign Language or the International English Language Testing System exam. A supplementary course in English may be recommended for some students. Foreign students eligible for admission must comply with all requirements of the Department of Homeland Security. Interviews are not required; however, the Graduate Program Committee may invite some applicants for an interview to discuss their career goals and research interests.

Degree Requirements and Advisory System

Each new student is assigned to a faculty advisory committee until they have selected a dissertation advisor. The advisory committee helps the student prepare a tentative doctoral program, advises the student and recommends for faculty approval a dissertation advisor, and provides continuing evaluation of the student's progress. This committee is replaced by the dissertation advisor when one is selected. With few exceptions, all students enrolled in the PhD program must take the following:

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease (8 credits)

DPAT 618 — Seminar (1 credit)

Also, a total of 12 hours of dissertation research is required by the Graduate School. The student also will do rotations of about eight to 10 weeks in faculty research laboratories. First-year students select the laboratories in which they will work at after consulting the departmental file on opportunities and their faculty advisory committee. Additional laboratory rotations may be done at the student's request.

Students will be expected to have basic knowledge of cell biology, biostatistics, and computer use in addition to the above subject areas. Students must take at least 36 credit hours of coursework beyond the 12 required credits of dissertation research. Courses covering areas of special interest will be selected by the student in consultation with, and with the concurrence of, the faculty advisory committee or the dissertation advisor.

Students are expected to earn grades of B or better in all courses. Those who fail to maintain a B average are subject to the rules of the Graduate School, which are published in this catalog. Competence for progression is judged on the basis

of the preliminary examination. This assessment is designed to test the student's mastery of a broad field of knowledge including the integration of their coursework with their research area. Upon completion of the dissertation research, a student shall present their results in the form of a dissertation. A PhD student is expected to publish (or receive acceptance for publication of) a significant part of their PhD dissertation findings in peer-reviewed journals of the corresponding field of research before graduation. A dissertation defense is required. Students may attempt to defend a dissertation no more than twice. Financial aid in the form of Graduate School fellowships and graduate assistantships is available to qualified students. Applications for Graduate School fellowships may be obtained directly from the Graduate School. They require three letters of recommendation and the filing of a financial aid form. While the latter is necessary to complete the application procedure, preference for the fellowship is based primarily on past academic performance. The fellowships generally provide a small stipend and remission of tuition and are renewable on a yearly basis.

Required Courses

GPLS 601 — Mechanisms in Biomedical Sciences: From Genes to Disease

DPAT 618 — Seminar

DPAT 898 — Pre-Candidacy Research

DPAT 899 — Doctoral Dissertation Research

Available Courses

DPAT 612 — Problems in Oral Pathology I

DPAT 613 — Problems in Oral Pathology II

DPAT 614 — Histopathology Technique I

DPAT 615 — Histopathology Technique II

DPAT 616 — Pathology of Oral Lesions I

DPAT 617 — Pathology of Oral Lesions II

DPAT 618 — Seminar

DPAT 799 — Master's Thesis Research

Palliative Care

http://graduate.umaryland.edu/palliative/

Degrees Offered

Master of Science, Postbachelor's Certificates

Program Description

The Master of Science program in Palliative Care provides interprofessional education and training for professionals who wish to gain experience in caring for patients with advanced and terminal illnesses and their families, emphasizing and integrating the unique contributions made by all disciplines that provide palliative care. The program also provides learners with experiences designed to foster a deeper knowledge and understanding of the numerous clinical, social, psychosocial, spiritual, ethical, and grieving issues in advanced illness. Participants learn to critically evaluate evidence and apply these findings to best practices in patient care. Participants include practitioners who are working in hospice and palliative care or aspire to do so; physicians, advance practice nurses, nurses, pharmacists, physician assistants, social workers, administrators, chaplains and grief/bereavement specialists, and others. The program covers the basic principles of hospice and palliative care in four foundation core courses. The completion of these four core courses leads to a graduate certificate in Principles and Practice of Hospice and Palliative Care. Learners also may select another track or area of focus (Clinical, Administrative, Psychosocial/Spiritual, or Thanatology) or select electives from among all focus areas. Four courses successfully completed in a noncore track will constitute award of a second graduate certificate. The MS in Palliative Care is taught entirely online. To be successful, the learner must complete all required and elective coursework totaling 30 credits. The program utilizes asynchronous lectures (e.g., prerecorded), readings, reflections, practice assignments, and active-learning instruction such as interprofessional group work.

Program Admission

Candidates for admission must meet the minimum qualifications and standards established by the Graduate School. Graduate Record Examinations scores are not required for admission. Candidates will minimally have a baccalaureate degree, and most will have an entry-level health care disciplinary degree (MD, PharmD, RN, APRN, PA-C, LCSW, etc.). International applicants must meet the minimum English language proficiency requirements set by the Graduate School.

Degree Requirements

The master's degree program requires a minimum of 30 credits. Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale to remain in good standing in the program. Complete guidelines and requirements for progression and completion are outlined in the Degree Requirements section of this catalog.

Postbaccalaureate Graduate Certificate Students who successfully complete the first four core courses (PALC 601, 602, 603, 604) will be awarded a graduate certificate titled Principles and Practice of Hospice and Palliative Care. Students who successfully complete four courses (12 credits in a given track) will be awarded a graduate certificate as follows:

- Clinical Aspects of Hospice and Palliative Care (PALC 605, 606, 607, 608)
- Psychosocial/Spiritual Aspects of Hospice and Palliative Care (PALC 609, 610, 611, 612)
- Leadership and Administration in Hospice and Palliative Care (PALC 613, 614, 615, and THAN 604)
- Aging and Applied Thanatology (THAN 604, 605, 606, 609)

The Aging and Applied Thanatology Certificate is an existing program offered by the Graduate School.

Program Outcomes

- Apply the knowledge of one's own role and those of other professions to appropriately assess and address the health care needs of patients with serious or life-threatening illnesses and their families.*
- Assess and develop practices that reflect the patient's or surrogate's goals, preferences, and choices for care within currently accepted standards of medical care, professional standards of practice, and applicable state and federal law.
- Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles to plan and deliver patient/population-centered care that is safe, timely, efficient, effective, and equitable.*
- Collaborate with the interdisciplinary team in a climate of mutual respect and shared values to identify and manage the symptoms of patients at the end of life and the needs of patients and families.*
- Contribute as part of the interdisciplinary team in the assessment and management of pain and/or other physical symptoms that demonstrate evidence-based best practices.
- Contribute as part of the interdisciplinary team in the assessment and management of psychological and psychiatric aspects of care that demonstrates evidence-based best practices.
- Complete a comprehensive, person-centered interdisciplinary assessment that identifies the social strengths, needs, and goals of each patient and family and develop a care plan designed to meet these needs, promote achievement of goals, and maximize strengths and well-being.
- Conduct an interdisciplinary assessment of spiritual, religious, and existential aspects of care and facilitate a plan that reflects rituals or practices as desired by patient and family, including at and after the time of death.
- Develop practices that reflect consideration of patient, family, and community cultural beliefs and linguistic needs.
- Identify, acknowledge, and resolve ethical issues that arise in the care of patients with advanced illnesses.
- Communicate with patients, families, communities, and other health professionals in a responsive and responsible manner that supports the interdisciplinary team approach to the management of patients with advanced illnesses and their families.*
- Demonstrate a commitment to excellence through continuing professional development and lifelong learning, and the education and training of patients, families, caregivers, interdisciplinary team members, other health care professionals, and other relevant stakeholders.
- Describe the strategic planning process of hospice and palliative care program development and management and data-driven processes that drive programmatic continuing quality improvement.
- Implement self-care strategies to support coping with suffering, loss, moral distress, and compassion fatigue.

* Interprofessional Collaborative Practice Competency Statement

Courses

Required core, and required for graduate certificate in Principles and Practice of Hospice and Palliative Care

PALC 601 — Principles and Practice of Hospice and Palliative Care

PALC 603 — Communication and Health Care Decision-Making

PALC 604 — Psychosocial, Cultural, and Spiritual Care

PALC 605 — Symptom Management in Advanced Illness

Electives in Clinical Track, and for graduate certificate in Clinical Aspects of Hospice and Palliative Care

PALC 615 — Advanced Pain Management and Opioid Dosing

PALC 611 — Advanced Non-Pain Symptom Management

PALC 612 — Advanced Disease State Management

PALC 607 — Clinical Management of Special Patient Populations

Electives in Administration, and for graduate certificate in Leadership and Administration in Hospice and Palliative Care

PALC 608 — Hospice Leadership and Administration

PALC 609 — Palliative Care Leadership and Administration

PALC 610 — Practice Development and Strategic Planning

PALC 602 — Principles and Practice of Palliative Care Education

Electives in Psychosocial/Spiritual Track, and for graduate certificate in Psychosocial/Spiritual Aspects of Hospice and Palliative Care

PALC 613 — Advanced Decision-Making and Communication Skills

PALC 614 — Advanced Spirituality and Psychosocial Skills

PALC 615 — Self-Care

PALC 602 — Principles and Practice of Palliative Care Education

THAN 604 — Death and Dying: Ethical and Legal Considerations

Electives in Thanatology Track, and for graduate certificate in Aging and Applied Thanatology

THAN 604 — Death and Dying: Ethical and Legal Considerations

THAN 605 — Palliative Care

THAN 606 — Caring for the Bereaved

THAN 609 — Psychosocial Perspectives in Aging

Required core

PALC 616 — Research and Outcomes Assessment in Hospice and Palliative Care

PALC 617 — Advanced Team-Based Palliative Care

Pathologist Assistant Program

http://www.medschool.umaryland.edu/pathology/Pathologists-Assistant-Program/

Degree Offered

MS

Program Description

The program aims to prepare students for a career as a pathologist assistant in a clinical laboratory environment. The entire curriculum prepares students for the practice of the profession. The pathologist assistant is an allied health professional, qualified by academic and practical training to provide service in anatomic pathology under the direction and supervision of an anatomic pathologist. The high degree of responsibility assumed by the pathologist assistant requires skills and abilities including, but not limited to, the following:

- **Surgical Pathology:** The pathologist assistant performs surgical specimen dissection by identifying the anatomical structures within the specimen and assessing the nature and extent of the pathological process. The pathologist assistant also assures appropriate specimen accessioning, obtains and assesses pertinent clinical information and ancillary studies, describes the gross anatomic pathology, and selects tissue to be submitted for further histologic processing and microscopic examination by the pathologist. The pathologist assistant also submits specimens for additional analytic procedures, such as immunohistochemical staining, flow cytometry, image analysis, microbiological cultures, genetic analysis, chemical analysis, and toxicology, and assists in the photography of pathological specimens as indicated or requested.
- **Autopsy Pathology:** The pathologist assistant may be involved in the performance of postmortem examination, including the assessment of death certificates and obtaining proper legal authorization, and the reviewing of the patient's medical record and pertinent clinical data. The pathologist assistant may perform evisceration, organ-block dissection per the departmental protocol, and triage autopsy specimens for special procedures and techniques as required. The pathologist assistant may further select tissue for histologic processing and special studies, obtain specimens for biological and toxicologic analysis, assist in photography of gross specimens, and communicate with clinicians regarding autopsy findings. The pathologist assistant also may be assigned to teaching, administrative, supervisory, and budgetary functions in anatomic pathology, depending on how the position is structured.

Pathologist assistants are employed in a variety of settings, which include community and regional hospitals, university medical centers, private pathology laboratories, and medical examiner offices. The ability to relate to people, a capacity for calm and reasoned judgment, and a demonstration of commitment to quality patient care are essential for pathologist assistants. They must demonstrate ethical and moral attitudes and principles that are essential for gaining and maintaining the trust of professional associates, the support of the community, and the confidence of the patient and family. Respect for the patient and confidentiality of the patient's records and/or diagnoses must be maintained.

The Pathologist Assistant Program track is full time; no part-time option is available. The program calendar begins in July and ends in May. The first year of the program is largely concentrated on didactic coursework. During the second year of the program, pathologist assistant students learn essential technical skills through affiliate clinical laboratory rotations. Program affiliates include, but are not limited to, the University of Maryland Medical Center, Johns Hopkins Hospital, and Maryland's Office of the Chief Medical Examiner.

The University of Maryland, Baltimore Pathologist Assistant Program is accredited by:

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)

5600 N. River Road, Suite 720
Rosemont, IL 60018
773-714-8880; 773-714-8886 (fax)
https://www.naacls.org/

Program Admissions

Completed application packets must be received by Feb. 1 to be considered for admission in July of the same year. All completed application packets, international and domestic, are reviewed by the Program Admissions Committee and receive equal consideration. From these completed applications, the committee invites selected candidates to participate in an interview. These students meet with select faculty, tour the

facilities, and are given the opportunity to discuss their career goals. No admissions are deferred for subsequent years. If a student who is accepted into the program declines admission, but desires admission the following year, the application materials (transcripts, letters of recommendation, Graduation Record Examinations scores, etc.) will be held by the department; however, the student must reapply.

The program adheres to the minimum standards and requirements for admission to graduate programs at the University of Maryland, Baltimore, outlined in this catalog, including the requirement of an undergraduate grade-point average (GPA) of at least 3.0 on a scale of 4.0. The program prefers grades of A or B in all science courses. Applicants must take the general aptitude GRE. Preference is given to students with verbal and quantitative scores above the 50th percentile and greater than or equal to 4.5 in the analytical writing scoring section. International applicants who meet the application, coursework, grade, and GRE requirements previously stated, and who hold degrees from foreign colleges or universities where English is not the primary language, must pass the Test of English as a Foreign Language with a score above 100 on the internet-based test as proof of their proficiency in English.

Applicants are required to have successfully completed a minimum of one semester of each of our prerequisites, as follows: biology, general chemistry, organic chemistry or biochemistry, microbiology, mathematics, and English composition.

Applicants are encouraged to use the application essay to describe their interest and experience in the pathologist assistant field, rather than contemplated research projects.

Degree Requirements

The required curriculum includes courses in general pathology, systemic pathology, clinical pathology, surgical pathology, autopsy pathology, lab management, physiology, and structure and development (anatomy training). The minimum number of credits required for the master's degree in the Pathologist Assistant Program track is 38. The program is structured to comply with University standards and standards from the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). Students must maintain a minimum 3.0 cumulative GPA for the duration of the program. Students whose cumulative GPA falls below 3.0 are placed on academic probation. They will not be permitted to graduate without remediation, and they face possible dismissal from the University.

The MANA 601 course, Structure and Development (Anatomy, Histology, and Embryology), is offered during the second semester of enrollment and is a benchmark course. MANA 601 comprises a concentrated learning experience in human anatomy, histology, and embryology, which are essential for entry-level competency as a pathologist assistant. This course also provides a foundation for the remainder of the two-year curriculum. Therefore, students must demonstrate a mastery of these subject areas by achieving a grade of C or better in MANA 601. Failure to do so will result in academic dismissal.

Beginning with the summer semester between the first and second years, pathologist assistant students fulfill clinical laboratory rotation requirements. Each rotation provides ample time to familiarize students with the duties and responsibilities of a pathologist assistant for each particular institution and training site.

Completion of the Pathologist Assistant Program requires 22 consecutive months of instruction as a full-time student. There is no part-time option available.

Required Courses (credits)

MANA 601 — Structure and Development (Anatomy, Histology, and Embryology) (9)

PATH 602 — Systemic Pathology (3)

PATH 603 — General Pathology (3)

PATH 751 — Clinical Pathology and Microbiology (3)

PATH 789 — Special Topics: Pathology (2)

PATH 608 — Autopsy Pathology (6)

PATH 609 — Surgical Pathology (6)

DBMS 618 — Special Topics in Biomedical Science: Physiology (3)

MEDT 680 — Laboratory Management (3)

Pharmaceutical Health Services Research

http://pharmacy.umaryland.edu/academics/phsr/

Degrees Offered

PhD, PhD/MS, MS

Program Description

The primary mission of the Pharmaceutical Health Services Research (PHSR) Graduate Program at the University of Maryland School of Pharmacy is to train strong researchers in a variety of important areas.

PhD in Pharmaceutical Health Services Research

The widespread use of medications in society has created a demand for individuals skilled in the evaluation of pharmaceutical services and interventions. The dynamic health care environment has created a number of critical factors that are constantly shaping and reshaping the health policies of the United States and countries around the world.

The PhD in PHSR provides graduates with the theory, practical experience, and decision-making skills needed to address a wide range of pharmacy-related problems. Pharmaceutical services are a vital part of health care, and factors affecting health care inevitably affect pharmacy, the pharmaceutical industry, and pharmacy practitioners. Some of the factors that are of academic and research interest include:

- Patient-centered outcomes analyses
- The role of the federal and state governments in health and pharmaceutical care policy
- Financing and economics of pharmaceutical care
- Drug utilization and pharmacoepidemiologic issues
- Cost containment and other benefit design issues
- Pharmaceutical care in vulnerable populations
- Pharmacovigilance and drug safety
- Pharmaceutical economics

PhD in Pharmaceutical Health Services Research and MS in Epidemiology Dual Degree

The dual-degree program offered by PHSR and the Department of Epidemiology and Public Health (DEPH) at the University of Maryland School of Medicine seeks to:

- Provide an opportunity for students in PHSR to augment their skills by adding more extensive training in epidemiologic methods.
- Provide formal recognition of training and expertise in epidemiology among students who complete the specified program.
- Formalize collaborations between the two departments in the training of these students.

This program is available only to students accepted into the PhD in PHSR program. Any PHSR graduate student is eligible to apply for admission to the dual-degree program, and students must remain in good standing with the PhD in PHSR Program and the Graduate School. Students admitted into the program will be awarded MS and PhD degrees simultaneously at the completion of their studies in the dual-degree program.

MS in Pharmaceutical Health Services Research

Adapted from the top-tier PhD in PHSR Program, the MS in PHSR is geared toward experienced professionals. Core courses for the MS in PHSR Program are identical to those in the PhD in PHSR Program and are taken alongside doctoral students. While the doctoral students go on to take additional courses, students in the MS in PHSR Program can complete their courses in as little as two years. Those courses also can be applied to the PhD in PHSR Program should a student in the MS in PHSR Program later decide to pursue the advanced degree.

Through a series of seven courses, students in the MS in PHSR Program will be introduced to four key research areas:

- Pharmacoeconomics
- Pharmacoepidemiology
- Pharmaceutical policy
- Comparative effectiveness and patient-centered outcomes research

Upon completion of the program, graduates will be able to serve as knowledgeable consultants to the public and private sectors of the health care and pharmacy/pharmaceutical communities and interact with members of other health, social, and administrative disciplines.

Program Admission

Applicants to the Doctor of Philosophy in Pharmaceutical Health Services Research Program should possess a bachelor's or master's degree from an accredited college or university. Applicants without a Bachelor of Science in Pharmacy or a Doctor of Pharmacy degree will be considered as students who can be successful in the program with no previous pharmacy-related education and/or experience.

All applicants must submit the following materials to be considered for admission:

- One official transcript from any undergraduate and graduate schools
- Graduate Record Examinations scores
- Three letters of recommendation
- Curriculum vitae
- Essay describing your academic goals and research interests
- Test of English as a Foreign Language or International English Testing System exam scores (international students only)

Application for admission can be found at *http://graduate.umaryland.edu/Admissions/Apply-Now/*. Applications for the PhD in PHSR Program are due Jan. 3 for admission in the fall semester. Applications for the MS in PHSR Program are due April 1 for admission in the fall semester.

Degree Requirements

PhD in Pharmaceutical Health Services Research
Required courses include a group of core graduate courses in pharmaceutical health services research, research methods, and statistics. The students also must complete at least 12 credits of advanced courses in their research track beyond core courses. It generally takes about 2 to 2½ years to complete the core and advanced course requirements.

While many students enter with prior graduate work, we require that they take the core courses here unless waived. When a core course is waived, students must take another course to meet the credit requirements. When noncore courses or the beginning/intermediate statistics requirements are waived, students are expected to take more advanced courses to complete the course requirements. To allow flexibility and ensure that students are well prepared in their area of specialization, students are asked to establish a curriculum committee by the end of their first semester of study.

MS in Pharmaceutical Health Services Research
The MS in PHSR is designed to be completed in two years. To receive a master's degree, students must successfully complete select required courses – which include a group of core graduate courses in pharmaceutical health services research, research methods, and statistics – as well as 6 credits of advanced courses in their chosen research area.

Some students might be required to take additional courses as deemed appropriate by the program. In particular, students without strong computer programming skills may need elective courses.

Required Courses

PhD in Pharmaceutical Health Services Research

PHSR 610 — Pharmacy, Drugs, and the Health Care System (3 credits)

PHSR 631 — Computing and Analytic Methods for Observational Studies (3 credits)

PHSR 650 — Comparative Effectiveness Research and Pharmacoeconomics I (3 credits)

PHSR 701 — Research Methods I (3 credits)

PHSR 702 — Research Methods II (3 credits)

PHSR 704 — Pharmacoepidemiology (3 credits)

PHSR 709 — Graduate Seminar (1 credit)

PREV 600 — Principles of Epidemiology (3 credits)

PREV 619 — Introduction to SAS (1 credit)

PREV 620 — Principles of Biostatistics (3 credits)

Advanced cognate courses include:

Electives as determined by student and curriculum committee: (12 credits)

PHSR 899 — Dissertation Research (12 credits)

MS in Pharmaceutical Health Services Research

PHSR 610 — Pharmacy, Drugs, and the Health Care System (3 credits)

PHSR 631 — Computing and Analytic Methods for Observational Studies (3 credits)

PHSR 650 — Comparative Effectiveness Research and Pharmacoeconomics I (3 credits)

PHSR 701 — Research Methods I (3 credits)

PHSR 704 — Pharmacoepidemiology (3 credits)

PREV 600 — Principles of Epidemiology (3 credits)

PREV 619 — Introduction to SAS (1 credit)

PREV 620 — Principles of Biostatistics (3 credits)

Advanced courses include:

Electives as determined by student and program director (6 credits)

PHSR 799 — Master's Thesis (6 credits)

Pharmaceutical Sciences

www.pharmacy.umaryland.edu/graduate/psc/

Degree Offered

PhD

Program Description

The PhD in Pharmaceutical Sciences (PSC) at the University of Maryland, Baltimore offers students outstanding opportunities to be part of cutting-edge biomedical and pharmaceutical research while preparing them for careers in academia, government, and industry. A wide range of research is conducted in the Department of Pharmaceutical Sciences, including medicinal chemistry, biochemistry, bioinorganic chemistry, cellular and molecular biology, computational chemistry, biophysics, microbiology, neuroscience, pharmacometrics, pharmacokinetics, drug formulation, drug transport and delivery, industrial pharmaceutical research, and translational and regulatory sciences. Research is interdisciplinary, and students have access to state-of-the-art facilities that include the Computer-Aided Drug Design Center, Mass Spectrometry Center, Nuclear Magnetic Resonance, Good Manufacturing Labs, Bio- and Nano-technology Center, Center of Excellence in Regulatory Science and Innovation, and more.

The program provides a mentor-driven plan of study that is individualized and dependent on the student's and mentor's specific research interests. Each student in the program develops their educational experience with the advice of their mentor and an advisory/thesis committee. Graduate students enrolled in the PhD in Pharmaceutical Sciences program are fully funded, typically by teaching and research assistantships. This support includes an annual stipend, tuition remission, health insurance, and student fees.

Program Admission

Applications are due by Jan. 15 for admission the following fall semester. We favor applicants with a BA, BS, or MS degree in the general areas of biology, biochemistry, chemistry, chemical engineering, molecular biology, pharmacy, and pharmaceutical sciences, although related degrees are considered. In addition to the Graduate School's minimum admission requirements, applicants should have a cumulative grade-point average (GPA) of at least 3.0 with A or B grades in recent science courses, competitive Graduate Record Examinations scores and strong letters of recommendation. International applicants whose native language or language of the home is not English must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) exam. The minimum acceptable TOEFL score for admission is 80 for the internet-based test. IELTS test takers must score at least Band 7. The program encourages applications from groups under-represented in the sciences.

Degree Requirements

Students pursing a PhD in Pharmaceutical Sciences must complete a minimum of 32 course credits (24 required, 8 elective) and a minimum of 12 doctoral dissertation research credits.

Required Courses

At a minimum, students must complete the following courses to graduate:

Required Core[1]

PHAR 600 — Principles of Drug Discovery (3 credits)[2]

PHAR 601 — Principles of Drug Development (3 credits)[2]

PHAR 615 — PSC Ethics and Biostatistics (2 credits)

PHAR 628 — Bioanalytical and Pharmacological Methods (1 to 3 credits)[3]

PHAR 639 —Spectrometric Methods (1 to 3 credits)[3]

PHAR 705 — PSC Journal Club (1 credit)[4]

1. Under certain circumstances, students may be exempted from some required core curriculum courses. Examples of this would be in the case of students who have completed the UM PharmD program and are exempt from parts of PHAR 600/601, or students who find appropriate alternatives to the PHAR 628/639 methods courses. All exemptions must be approved by the graduate program director and the graduate program steering committee.
2. PharmD students may take 1 to 3 credits.
3. 4 credits out of 6 total from the two courses are required. Credits beyond the 4-credit requirement may count as elective credits.
4. Students enroll in PHAR 705 every semester.

Required Student Rotations

PHAR 608 – Introduction to Laboratory Research (1 to 2 credits)

Most students are required to complete two laboratory rotations, minimum of eight weeks per rotation. All students must join a laboratory by the end of their first year.

Required Seminars

Students must complete three seminars.

PHAR 708 — Comprehensive Exam Seminar (third year, fall semester; 1 credit)

PHAR 709 — Departmental Seminar (1 credit)

Students are required to present one departmental seminar after their comprehensive exam. Students register for 1 credit during the semester in which they are presenting, six to 12 months before their dissertation defense.

Dissertation Defense

Dissertation Research/Thesis Committee

PHAR 899 — Dissertation Research (1 to 3 credits)

Students need a total of 12 credits to meet graduation requirements. The thesis committee is formed after the comprehensive exam and is required to meet on a yearly basis to evaluate progress and direction (it may need to meet more frequently to suit individual student needs).

Elective Courses

Students must take at least 8 credits of elective courses to fulfill graduation requirements.

Available Electives

Students may select from various graduate-level courses within the department and, with approval, courses within other University of Maryland graduate programs.

PHARMACOMETRICS

www.pharmacy.umaryland.edu/academics/pharmacometrics/

DEGREE OFFERED

MS

PROGRAM DESCRIPTION

The objective of the Master of Science in Pharmacometrics program is to give current professionals the skills and knowledge to plan, perform, and interpret pharmacometric analyses with the goal of influencing key drug development, regulatory, and therapeutic decisions. The program offers theoretical and applied technical knowledge together with requisite business skills tailored for the pharmaceutical sector. All courses follow case-based study and teaching. The program is designed for professionals with full- or part-time jobs in areas such as pharmacology, engineering, statistics, pharmaceutical sciences, and epidemiology. All classes are held online.

PROGRAM ADMISSIONS

Candidates for admission must meet the minimum qualifications and standards established by the Graduate School. Graduate Record Examinations scores are not required for admission. International students must provide current, official results of the Test of English as a Foreign Language (minimum score of 550 for the paper-based test, 80 for the internet-based test), or the International English Language Testing System exam (minimum Band 7). Application deadlines and required credentials are regularly published by the Graduate School and by the pharmacometrics program.

DEGREE REQUIREMENTS

The master's degree program requires a minimum of 30 credits. Students must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog.

COURSES

PHMX 601 — Basic Pharmacometric Tools

PHMX 602 — Basic PKPD Modeling

PHMX 638 — Intermediate PKPD Modeling I

PHMX 663 — Statistics for Pharmacometricians I

PHMX 665 — Dose-Response Trials

PHMX 666 — Strategic Communication and Negotiations

PHMX 747 — Intermediate PKPD Modeling II

PHMX 759 — Statistics for Pharmacometricians II

PHAR 758 — Special Topics (Project)

Listings and details are given in the Course Descriptions part of this catalog.

Regulatory Science

www.pharmacy.umaryland.edu/academics/regulatoryscience/

Degree Offered

MS

Program Description

The Master of Science in Regulatory Science is designed to provide graduates with the knowledge and skills necessary to contribute to drug regulation and pharmaceutical product life cycles. The program primarily focuses on drugs, although aspects of biologics, diagnostics, devices, and nutritional products also are addressed. The program covers all major areas of drug product regulatory science, including:

- Chemistry, manufacturing, and controls (CMC)
- Clinical research
- Pharmacovigilance
- Phase IV research (e.g., pharmacoepidemiology)
- Drug discovery

The strength of the program is its science-driven understanding of drug product development and regulation. The program covers regulatory affairs in a global manner, including the application of regulatory principles worldwide. Graduates of this program will be fluent in the science of developing new tools, standards, and approaches to assess the safety, efficacy, quality, and performance of products regulated by the U.S. Food and Drug Administration. They will possess the knowledge and skills needed to:

- Devise and implement global strategies for drug, biologic, and device development and evaluation.
- Differentiate U.S. and other regional requirements for drug product development and registration.
- Apply principles of basic and applied pharmaceutical sciences in drug discovery and development.
- Formulate critical elements of CMC to drug development.
- Relate principles of clinical research design to practices in clinical trial management.
- Apply critical methods of risk assessment and drug utilization from pharmacoepidemiology and postmarketing surveillance, and evaluate economic and sociodemographic factors that influence drug use.

This is an online program designed for working professionals who would like to obtain a formal degree in regulatory science. The program primarily focuses on drugs and drug development. Each of the program's 6-credit courses consists of about 70 hours of prerecorded lectures, seven hours of live web conferencing, and 13 hours of active-learning instruction. In addition, there are individual projects, team presentations, and mini-reviews.

Program Admissions

Candidates for admission must meet the minimum qualifications and standards established by the Graduate School. Graduate Record Examinations scores are not required for admission if the applicant has five years or more of related work experience. International students must provide current, official results of the Test of English as a Foreign Language (minimum score of 550 for the paper-based test, 80 for the internet-based test) or the International English Language Testing System exam (minimum Band 7). Application deadlines and required credentials are regularly published by the Graduate School and the Regulatory Science program.

Degree Requirements

The master's degree program requires a minimum of 30 credits. Students must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog.

Courses Offered/Required

REGS 603 — Drug, Biologic, and Device Regulation

REGS 614 — Drug Discovery

REGS 621 — Clinical Research

REGS 631 — Drug and Biologics Development

REGS 641 — Regulated Products in the Marketplace

Research Administration

http://graduate.umaryland.edu/researchadmin/

Degree Offered

Postbaccalaureate Certificate

Program Description

Research Administration is a 12-credit, online postbaccalaureate graduate certificate program designed to ensure that students have a greater understanding of the many behind-the-scenes aspects of research so they can successfully manage grants, understand legalities in research administration, and become familiar with the transfer of intellectual properties. Students in this track will gain advanced knowledge and practical training to ensure that learning is relevant and applicable to each student's professional goals.

This program provides students with the opportunity to learn about the complex environment that supports academic research. This includes topics such as historical and evolutionary perspectives, legal issues in research, contract management, and safeguarding confidential information. Students in this program typically work in the following fields: data analysis, grant writing, clinical research, patient care, mental health, epidemiology, clinical trials, collaborations, personnel management, and related areas.

Research Administration also is a concentration of study within the Master of Science in Health Science (MSHS) program. Credits earned in the stand-alone Research Administration certificate program may be applied toward the MSHS degree requirements.

Program Admission

Candidates for admission must meet the minimum standards of admission established by the Graduate School and provide the requisite credentials. Admission to the certificate program is highly selective. A U.S. bachelor's degree or its equivalent from a non-U.S. educational institution is required. No specific undergraduate course of study is required or recommended. Graduate Record Examinations are not required for admission.

Degree Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guideline and requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Courses

These courses are required to complete the Research Administration program:

MHS 601 — Introduction to Research Administration (3 credits)

MHS 618 — Regulatory and Legal Issues in Research (3 credits)

MHS 635 — Grant and Contract Management in Research (3 credits)

MHS 640 — Technology Transfer (3 credits)

Research Ethics

http://www.graduate.umaryland.edu/research-ethics/

Degree Offered

Postbachelor's Certificate

Program Description

The goal of this 12-credit, six-course online certificate program is to provide individuals with an understanding of the ethical and regulatory aspects of human subjects research and give them the skills needed to analyze ethical issues that arise in the conduct of research in domestic and international arenas. The certificate program interrelates with the Fogarty International Center/National Institutes of Health training program that is focused in the Middle East (MERETI). The inclusion of these targeted audiences will ensure an interprofessional and global experience for all enrolled students. The program is particularly designed for investigators, clinical research coordinators, nurses, individuals from institutional review boards, contract research organizations, pharmaceutical industry representatives, and others involved in research. The exclusive use of distance learning technologies meets the needs of professionals worldwide who may have few opportunities to enroll in an on-site program.

All six courses are offered throughout the fall, spring, and summer semesters to enable individuals to complete the program within an academic year. However, since all courses stand alone (i.e., are not dependent on each other), one may take these courses in any order and at one's own pace; in these instances, the program may take more than a year to complete.

Program Admission

Candidates for admission must meet the minimum standards of admission established by the Graduate School and must provide the requisite credentials. Admission to the certificate program is highly selective. A U.S. bachelor's degree or its equivalent from a non-U.S. educational institution is required. No specific undergraduate course of study is required or recommended. Graduate Record Examinations are not required for admission.

Certificate Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade- point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guidelines/requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Required Courses

ETHC 629 — Introduction to Ethical Theory

ETHC 637 — Introduction to Research Ethics

ETHC 638 — Issues in International Research Ethics

ETHC 639 — Regulatory and Legal Aspects of Institutional Review Boards

ETHC 640 — Ethics of Globalization

ETHC 665 — Responsible Conduct of Research in International Affairs

Research Implementation and Dissemination

http://graduate.umaryland.edu/research/

Degree Offered

Postbaccalaureate Certificate

Program Description

The program in Research Implementation and Dissemination is a 12-credit, online postbaccalaureate graduate certificate program.

Dissemination science is the process of the distribution of information and intervention materials to a specific public health or clinical practice audience. Translating research into practice is a complex process that involves dissemination science. The purpose of dissemination science research is to translate evidence-based interventions into practice to improve lives and to help translate the results of clinical and population research into everyday clinical practice and public health. Additionally, implementation and dissemination science seeks to ensure that the knowledge and materials produced by health research lead to improved individual and population health by reaching the people for whom they are intended; being adapted to local circumstances; and being implemented effectively, safely, equitably, and in a timely and patient-centered manner.

Many students interested in this certificate work in the following fields: clinical research, data analysis, program management, learning and development, strategy, laboratory research, and related areas.

Students in this program will study methods that promote systematic uptake and translate the results of clinical and population research into everyday clinical practice and public health. The program also intends to help students ensure that the knowledge and materials produced by health research will improve individual and population health.

Research Implementation and Dissemination also is a concentration of study within the Master of Science in Health Science (MSHS) program. Credits earned in the stand-alone Research Implementation and Dissemination certificate program may be applied toward MSHS degree requirements.

Program Admission

Candidates for admission must meet the minimum standards of admission established by the Graduate School and provide the requisite credentials. Admission to the certificate program is highly selective. A U.S. bachelor's degree or its equivalent from a non-U.S. educational institution is required. No specific undergraduate course of study is required or recommended. Graduate Record Examinations are not required for admission.

Degree Requirements

Certificate candidates must complete a minimum of 12 credits. Students must maintain a minimum, cumulative grade-point average of 3.0 on a 4.0 scale. All courses must be taken for letter grade; courses taken as Pass/Fail (P/F) or Audit (AU) do not count toward the certificate. All requirements for the certificate must be completed within three years after admission and all credits for the certificate must be completed at the University of Maryland, Baltimore. Complete guideline and requirements for progression and completion are outlined in the Academic Performance and Progress in a Postbaccalaureate Certificate Program section of this catalog.

Required Courses

MHS 613 — Research Implementation and Dissemination I (3 credits)

MHS 614 — Research Implementation and Dissemination II (3 credits)

MHS 624 — Observational Studies Design and Development (3 credits)

MHS 630 — Essentials of Chronic and Infectious Disease Epidemiology (3 credits)

Science Communication

http://www.graduate.umaryland.edu/scicomm/

Degree Offered

Postbaccalaureate Certificate

Program Description

Students in the Science Communication certificate program will have the opportunity to strengthen their skills in writing and communication for the health sciences industry. In this one-year, 12-credit postbaccalaureate certificate program, students study topics such as technical writing, writing for scholarly journals, writing proposals and grants, and writing for the public.

Science Communication also is a concentration of study within the Master of Science in Health Science (MSHS) program. Credits earned in the stand-alone Science Communication certificate program may be applied toward MSHS degree requirements.

Certificate Objectives

This program is designed to equip students to communicate effectively with a variety of audiences using different forms and styles of writing. By providing students with advanced knowledge and practical training, this program strives to ensure that learning is relevant and applicable to each student's professional goals. Students learn how to strategically plan, craft, edit, and execute their writing to communicate in an engaging, scientifically informed manner about health-related topics.

Learning Outcomes

Upon completion of this program, students will be able to:

- Develop proficiency in technical writing (including proper sentence and paragraph structure, transitions, punctuation, coherence, and grammar).
- Rigorously analyze scientific writing on the sentence and paragraph level.
- Describe the form and content of research articles, case studies, meta-analyses, theoretical articles, and book reviews.
- State the requirements and expectations of writing and submitting scholarly research articles.
- Apply the principles of planning and writing a research paper.
- Summarize research findings in a clear, engaging, and concise manner.
- Describe the purpose of grant writing in academic and nonacademic careers.
- Critique the essential elements of grants and proposals.
- Draft a grant or proposal on a health-related topic of interest.
- Demonstrate basic proficiency in various writing forms and techniques for communicating effectively with general, nonacademic audiences.
- Identify and avoid common mistakes academic writers make when writing for the public.
- Produce a writing product for the general public that is ready to submit for publication.

Program Admission

General application requirements for admission to postbaccalaureate certificate programs are outlined in the Admissions section of this catalog. Admission to this online certificate program is selective. A U.S. bachelor's degree or its equivalent from a non-U.S. educational institution is required. No specific undergraduate course of study is required or recommended.

Degree Requirements

Students must maintain a minimum cumulative grade-point average of 3.0 to remain in good standing in the program. A complete description of progression guidelines and degree requirements is provided in the Degree Requirements section of this catalog. Students must successfully complete a minimum of 12 credit hours to earn the certificate.

Required Courses

MHS 603 — Technical Writing (3 credits)

MHS 607 — Writing for Scholarly Journals (3 credits)

MHS 627 — Writing for the Public (3 credits)

MHS 637 — Writing Proposals and Grants (3 credits)

Social Work

http://www.ssw.umaryland.edu/phd/

Degree Offered

PhD

Program Description

The School of Social Work's Doctor of Philosophy program is designed to prepare graduates to conduct interdisciplinary research and become exemplary social work scholars and educators.

Program Features

- Highly competitive, nationally renowned program
- Small class sizes
- Individualized, one-on-one advising from dissertation chairs
- Rigorous curriculum
- Educational environment conducive to academic success
- Integrative approach to research applications
- All full-time students are supported with graduate research assistantships that provide a stipend, tuition remission, and health insurance
- Numerous campus resources and amenities

Program Admission

General application requirements for admission are outlined in the Admissions section of this catalog. To be considered for admission to the PhD Program in Social Work, applicants must have or be in the process of completing an MSW or equivalent degree and supply Graduate Records Examinations scores that are no more than 5 years old.

The PhD Program in Social Work maintains a strict language requirement for non-native speakers of English. All applicants to the PhD program whose native language and/or language of the home is not English are required to submit results from the Test of English as a Foreign Language or the International English Language Testing System exam. This guideline includes international students/non-native speakers of English who have completed a Master of Social Work or similar degree from a U.S. college or university.

Degree Requirements

The 51-credit curriculum begins with 21 credits of core courses: quantitative and qualitative research design and methods (9 credits); data analysis and statistics (6 credits); and research practicum (6 credits). Additional required courses include intervention research (3 credits), theory and philosophy of teaching (3 credits), an integrative seminar (3 credits), an advanced research or data analysis course in the student's area of interest (3 credits), and a theory course in the student's area of interest (3 credits). Students also take an elective (3 credits) and complete at least 12 credits of dissertation research.

After completing 36 credits, students complete a comprehensive examination. The final phase of the program is completion of the doctoral dissertation.

Learning Outcomes

- Develop the skills and experience required to conduct high-quality research, individually and as part of a research team.
- Gain a thorough understanding of research design, data collection strategies, and analysis methods appropriate to multiple types of research questions, social problems, and populations of interest.
- Apply theoretical models to research studies and critique existing theory in a particular content area.
- Critically evaluate the state of the knowledge base in a content area of the student's choice.
- Develop a research agenda in a content area of the student's choice.
- Gain knowledge and experience in teaching and apply the best available evidence regarding adult learning to the classroom.
- Disseminate findings through peer-reviewed publications and/or presentations.

REQUIRED COURSES

SOWK 804 — Research Methods in Social Work I

SOWK 805 — Data Analysis I

SOWK 806 — Research Methods in Social Work II

SOWK 807 — Data Analysis II

SOWK 810 — Research Practicum I

SOWK 811 — Research Practicum II

SOWK 812 — Integrative Seminar

SOWK 814 — Intervention Research

SOWK 835 — Theory and Practice of Social Work Teaching

See complete Social Work (SOWK) offerings in the Course Descriptions part of this catalog.

Course Descriptions

COURSE NAME CREDITS

CIPP 907 RESEARCH ETHICS..... 1

Various aspects of research ethics are examined, including data collection and ownership; issues in the use of human and animal subjects; responsibilities of authorship; identifying and handling conflicts of interest; scientific misconduct; the peer review system; collaborative research in academia and industry; mentor-mentee relationships; contemporary ethical issues; and the role of the scientist as a responsible member of society. Each session has a reading list assigned and involves in-depth small-group discussions of relevant cases with faculty. Postdoctoral fellows and students not needing the credit may sign up for the course informally but are expected to participate fully in order to receive a letter of course completion. Grading is based on group participation and leadership of at least one group discussion.

CIPP 909 RESPONSIBLE CONDUCT OF RESEARCH .....1 TO 2

This campuswide course prepares students for the ethical responsibilities of research. Topics include scientific integrity; research ethics and the ethical decision-making process; data handling and management; authorship peer review; conflicts of interest; defining, identifying, and handling fraud and misconduct; animal and human research; genetics and reproduction; ownership of data and intellectual property; and the role of the scientist in society. The course includes lectures, seminar discussions, and class exercises. Grading is based on class participation and a written paper.

CIPP 924 GERIATRIC IMPERATIVE .....1 TO 2

This weeklong course scheduled for each January offers a review of current clinical, policy and research trends in the field of aging. Presentations are made by faculty, regional leaders in the field of aging, and family caregivers. Lectures, case simulations, panel discussions, and videos are the teaching methodology used during the week. Field trips are taken to geriatric health care facilities to meet with staff and residents.

CIPP 932 CRITICAL ISSUES IN HEALTH CARE.... 3

This course is open to students from the schools of law, medicine, social work, nursing, pharmacy, dentistry, and the graduate schools at UMB and the University of Maryland, Baltimore County (UMBC). The course is designed to provide students with an opportunity to reflect on the legal, ethical and policy issues surrounding a number of health care delivery problems; expose participants to the basic skills necessary to analyze problems from a legal, ethical, and policy perspective; and offer participants from different disciplines an opportunity to interact and share information and perspectives about their professions with one another. A variety of teaching techniques, including case studies, simulations, and video clips, are used to explore topics such as medical malpractice; rights of patients to refuse treatment; informed consent and substituted consent in medical decision-making; regulation of experimental drugs; and health care reform. The course is taught by faculty from a variety of disciplines. During the course, students have an opportunity to work in multidisciplinary teams to analyze a health care problem and develop a position paper on a health care policy issue.

CIPP 960 GLOBAL WOMEN'S HEALTH 3

This course is a comprehensive examination of the complex issues facing women's and children's health globally. Emphasis is on a comprehensive and multidisciplinary perspective based on the World Health Organization's 2007 "Framework for Action" structure for strengthening health systems, the United Nations' Millennium Development Goals, and the Universal Declaration of Human Rights. This survey course addresses biological and medical issues; reproductive health; violence against women and children and its impact on health; infectious and chronic disease; and the environmental and social relationships to health issues. Analysis covers current national, regional, and global trends; program and policy responses to these trends; and prospects for the future.

CIPP 970 INTERPROFESSIONAL SERVICE..... 1

This course links the experiential with the theoretical by providing hands-on professional experience in the University of Maryland, Baltimore's surrounding community. The goal of this course is to offer true service learning in which students learn by providing for the expressed need of the community through a social justice lens. Students learn how community health and human service programs are developed, organized, implemented and evaluated; how interprofessional teams successfully function; how to interact with individuals and groups living in our community; and how to report their observations to peers and supervisors. Students work with organizations with which the University has formed partnerships to meet course learning objectives. Service learning is a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development. Through the reciprocity associated with service learning, students gain a better sense of belonging to that community while community members are empowered to address and advocate for their own needs.

CIPP 971 POPULATION HEALTH IN BALTIMORE..... 1

This 1-credit interprofessional course provides students with an inside perspective on addressing health disparities and inequities in Baltimore from academic and community perspectives. Faculty fellows of the UMB Center for Community-Based Engagement and Learning and their affiliated community partners present course content. Through the lens of case studies and personal narratives or stories, faculty from UMB professional schools (medicine, social work, nursing, law, physical therapy, pharmacy, and dentistry) describe their community-based work and collaboration with community partners, emphasizing barriers to, and solutions toward, achieving health equity and population health in Baltimore. Learning about Baltimore history, local contextual factors, and neighborhood resources highlights opportunities where the realities of health disparities can be seen. Using the World Health Organization's Social Determinants of Health framework, social concepts such as place and race are explored. Foundational principles of social justice are also emphasized. Population health and culture of health and their relevance to Baltimore-based solutions are described in order for students to identify opportunities to address interprofessional health disparities in their own careers.

CIPP 980 ENTREPRENEURSHIP LIFE SCIENCE..... 3

Students explore the development of a life sciences startup venture and, in some cases, begin to create their own startup ventures. Students learn how to assess the feasibility of a life science startup venture; evaluate financial and market opportunities; explore the customer discovery process; author a business plan; and build financial projections. Students discuss a wide range of issues of importance and concern to life science entrepreneurs and learn to recognize opportunity, assess the skills and talents of successful entrepreneurs, network with life science entrepreneurs, and learn models and approaches that help them analyze entrepreneurial opportunities throughout their career. Successful life science entrepreneurs will highlight real-world experiences in guest lectures.

DBMS 604 CURRENT TRENDS IN CELLULAR AND MOLECULAR BIOLOGY OF ORAL TISSUES..... 1

Presentations by students, faculty members, and guest speakers consist of original research work and related issues and trends in molecular biology research of oral tissues. The course emphasizes new methods in molecular and cell biology.

DBMS 605 SCIENTIFIC METHOD, WRITING, AND ETHICS..... 1

This course covers the scientific method, including the relationship of empirical vs. rational approaches. It emphasizes the formulation of hypothesis and experimental design and critical review of literature, and it covers ethical issues and writing styles for scientific papers and research grant proposals.

DBMS 608 INTRODUCTION TO BIOMEDICAL SCIENCES RESEARCH..... 1

This course introduces new biomedical sciences graduate students to the program degree requirements and expectations, and it is recommended to be taken in the first year of the

program, concurrent with the scientific writing course. Assignments pertain to assisting the student in selecting a research topic and mentor. Assignments include literature searches and description of three to five research questions of interest to the student; refining to one to three potential projects and meeting with potential mentors; mentor selection; and submission of final proposal.

DBMS 611 PRINCIPLES OF MAMMILIAN PHYSIOLOGY 6

This course focuses on ideas of human physiology. Topics include cardiovascular, respiratory, gastrointestinal, nervous, renal, and endocrine systems; didactic method and seminar methods of instruction; and research aspects of physiology.

DBMS 614 PHYSIOLOGY OF AGING 2

This course for graduate students in health professions and others with an interest in gerontology focuses on cell biology, metabolic processes, cardiovascular, and neurobiological aspects of aging. It covers a pathophysiological basis for health problems of older adults. Students study alterations at the cell, organ, and system levels to provide the basis for clinical management of common health problems. *Prerequisite: DBMS 611 or MPHY 600, or equivalent.*

DBMS 618 SPECIAL TOPICS IN BIOMEDICAL SCIENCE .....1 TO 3

This multisectioned course offers students research and educational opportunities in the traditional biomedical disciplines and several new, emerging areas of biology. Small groups of students and graduate faculty arrange the offerings. Areas of specialization include: anatomy-Section 2; biochemistry-Section 3; and microbiology-Section 4.

Microbiology-Section 4 is offered for 1 to 3 credits. A student may elect to take a 10-hour lecture portion on advanced oral microbiology for 1 credit and/or do special microbiology projects for 1 to 3 credits. The lecture segment covers oral microbial aspects of oral ecology; oral biofilms; dental caries; endodontic disease; periodontal disease; oral malodor; candida infections; viral infections; and treatment strategies for oral infections. The other options may be laboratory or library special projects in oral or general microbiology. Any professor in the Department of Microbial Pathogenesis can sponsor these projects.

Other topics include: pharmacology-Section 5; physiology-Section 6; neuroscience-Section 7; immunology-Section 8; molecular and cell biology-Section 9; molecular endocrinology-Section 10; and mineralized tissues-Section 11.

DBMS 619 BIOMEDICAL SCIENCES SEMINAR..... 1

Presenting seminars and participating in discussions is an important part of graduate education. Attendance at departmental seminars is a program requirement. The multidisciplinary program provides students and faculty the opportunity to learn about research across the curriculum. Students must present one seminar each year. Students register for and earn 1 credit hour in the semester that they present. Students must earn at least 4 credits with a minimum grade of B for graduation.

DBMS 620 BIOMEDICAL ASPECTS OF DENTAL CARIES 2

This course presents current, evidence-based information about biological aspects of dental caries. Topics include microbial mechanisms of caries; histopathology of enamel, dentin, and root surface caries; composition and functions of saliva as they relate to dental caries; fluorides in dentistry, their mechanisms against dental decay, and systemic effects; dietary and nutritional aspects of caries; salivary dysfunction; remineralization of enamel; anticariogenic properties of chlorhexidine and xylitol; and caries risk assessment.

DBMS 621 ADVANCED DENTAL MICROBIOLOGY..... 4

This course, intended for graduate students of oral microbiology, is supplemented with library readings and advanced laboratory experimentation. It includes four lecture hours each week with some laboratory experience.

DBMS 622 IMMUNOLOGY AND ORAL DISEASES 3

This course covers basic immunologic principles, clinical immunology, and immunologic studies of oral diseases. It is offered in the spring semester.

DBMS 625 MAMMILIAN ORAL HISTOLOGY EMBRYOLOGY 2

Developing and definitive oral and paraoral structures are presented, with emphasis on recent advances in this field of study.

DBMS 626 ADVANCED ORAL RADIOLOGY.....1 TO 2

This course provides advanced specialty education students advanced training in oral and maxillofacial radiology techniques. The primary, technical focus of the course is on dental cone beam computed tomography (CBCT). During the didactic portion of the course, the principles of magnetic resonance imaging also are discussed. The course begins with lectures by the course director to introduce the topic of advanced oral radiographic methods and interpretation. Using lectures assisted with PowerPoint presentations, groups of three to four graduate students present on the following assigned topics: developmental anomalies; inflammatory diseases of the jaws; cysts; benign neoplasms; malignant neoplasms; fibro-osseous neoplasms; and systemic diseases. The course concludes with a review of incidental findings and lectures on CBCT diagnosis in the fields of implantology, endodontics, and growth and development. Our final lecture is seminar-style with presentation of unknown cases, with open discussion by students.

DBMS 628 ADVANCED HEAD AND NECK ANATOMY .....2 TO 4

This course gives students a working knowledge of the functional anatomy of the head and neck through detailed dissection and lectures.

DBMS 631 ORAL MOTOR FUNCTION..... 2

This course provides biomedical sciences students with an updated, in-depth presentation of mandibular function and neuromuscular control mechanisms involved in mastication, swallowing, and speech. Lectures and student presentations cover the morphology, physiology, pharmacology, and pathology of structures required for oral motility. Emphasis is on the clinical relevance of basic science information. *Prerequisite: DBMS 611 or equivalent.*

DBMS 633 THE ANATOMY OF THE TEMPOROMANDIBULAR JOINT 1

Graduate and postgraduate students learn about developmental, microscopic, and gross anatomic features of the temporomandibular joint through lectures and seminars by the Department of Anatomy and Neurobiology and clinical disciplines.

DBMS 635 BACTERIAL GENETICS..... 4

This course covers induction, expression, and selection of mutants; molecular basis of mutations; transfer of genetic information by transformation, transduction, and conjugation; complementation and recombination in phage and bacteria; plasmids; and recombinant DNA. Offered first semester. Two lectures/discussion periods per week deal with the genetics of bacteria and bacterial viruses. *Cross-listed with GPLS 635.*

DBMS 636 PHARMACOLOGY OF ANESTHETIC DRUGS..... 3

This course covers basic pharmacologic aspects of general and local anesthetic drugs and drugs used for pain control. Topics include theories on the mechanism of action; structure-activity relationships; physiological effects of these agents; and drug interactions and clinical aspects.

DBMS 637 PEDIATRIC DENTAL PHARMACOLOGY 1

This course consists of current topics related to drug actions in pediatric dental pharmacology. It is structured as an online series of lecture presentations on the pharmacology of pediatric dental drugs and their importance to patient care.

DBMS 638 BIOSTATISTICS.....1 TO 3

This course introduces students to research design and statistics as they apply to dentistry to allow students to evaluate literature in their fields and work cooperatively with a statistician on research projects.

DBMS 639 ADVANCED DENTAL BIOMATERIALS I 2

This course has three primary objectives. The first is to develop a student's understanding of the physical and chemical properties of dental biomaterials and the correlation of these materials' characteristics with the selection of dental biomaterials for clinical use. The second is to develop an understanding of how dental biomaterials behave in the clinical setting and which characteristics determine their selection and clinical application. The third is to develop the ability to read dental biomaterials research papers, follow the progress of dental biomaterials' new development and research activities, and learn to summarize and present literature review findings.

DBMS 640 ADVANCED DENTAL BIOMATERIALS II..... 2

This course provides doctoral students in the BMS PhD Program with training in the use of advanced dental biomaterials. The primary technical focus of this course is on an enhanced understanding of the physical and chemical properties of dental biomaterials and the correlation of these materials' characteristics with the selection of dental biomaterials for clinical use, including preventive and restorative dental materials. In addition, this course provides students with an understanding of how dental biomaterials behave in the clinical setting, which characteristics determine their selection and clinical applications, and the importance of physical, mechanical, and biological properties, including biocompatibility and long-term durability. Furthermore, the course provides training for students to research the literature, study research papers on dental biomaterials, follow the progress of new dental biomaterials research and development, and be able to summarize and present literature review findings. *Prerequisite: DBMS 639.*

DBMS 642 NOCICEPTION, PAIN, AND ANALGESIA..... 2

This course's emphasis is on the nervous system mechanisms responsible for nociception, pain, and the alleviation of pain. Classical and current research in the neuroanatomy, neurochemistry, and neurophysiology of pain relate to clinical observations, pain syndromes, and mechanisms of analgesic drugs. Material is most relevant for dental, medical, and nursing graduate students. Offered in the fall semester. *Prerequisite: DBMS 611 or equivalent.*

DBMS 643 THE NEUROBIOLOGY OF NOCICEPTION AND PAIN 3

Designed for neuroscience graduate students in all health disciplines, this course focuses on the basic science and research aspects of nociception and pain. Topics include the neuroanatomy, neurophysiology, neuropharmacology, and psychophysics of nociception and pain. Weekly, two-hour class meetings consist of student presentations and group discussions, based on a reading list provided by the faculty. *Cross-listed with GPLS 643. Prerequisite: GPLS 641.*

DBMS 653 TECHNIQUES IN MICROSCOPY 4

Students learn techniques used to prepare biological material for examination with light and electron microscopes. The course covers theory of light and electron optics. Students use techniques to help solve problems that may require a microscope in individual research projects.

DBMS 668 ORAL INHALATION SEDATION .....1 TO 2

This intensive course is offered dentist for training in the safe and effective use of combined inhalation-enteral conscious sedation in the adult dental patient. This course will follow objectives and course content based on the current American Dental Association guidelines for teaching combined inhalation-enteral conscious sedation (combined conscious sedation). The information is designed to cover material necessary to apply for a Class I sedation permit in Maryland. The course is case-based and offers in-depth discussion of each aspect of the sedation regimen, including scenarios of how to do things correctly as well as what can go wrong.

DBMS 708 LABORATORY ROTATIONS.....1 TO 3

This course provides students with practical laboratory experience in a variety of techniques and allows them to become familiar with faculty members and their research. Doctoral students are required to complete at least two rotations in different laboratories in the program. Rotations may run either one full semester or a half semester (eight weeks). All rotations should be completed by the end of the fourth semester in the program.

DBMS 799 MASTER'S THESIS RESEARCH....1 TO 12

Required enrollment for students engaged in master's thesis studies.

DBMS 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

DBMS 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

DPAT 612 PROBLEMS IN ORAL PATHOLOGY I..... 2

This course covers pathology of selected oral lesions with emphasis on advances in diagnostic techniques. *Prerequisite: a basic course in pathology.*

DPAT 613 PROBLEMS IN ORAL PATHOLOGY II..... 2

This course covers pathology of selected oral lesions with emphasis on advances in diagnostic techniques. *Prerequisite: DPAT 612.*

DPAT 614 HISTOPATHOLOGY TECHNIQUE I..... 4

This course covers methods used to prepare pathologic tissues for microscopic examination. *Prerequisite: A basic course in pathology.*

DPAT 615 HISTOPATHOLOGY TECHNIQUE II..... 4

This course covers methods used to prepare pathologic tissues for microscopic examination. *Prerequisite: A basic course in pathology.*

DPAT 616 PATHOLOGY OF ORAL LESIONS I..... 3

This course covers common and rare lesions of the head and neck. *Prerequisites: DPAT 612 and 613.*

DPAT 617 PATHOLOGY OF ORAL LESIONS II 3

This course covers common and rare lesions of the head and neck. *Prerequisite: DPAT 616.*

DPAT 618 SEMINAR..... 1

This seminar covers recent advances in oral pathology. *Prerequisite: A basic course in pathology.*

DPAT 799 MASTER'S THESIS RESEARCH.....1 TO 8

Required enrollment for students engaged in master's thesis studies.

DPAT 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

DPAT 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

ETHC 629 INTRODUCTION TO ETHICAL THEORY..... 2

This course introduces students to the prominent theories in ethics and political philosophy that inform our ethical arguments and the articulation of our values. By the end of the course, students are able to articulate ethical problems and understand how these problems differ from problems that can be addressed by empirical investigations or scientific discoveries, explain the difference between various schools of

thoughts in ethics, and analyze ethical claims in terms of their theoretical assumptions and commitments.

ETHC 635 FUNDAMENTALS OF COORDINATING CLINICAL RESEARCH 2

The clinical research coordinator (CRC) is a specialized research professional who works with and under the direction of a clinical investigator. Although a clinical investigator is legally responsible for the management of the clinical trial at a site, the CRC handles the majority of the daily clinical trial activities and plays a critical role in the study conduct. This course reviews the knowledge and skills necessary to be a good CRC, the duties and responsibilities of a CRC, and the importance of the CRC to be an efficient and effective operative of clinical trials.

ETHC 637 INTRODUCTION TO RESEARCH ETHICS 3

This course acquaints students with basic concepts in research ethics; examines the ethical and philosophical issues raised by involving human subjects in research; and reviews concepts of risks and benefits, vulnerability, privacy and confidentiality, undue inducement, exploitation, equipoise, and therapeutic misconception. By the end of the course, students are able to analyze research protocols and assess the ethical appropriateness of such protocols.

ETHC 638 ISSUES IN INTERNATIONAL RESEARCH ETHICS 3

This course examines the ethical and philosophical issues raised by research involving human subjects conducted in international settings and examines issues involved with the standard of care, informed consent, exploitation, post-trial benefits, and a developmental and organizational model of ethics review systems. By the end of the course, students are able to construct and support valid arguments in the analysis of exploitative research; analyze ethical questions regarding international collaborations in research; describe methods to achieve a culturally valid informed consent; describe the issues involved with tissue sample research performed between international partners; and assess an ethical review an international protocol.

ETHC 639 REGULATORY AND LEGAL ASPECTS OF INSTITUTIONAL REVIEW BOARDS 2

This course covers the legal and regulatory aspects of ethical review systems and covers topics critical to performing clinical research, including structures and operations of institutional review boards, understanding investigational new drug (IND) applications, and conflict of interest issues. By the end of the course, students are able to explain the issues involved with regulating institutional review boards and human subject protection programs.

ETHC 640 ETHICS OF GLOBALIZATION 1

This course introduces students to the identification and assessment of moral dilemmas in the context of changes and development in an increasingly globalized world with attention to its theoretical and practical dimensions, including global health. By the end of the course, students are able to explain the forces associated with globalization; evaluate the impact of globalization on social justice issues; evaluate the moral theories underlying a just globalization; and explain the moral dilemmas posed by an increasingly globalized world.

ETHC 641 INTRODUCTION TO MEDICAL ETHICS 3

This course introduces graduate and professional students to clinical ethics consultations as a field of medical ethics and as a field of scholarly inquiry and analysis. It accomplishes this primarily by exploring diverse methods of scholarly inquiry in bioethics and considering their application to the clinical setting. The course also looks at the historical development of ethics committees and ethics consultation services designed to bring bioethics into the clinical setting. Students explore different disciplinary approaches to bioethics through readings, online class discussions and activities, and online presentations. Weekly reading assignments drawn from the literature of bioethics provide context and background for the online discussions. The course concentrates on controversial topics and issues that are confronted by health care professionals, families, and patients in a tertiary hospital.

ETHC 642 CLINICAL ETHICS CONSULTATION..... 1

This course focuses on the practical aspects of performing ethics consultations in a hospital setting. The course consists of an online component and an on-site component. The online component consists of a comprehensive overview of the history of ethics committees; the ethics consultation process; different models of ethics consultation; case analysis skills; communication skills; and frequent case write-ups based on fictitious cases. The on-site practicum teaches students the hands-on skills required to do ethics consultation and mediation in health care settings.

ETHC 665 RESPONSIBLE CONDUCT OF RESEARCH IN INTERNATIONAL AFFAIRS..... 1

This course examines the ethical responsibilities of conducting research with special emphasis on collaborative international research that involve scientific integrity; determination of authorship; peer review; conflicts of interest; ownership of data; and intellectual property across borders with differing laws. By the end of the course, students are able to describe examples of research misconduct and methods of dealing with misconduct; can discuss the relationship between authorship and accountability; can discuss the ethical and legal foundations of intellectual property; and can describe how conflicts of interest can corrupt scientific objectivity.

FMED 610 FORENSIC TOXICOLOGY LABORATORY..... 3

This course provides students with basic analytical methods to detect drugs and chemicals in biological samples. Students also learn the procedures of sample collection, storage, and testing result analysis. The course is given by case presentation with discussion and hands-on laboratory training.

FMED 710 FORENSIC PATHOLOGY..... 6

Forensic pathology is the foundation of forensic medicine and deals with the study of the cause and manner of death by examination of a dead body during the medicolegal investigation of death in criminal and civil law cases in some jurisdictions. This course is designed to provide students with the principles and basic knowledge of forensic pathology practice in the United States and around the world. It provides the core for the curriculum and is a prerequisite for all the other courses. The elements include the medicolegal death investigation system in the U.S. and China; the categories of medicolegal cases; the objectives of medicolegal investigation; the concept of cause and manner of death, common types of injuries associated with deaths; investigation of sudden, unexpected deaths; the role of forensic pathology in criminal justice, public health, and safety; and pattern of various trauma. The course is given by lectures, seminars, laboratory, prerecorded study lectures, and computer/online.

FMED 720 FORENSIC AUTOPSY..... 3

Forensic autopsy is a key procedure required in all medicolegal cases to identify the cause of death, especially in questionable cases. Forensic autopsy, or post-mortem examination as it is often called, is conducted to identify any deviation from normal anatomy. These variances from normal include diseases and injuries and help determine the cause of death; the mechanism of death; and the manner of death of the deceased. This course is designed to teach students to perform eviscerations and organ block dissection; select tissue for histological processing and special studies; and obtain specimens for biological and toxicological analysis. This course is given by case presentation with discussion and laboratory training with hands-on instruction.

FMED 730 MEDICOLEGAL DEATH SCENE INVESTIGATION.....1 TO 3

Medicolegal death scene investigation is often critical in the final determination of the manner of death, documenting observations and collecting physical and trace evidence from death scenes involving homicides, suicides, accidents, and natural causes. The course is designed to show students how to conduct scientific, systematic and thorough death scene investigation for medical examiner and coroner offices and how to obtain essential facts regarding the death scene, medical history, and social history. The course is given by case presentation with discussion, death scene visits with death scene investigation, and simulation laboratory work (death scene re-enactment training).

FMED 740 EPIDEMIOLOGICAL DATA RESEARCH-CAPSTONE PROJECT.....1 TO 5

Well-designed epidemiological data research in the field of forensic medicine is essential to identify risk factors of certain deaths, which in turn produces valuable information useful in public health and public safety. This course is almost a yearlong sequence that starts in the spring and ends in the summer. Students learn how to design and conduct epidemiological data analysis and research. Each student is required to develop a formal research proposal, conduct one research project under supervision of a faculty member, complete a publishable paper, and present their paper to the class and faculty panel.

FMED 820 FORENSIC NEUROPATHOLOGY..... 1

Forensic neuropathology is a subspecialty of forensic medicine that focuses on all aspects of neurologic diseases and injuries that are relevant in judicial cases. This course teaches students the mechanisms, morphology, and dating of neurologic traumas, neurologic causes of sudden death, and the effects of drugs and toxins on the central nervous system. Principles, practices, and current developments in the field of forensic neuropathology also are discussed. The course is given by lectures with case discussion and laboratory brain and spinal cord examination.

FMED 830 FORENSIC RADIOLOGY .....1 TO 2

Image technologies are powerful tools in forensic sciences. This course is designed to teach students the basic radiology technologies, including post-mortem X-ray and CT scan operations and post-mortem radiology case studies. The course is given by lectures, case presentation with discussion, and laboratory training.

FMED 840 FORENSIC ODONTOLOGY AND FORENSIC ANTHROPOLOGY..... 2

Forensic odontology is involved in assisting investigative agencies in the identification of whole or fragmented recovered human remains. This course is designed to teach students the basic skills for determining the age and race of unidentified human remains by comparison of ante-mortem and post-mortem dental records and use of the unique features visible on dental radiographs. Students also learn how to do the assessment of bite mark injuries and the source of bite mark injuries in cases of assault or suspected abuse. Forensic anthropology is the application of the science of anthropology in criminal investigation in which the victim's remains are in the advanced stages of decomposition, severely burned, mutilated, or otherwise unrecognizable. This course is designed to teach students the basic anthropological techniques and analysis to assess the age, gender, race, stature, and evidence for estimation of post-mortem interval of the individual, as well as if the individual suffered any trauma or disease before or at time of death. The combined course is given by lectures and laboratory case studies.

GERO 672 ISSUES IN AGING POLICY..... 3

This is an upper-level undergraduate or introductory graduate course on issues in aging policy. Its purpose is to provide an overview of the salient issues in aging policy and to provide the student with a context for understanding the public policy process. The course provides basic information and knowledge that is useful to the student in more advanced, policy-related studies in aging and health.

GERO 681 EPIDEMIOLOGY OF AGING..... 3

This core course covers applications of the principle and methods of epidemiology and public health to the study of aging. There is a review of health assessment techniques that are potentially useful for conducting epidemiological studies of older people; the epidemiology of selected disease common to old age; primary, secondary, and tertiary prevention as applied to older people, focusing on psychosocial and environmental aspects of health; differing ideas of long-term care, and their roles in the prevention, intervention, and treatment of illness in older people. Students learn how to critically evaluate and present research in a specific area of gerontological epidemiology with faculty supervision. *Cross-listed with PREV 681.*

GERO 711 BIOLOGY OF AGING 3

This course provides opportunities to learn about several aspects of biological aging, including what it is; how it happens; what effects it has on the structure and operations of the human body; how it affects social, psychological, and other aspects of life; how it is related to diseases; and what can or cannot be done about it.

GERO 750 THEORY AND METHODS I 3

The first of a two-semester sequence integrating theory and methods in gerontology, this course provides students with the information and skills to think like a gerontologist, using theory and methods unique to the field and understanding the language and techniques utilized by a wide range of gerontological researchers. Key to these understandings is making connections between style and techniques of research and theorizing in varied disciplines, application of critical thinking skills, and being able to bridge linguistic and paradigmatic barriers in an interdisciplinary field. Students completing this sequence will be able to approach problems from an interdisciplinary perspective; "speak the language" of gerontology across disciplinary barriers of jargon; employ the work of contributing disciplines in their own research; and work as part of an interdisciplinary research team.

GERO 751 THEORY AND METHODS II 3

The second of a two-semester sequence integrating theory and methods in gerontology, this course provides students with the information and skills to think like a gerontologist, using theory and methods unique to the field and understanding the language and techniques utilized by a wide range of gerontological researchers. Key to these understandings is reading, evaluating, and understanding the connections between research questions, theorem and appropriate methods of research. Application of critical thinking skills and being able to bridge linguistic and methodological variation in an interdisciplinary field are emphasized. Students completing this sequence will be able to employ the work of contributing disciplines in their research; produce a "real world" proposal for research; and work as part of an interdisciplinary research team.

GERO 798 SPECIAL TOPICS IN GERONTOLOGY .....1 TO 3

Topics vary from term to term.

GERO 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

GERO 801 INDEPENDENT STUDY IN GERONTOLOGY .....1 TO 3

The student selects a topic of professional interest and studies with a graduate faculty member who is competent in that field.

GERO 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

GERO 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

GPLS 600 CELLULAR AND MOLECULAR BASIS OF TRANSLATIONAL RESEARCH 5

This course provides a comprehensive and in-depth overview of molecular biology; genetics; protein structure and function; biochemistry; cell signaling; and immunology. It is designed for incoming master's degree students who are interested in pursuing translational research and/or who are planning to attend medical school. The course also is designed for postdoctoral fellows, nursing students, clinicians, and/or other professionals and faculty involved in translational research who do not have a traditional background in cellular and molecular biology. This course also forms the backbone for subsequent specialized translational coursework and research. The course is offered in the fall semester and consists of four to six hours per week of online lectures recorded from the 8-credit Core Course (GPL 601) and involves mandatory participation in online discussion boards, weekly journal articles, or problem sets, and a two-hour in-class, faculty-led integration session. These integration sessions are used to discuss the weekly lectures and give students the opportunity to ask faculty members questions and present/discuss the weekly journal article and problem sets. Exams (three in total) also are given during this in-class time.

GPLS 601 MECHANISMS IN BIOMEDICAL SCIENCES: FROM GENES TO DISEASE 8

This course is a comprehensive overview of current knowledge in cellular, molecular, and structural biology. It provides the background necessary for subsequent specialized studies in biomedical research in a concentrated program. The GPILS Core Course is organized into 10 sections that span molecular biology; genetics; proteins; pharmacology; metabolism; membranes and organelles; protein processing; membrane signaling; cell signaling, immunobiology; and development. The format is highly interactive and includes: lectures presenting creative, cutting-edge approaches to investigating fundamental, current biomedical questions, together with review of fundamental principles of molecular and cellular biology.; vertically integrated topics that tie together the study of individual genes, proteins, cellular function and associated clinical disorders; emphasis on development and critical evaluation of scientific hypotheses; introduction to state-of-the-art techniques; mentored discussions of primary papers; topic-specific seminars, including cancer, neuroscience, and drug development/gene therapy. Upon completion of the core curriculum in early December, students may begin a lab rotation and/or participate in program-specific coursework.

GPLS 604 NEUROPHARMACOLOGY..... 3

This course focuses on the mechanisms by which drugs act at the molecular level. Topics include drug and neurotransmitter receptors; how they are studied; how they are coupled to responses; and other sites of drug action.

GPLS 607 PRINCIPLES OF PHARMACOLOGY..... 3

This half-semester course (through spring break) has three sections: (1) pharmacodynamics, pharmacogenomics, and pharmacokinetics; (2) chemotherapeutics of infectious diseases and immunomodulation; and (3) peripheral nervous system.

GPLS 608 SEMINAR..... 1 OR 2

This is a weekly critical review and discussion of original works and recent advances on a variety of research subjects by graduate students, faculty, staff members, and guests. Students take this course for credit at least twice, once when they present their dissertation proposal seminar and once after presenting their dissertation defense public seminar. Molecular medicine students take it for one additional seminar. (Section 1, biochemistry; Section 2, molecular medicine; Section 3, microbiology; Section 4, neuroscience)

GPLS 609 LABORATORY ROTATIONS.....1 TO 3

Students gain experience in a variety of techniques and become familiar with faculty members and their research. Doctoral students generally complete two or three rotations in different laboratories in the program. Rotations usually last six to eight weeks and are graded Pass/Fail. (Section 1, biochemistry; Section 2, molecular medicine; Section 3, microbiology; Section 4, neuroscience)

GPLS 610 PRINCIPLE KIDNEY AND BODY FLUIDS 2

This course covers contemporary research in renal function and epithelial transport. Students read and present an assigned topic, evaluate methodology, interpret results, and discuss models and their experimental verification.

GPLS 613 NEUROENDOCRINOLOGY..... 3

This course takes an integrative approach to the topic of neuroendocrinology. Didactic lectures review in detail the cellular and molecular mechanisms of steroid and peptide hormones. These processes are placed in the context of the control of female and male reproductive physiology and extended to the hormonal control of behavior. Other topics include the hormonal basis of and responses to stress, circadian rhythms, and seasonality and feeding behavior. In addition to lectures, each student will make an in-depth presentation on a topic of their choice that is relevant to the field of neuroendocrinology. Grades are based on the presentation, a midterm exam, a final exam, and class participation.

GPLS 616 MOLECULAR MECHANISMS OF SIGNAL TRANSFER 3

This twice-weekly literature, discussion, and lecture course covers mechanisms of hormone action upon target cells with emphasis on the molecular mechanisms by which hormones mediate their cellular effects. *Prerequisite: Completion of GPILS core curriculum, GPLS 601.*

GPLS 618 READINGS AND SPECIAL TOPICS ..... 1 TO 3

Topics vary from term to term.

GPLS 620 SYNAPTIC PHYSIOLOGY AND PHARMACOLOGY 3

Emphasis is on the electrophysiological analysis of synaptic transmission. Topics include ionic basis of excitatory and inhibitory post-synaptic potentials, equivalent circuits of transmitter action, mechanisms and regulation of transmitter release, fast and slow synaptic responses, and functional structural plasticity at synapses.

GPLS 623 MOLECULAR TOXICOLOGY 3

This course will focus on areas of toxicology in which significant advances are being made into molecular mechanisms. Faculty mentors of the GPILS Toxicology Graduate Program's track in molecular and mechanistic toxicology will present topics related to their research expertise. Emergent technologies will be introduced — for example, in toxicogenomics, gene therapy, and metabonomics. The course is intended for students in their third semester of graduate studies. Emphasis will be placed on enhancing skills in interpreting and critiquing primary research literature. Grading is based on student presentations and a term paper.

GPLS 624 ONCOPHARMACOLOGY 3

Molecular therapy approaches will be discussed within the context of modern understanding of cancer biology and target identification. State-of-the-art approaches for cancer diagnosis and treatment will be reviewed. These include signaling pathways associated with tumor development; the role of endocrine and other receptors as drug targets; the contribution of transcriptional regulation, genome instability and DNA repair; and the harnessing of apoptotic cascades for cancer therapy. Drugs involved in cancer treatment and their mechanism of action; angiogenesis regulation; gene therapy approaches to cancer treatment; the use of stem cells and dendritic cells in therapy and immunotherapy, drug resistance; and toxicity also will be highlighted. The format is lectures followed by student discussion of assigned papers.

GPLS 625 ION CHANNELS 2

This course covers the role of voltage- and receptor-gated ion channels in cell function. Although the emphasis is on structure and function of channels in excitable tissues such as nerve and muscle, students gain insight into the rapidly developing field of ion channel function in nonexcitable cells such as lymphocytes, transformed cells, and glial cells, and the roles of ion channels in development. *Prerequisites: GPLS 601 and 644, or consent of the instructor.*

GPLS 626 MEMBRANE CARRIERS TRANSPORTERS 2

This course is designed to prepare students for advanced study and laboratory research on the mechanisms by which ions and small molecules are transported across biological membranes. The course starts with consideration of the general methodology, thermodynamics, and kinetics of transmembrane, transcellular, and transepithelial ion transport. The focus then shifts to the biochemistry and molecular and structural biology of common plasma membrane active transport systems for ions, nutrients, and neurotransmitters. It also covers the relationships and interactions between transport proteins in the plasma membrane and intracellular membranes. *Prerequisites: GPLS 691 and GPLS 644 or equivalent, or consent of the instructor.*

GPLS 627 DEVELOPMENTAL NEUROBIOLOGY 3

This course introduces students to fundamental processes of neuronal development, including cell proliferation; differentiation of neurons and glia/cell lineage; neuronal migration; development cell death; regional differentiation; the formation of neuronal connections; and plastic reorganization

of the nervous system during development and developmental diseases and malformations. The underlying cellular and molecular mechanisms of these processes also are explored. Each topic is covered by a lecture and a discussion of current papers in the literature.

GPLS 629 JOURNAL CLUB..... 1

This course exposes students to advances in their specific disciplines through presentations of recent papers by faculty, research fellows, and students.

GPLS 630 FUNDAMENTALS OF BIOSTATISTICS 3

This course covers most of the basic types of analysis procedures used for continuous and discrete variables. Topics include statistical inference (p-values, confidence intervals, hypothesis tests); t-tests; chi-square tests; power calculations; nonparametric methods; simple and multiple linear regression; ANOVA; logistical regression; and survival analysis.

GPLS 631 CARDIAC CELLULAR PHYSIOLOGY..... 2

This course covers cardiac cellular physiology, electrophysiology, and molecular biology through lectures, readings, and discussions. Topics change yearly. Recent topics have included: channels in the sarcolemma and sarcoplasmic reticulum; ion exchangers and pumps; signal transduction mechanisms; excitation contraction coupling in heart muscle; novel aspects of cardiac muscle mechanics; and review of new molecular, optical, and electrical methods. Students present and discuss assigned papers and write a mock grant application.

GPLS 641 SYSTEMS AND COGNITIVE NEUROSCIENCE..... 4

This course begins with an initial module that covers human neuroanatomy (students take lectures and labs with medical neuroscience students), followed by lectures on general organizations of brain circuits and sensory and motor systems. The course closes with lectures covering the neural bases of cognitive functions, language, sleep, etc., and lectures on disorders of the nervous system.

GPLS 642 NONCICEPTION OF PAIN 2

This course is designed for graduate students in all health disciplines. Its focus is on the basic science and research aspects of nociception, pain, and analgesia. Topics include the neuroanatomy, neurophysiology, neuropharmacology, and psychophysics of nociception and pain.

GPLS 643 NEUROBIOLOGY OF NOCICEPTION 2

This course is designed for neuroscience graduate students interested in the neurobiology of nociception and pain. While GPILS 642 provides a general background in this field, GPILS 643 provides a solid foundation of knowledge through a combination of lectures, directed reading, and discussion of the primary literature. The focus is on the most contemporary views of nociceptive processing.

GPLS 644 INTRODUCTION TO MEMBRANE BIOPHYSICS..... 1

This course is designed to provide students with sufficient understanding of a range of electrophysiological concepts — including current flow and intracellular, patch clamp, and extracellular recording — required for electrophysiological laboratory rotations. In addition, lecture topics will focus on quantitative topics that students must be familiar with for more advanced courses such as Cellular Basis of Synaptic Physiology and Fundamentals of Membrane Transport. Topics include electrochemical equilibrium; electrochemical potential energy and transport processes; electricity primer; operational amplifiers; equivalent circuits of membranes; voltage-gated channels and action potentials; and extracellular recording and stimulation. This course, in combination with the Core Course and GPLS 691 (Topics in Contemporary Cellular and Molecular Neuroscience), provides neuroscience-oriented students with a strong background in molecular and cellular neuroscience and electrophysiological concepts, which are necessary for advanced courses in neuroscience. This course is required for students in the Program in Neuroscience and is recommended for GPILS students interested in cellular and molecular neuroscience.

GPLS 645 CELL AND SYSTEMS PHYSIOLOGY 3

This course covers the fundamentals of cellular and organ physiology, the integrative function of physiological systems, and homeostasis. The first half of the class focuses on cellular/tissue physiology (sample topics include epithelial, muscle, neuron, bone, blood, and endocrine cell physiology), with the second half focusing on organs and systems (nervous, cardiovascular, respiratory, renal, digestive, immune, and endocrine systems). Weekly discussion groups focus on important techniques in physiology, integrating class lectures with experimental topics and journal articles. Students are evaluated with two exams and a class presentation on a physiological system of their choice.

GPLS 647 MOLECULAR MEDICINE SURVIVAL SKILLS 2

The ability to effectively communicate scientific findings and new ideas not only aids the researcher in promoting their program, but it also helps in the conceptualization of new areas of inquiry and generates new insights into recent discoveries. This course is designed to provide second-year molecular medicine graduate students with instruction in five critical areas of scientific communication that underpin a successful graduate career: grant writing skills; manuscript preparation skills; presentation skills (preparation and delivery of an oral presentation); bio-informatics; and people skills (professional skills for future employment opportunities). The format will include formal lectures on each topic, followed by an accompanying workshop and/or forum in which to engage in interactive learning sessions.

GPLS 648 ROUNDS IN MEMBRANE BIOLOGY 1

Two faculty members in the interdepartmental program in membrane biology present two topics in the field of biomembranes each week. Time is reserved for questions and discussion.

GPLS 660 FUNCTIONAL SYSTEMS: CELL FUNCTION 1

This course provides students with a fundamental knowledge of the biophysical properties of cells and cell membranes in lectures and small-group discussions. Topics include diffusion; permeability; osmotic pressure; electrical consequences of ionic gradients; resting membrane potentials; action potential generation and propagation; ionic channel diversity; active transport; epithelial transport; excitation contraction coupling in skeletal muscle; and the mechanical properties of muscle. Emphasis is on the experimental basis of the biophysical properties of cells (a component of the medical physiology course).

GPLS 661 FUNCTIONAL SYSTEMS: ENDOCRINE FUNCTION 1

Students learn about the endocrine system through lectures and small-group conferences. Lectures focus on the biosynthesis of the major hormones; regulation of hormone release; effects of hormones on target tissues; and intracellular mechanisms of hormone action. Students discuss the clinical relevance of endocrine findings and critically evaluate the experimental design, observations, and interpretation of data presented in current papers in small-group conferences (a component of the medical physiology course).

GPLS 662 FUNCTIONAL SYSTEMS: CARDIOVASCULAR FUNCTION..... 2

Students learn about the integrated functioning of the cardiovascular system. Topics include electrophysiology of the heart at the cellular and multicellular levels; excitation-contraction coupling mechanisms in cardiac and vascular smooth muscle; cardiac cycle and ventricular mechanics; hemodynamics; short- and long-term mechanisms for regulation of blood pressure; and function of the lymphatic system. Final topics include those that exemplify the integrated functioning of the cardiovascular system: exercise; response to postural changes; heart failure; and others (a component of the medical physiology course).

GPLS 663 FUNCTIONAL SYSTEMS: RENAL FUNCTION..... 1

Students learn about renal mechanisms responsible for water and electrolyte homeostasis in lecture and small-group format. Topics include body fluids; sodium and water balance; renal blood flow and glomerular filtration; tubular mechanisms of NaCl transport and regulation; solute transport; diuresis; concentrating mechanisms; potassium homeostasis, and acid-base homeostasis (a component of the medical physiology course).

GPLS 664 FUNCTIONAL SYSTEMS: GASTROINTESTINAL AND RESPIRATORY FUNCTION 1

Students learn about respiratory and gastrointestinal systems through lectures and small-group work. Respiratory physiology topics include lung volumes; ventilation; mechanics of breathing; pulmonary blood flow; ventilation-perfusion matching; gas transport; control of breathing; and fetal respiration. Gastrointestinal physiology topics include secretions of the salivary glands, stomach, pancreas, and small intestine; enzymatic digestion and absorption; motility; gastrointestinal hormones and the enteric nervous system; and colonic function (a component of the medical physiology course).

GPLS 665 CANCER BIOLOGY: FROM BASIC RESEARCH TO THE CLINIC 3

This course is designed to introduce students to the biology of specific cancers and how patients with these diseases are managed and treated. The course consists of twice-weekly lectures in which a basic or translational scientist is paired with a clinician to describe a specific disease and the major questions that need to be answered to improve treatments. Thus, the lectures alternate between lectures on basic biology and clinical management of cancer patients. The first half of the course deals with hereditary cancers and the second half covers sporadic cancers. In addition to lectures, students attend one relevant tumor board conference (where clinical cases are presented and discussed) each week. Each student is assigned a clinical mentor who helps identify a clinical question or problem of current interest, and each student writes a concise, focused review of the literature and issues related to this question (guidelines are provided).

GPLS 667 CELLULAR-MOLECULAR BASIS OF AUTISM 3

This course provides an overview of clinical and neurobiological research on autism spectrum disorder. After an introduction on understanding what autism is – and how it impacts people's lives – the course examines the neurobiological processes underlying autism spectrum condition in human and animal models. It also investigates changes in brain development; gene expression and sex differences; neurotransmitter systems; and synaptogenesis, including recent advances in the stem cell research field.

GPLS 690 CURRENT TOPICS IN VASCULAR AND STEM CELL BIOLOGY 1

This course introduces students to contemporary topics of scientific and clinical importance in vascular and stem cell biology. Lectures and discussions cover a series of subjects, including the nature and origin of stem cells and their application to medicine, inflammation, proteolytic mechanisms of thrombosis, atherosclerosis, angiogenesis, and vascular disease. Offered in the fall semester, this course complements the GPILS Core Course.

GPLS 691 MOLECULAR NEUROSCIENCE AND BIOPHYSICS..... 1

This is lecture and discussion course complements the GPILS Core Course by introducing current topics in the area of cellular and molecular neuroscience. The class meets once a week and consists of lectures that introduce students to topics in cellular and molecular neuroscience, including neurogenetics; neural development; neuroendocrinology; neuropharmacology; neuronal survival and degeneration; neuromodulation; and synaptic plasticity. Each lecture includes a general introduction to a topic followed by discussion of recent studies addressing specific questions relevant to that topic. This course is required for the Program in Neuroscience and is recommended for any student interested in cellular and molecular neurobiology.

GPLS 692 CURRENT TOPICS IN GENETICS AND GENOMICS..... 1

Topics vary from term to term.

GPLS 701 ADVANCED MOLECULAR BIOLOGY..... 3

This is an advanced course for graduate students majoring in molecular biology and genetics. It covers developments in DNA replication, repair, recombination, gene expression, and RNA processing in prokaryotes and eukaryotes (with emphasis on eukaryotic systems).

GPLS 702 BASIC IMMUNOLOGY 4

This core course introduces basic ideas of immunity and the immune system, including evolutionary and comparative studies; specific and nonspecific immunity; the biology of T and B lymphocytes; the genetics of the antigenreceptor and MHC loci; immunochemistry; and the role and action of cytokines. The course includes lectures, student presentations, and term papers.

GPLS 704 PRINCIPLES OF VIROLOGY 3

This core course introduces students to animal virology with a concentration on the pathogenesis, molecular biology, and immunology of selected medically important viruses. Lecture material is drawn from classical and current literature. Students must actively participate in and lead discussions based on assigned readings and submit an in-depth term paper on a key research area in virology.

GPLS 705 BASIC HUMAN GENETICS I 4

Students learn basic genetic principles as they relate to the study of human health and disease. Topics include an overview of human genetics in Mendelian genetics, cytogenetics, population genetics, molecular cytogenetics, oncocytogenetics, clinical applications of principles, and the importance and implications of genetic disease at the levels of the population and individual families.

GPLS 706 HUMAN GENETICS SEMINAR 1

Students, faculty members, and guests participate in the presentation and review of current topics in human genetics.

GPLS 708 CLINICAL GENETICS I 2

Topics include collection and interpretation of pedigree information; determination of modes of inheritance; calculation of recurrence risks; techniques of genetic counseling; and an introduction to genetic nosology. Students gain experience in genetic counseling clinics and on hospital ward consultative rounds, with training in abstract in-patient medical histories, writing evaluation reports cosigned by faculty members, and interpreting laboratory results. Includes three or four embryology lectures.

GPLS 709 ADVANCED BIOCHEMISTRY 3

This course covers topics not normally covered in other biochemical courses, including an advanced treatment of enzyme kinetics, with emphasis on two substrate systems; allosteric control mechanisms; replication and transcription; and the biochemistry of specialized tissues.

GPLS 710 MICROBIAL PATHOGENESIS 3

The aim of this course is to provide a groundwork in basic principles of bacterial pathogenesis and illustrate current research topics and methodologies used in this field. It is assumed that students will be somewhat familiar with fundamentals of bacterial structure and metabolism. The first part of the course covers basic concepts, and the second part examines specific organisms and topics in further detail. Classes consist of lecture material and discussion of research papers, with the idea of familiarizing students with the basic facts and ideas of a subject and exploring methods of study and research questions on that topic. It is expected that students will read the assigned research papers before class and participate in class discussions of the material. There are two exams covering the material discussed in classes, the first just before spring break and the second toward the end of the semester. After the second exam, students make presentations based on assigned reading and research topics.

GPLS 711 GENETIC EPIDEMIOLOGY 3

This course uses qualitative and quantitative traits to discuss genetic and epidemiologic factors affecting normal and abnormal variation within and between populations. Topics include traditional and modern methods of family data analysis, including segregation and linkage analysis; the underlying assumptions of each method (including Hardy-Weinberg equilibrium); steps in each analysis; and computer programs.

GPLS 712 HUMAN CYTOGENETICS 2

This course covers the normal human karyotype; chromosome identification methods; numerical and structural abnormalities and their clinical correlates; X chromosome gene action; chromosomes and cancer; human population cytogenetics; gene mapping; and karyotype evolution. Students give a seminar on a pertinent topic.

GPLS 713 BIOCHEMISTRY STUDENT SEMINAR 2

Under the guidance of a faculty mentor, students critically review a recent scientific paper and deliver a formal presentation to their peers and instructor(s). The topics vary each semester the seminar is offered.

GPLS 714 MUSCLE CONTRACTILITY AND EXCITATION 3

This course covers basic physiology, biochemistry, and biophysics of cardiac, skeletal, and smooth muscle. Topics include ultrastructure of skeletal muscle; mechanical and biochemical features of the crossbridge cycle in contraction; excitation contraction coupling; calcium-induced calcium release in cardiac muscle; and physiology and pharmacology of smooth muscle.

GPLS 715 MUSCLE CELL BIOLOGY AND DEVELOPMENT 3

This course considers the developmental biology of muscle, including its innervation and plasticity. The course begins with a discussion of the factors controlling the proliferation and differentiation of myoblasts. Next are a consideration of fiber type determination, its relationship to use, and the effects of hypertrophy and atrophy on muscle. The structure, function, and formation of the neuromuscular junction and its relationship to the organization of structures in the extrajunctional region forms the next set of topics. Emphasis is placed on the extracellular matrix and the cytoskeleton. The last part of the course deals with the relationship of activity and hormonal influences to the biochemical properties of muscle. The course meets twice a week and consists of one lecture and one session for student oral presentations and discussion of assigned research pertinent to the lecture topic.

GPLS 716 GENOMICS AND BIOINFORMATICS 3

The explosive growth of data derived from genomic and post-genomic projects has revolutionized biology and medicine. As a result, a solid foundation in computational biology and bioinformatics is essential for practitioners of biological and biomedical research. This course emphasizes the theory and application of fundamental, computer-based approaches to sequence analysis, data mining, integration, and interpretation of data related to genes and their function. Using a hands-on, problem-based learning approach, students acquire familiarity with computational tools useful for analysis of the structure, function, and evolution of nucleic acids and proteins.

GPLS 717 MOLECULAR GENETICS AND DEVELOPMENT IN MODEL ORGANISMS 3

This course is for the molecular genetics, genomics, and bioinformatics track of the molecular medicine program. It covers advanced topics in molecular genetics and development and is taught by specialists in each subject. It is offered in the format of lectures and student-directed seminars of recent literature. Some of the lectures are given by the students under the guidance of the course faculty. The addressed topics focus on challenging areas of cell and molecular genetics, such as epigenetics, embryogenesis, and differentiation, in different model organisms.

GPLS 718 PROGRAMMING FOR BIOINFORMATICS .....1 TO 2

This course is an introduction to scripting and programming in bioinformatics. It includes fundamentals of programming in the Perl language for automation and parsing of biological data. Scalar variables and function, conditionals, arrays and loops, and regular expressions are covered. The course is worth 1 credit. A second, optional credit is available for an independent programming project.

GPLS 719 ADVANCED PARASITOLOGY..... 3

This course presents a comprehensive review of the parasites of humans and the diseases they cause. Topics include the biology of selected parasites causing human diseases, including host-parasite interactions at the molecular level and vaccine use; immunological aspects of human parasite-interactions, including ways in which the immune response can mediate pathology and protection; and the epidemiology of human parasitic diseases, including parasite population dynamics, ecology, and transmission.

GPLS 721 MICROSCOPY FUNDAMENTALS AND MODERN IMAGING APPLICATIONS 2

The major goal of this course is for students to gain a comprehensive understanding of modern optical microscopy with a basis in fundamental principles. These principles will be explored further with discussions of core techniques in biological microscopy. Lectures will be combined with interactive demonstrations whenever possible, including hands-on time with the School of Medicine/Physiology Confocal Microscopy Core Facility. Topics include fundamentals of optics and lenses; the anatomy of modern microscopes; fluorescence; light sources and detectors; fluorescent indicators and molecules; photolysis; confocal and multiphoton microscopy; Ca2+ imaging; FRAP; photoactivation; FRET; TIRF; correlative LM/EM; and super-resolution PALM and STED. Faculty auditors are encouraged to attend after discussion with the course organizers.

GPLS 722 GENETICS AND METABOLISM 2

Students study mechanisms of gene action as illustrated by inherited human biochemical defects. Topics include fundamental aspects of the function and malfunction of enzymes, vitamins, and structural and regulatory proteins at the biochemical and molecular levels; clinical features of metabolic diseases; differential diagnosis; and laboratory follow-up. This course is offered in the fall semester every other year.

GPLS 723 BASIC HUMAN GENETICS II 4

Introductory material in basic genetic principles, with emphasis on biochemical and molecular approaches to the study of human health and metabolic disease, will be provided. Primary genetic defects underlying a diversity of disorders will be discussed. Subjects will include molecular and biochemical genetics; immunogenetics; cancer genetics; neurogenetics; and developmental genetics. Clinical applications of metabolic and molecular studies will be discussed. *Prerequisite: Biochemistry.*

GPLS 725 ADVANCED MICROBIAL PATHOGENESIS 3

This course addresses important aspects of microbial pathogenesis and molecular genetics at an advanced level and is based exclusively on current primary research literature; no textbook is assigned. The course is intended to extend students' knowledge from previous courses and prepare them for PhD-level studies in these disciplines. Potential topics include pathogenic mechanisms in relevant organisms while covering gram-positive and gram-negative bacteria, and pathogenic fungi and parasites. Detailed elements of common pathogenic mechanisms, including secretion systems, surface structures, toxin production, and gene regulation, also will be examined. The course attempts to integrate topics of immune modulation and evasion, provide a broad view of the host pathogen interaction, and integrate the newer microbiota studies into the class. The course, therefore, covers a broad view of biological processes that are at the frontier of current knowledge in biology. The instructors are specialists in their fields and give lectures and assign papers related to the subject of the class lecture. Students also are involved in lecture and paper presentations that encourage the interaction and direction of the material covered.

GPLS 731 CLINICAL GENETICS II 2

This lecture series, which complements HGEN 728, covers clinical aspects of genetic disease. Topics include genetic disorders and birth defects; organ systems; metabolic and dysmorphic syndromes; normal prenatal and pediatric development; medical terminology; components of medical charts and physical examinations; and organization and administration of medical centers. The course also introduces other specialties and subspecialties, as most genetic disorders involve coordination of complex medical care.

GPLS 732 POPULATION ASPECTS OF HUMAN GENETICS 1

This course covers basic concepts in genetic epidemiology, including assessment of familial aggregation. It is designed to provide students with a basic understanding of approaches used in gene mapping, such as linkage and association analysis.

GPLS 735 BEHAVIORAL NEUROSCIENCE 3

Behavioral neuroscience is the study of behavior and its biological underpinnings. In this course, students learn how behavior is generated in response to events in the world around us. Students gain a significant understanding of the nervous

system, how it is organized, and how it works in response to the environment. First, the course examines some of the techniques used in behavioral neuroscience. Next, it covers how organisms are built to receive information from the senses and how they turn that information into plans to move our bodies to react to those sensations. The course also covers how the endocrine system, which releases hormones, interacts with the nervous system and influences behavior. Further, it considers a biological basis for higher-order function (e.g., learning and memory) as well as psychological disorders such as schizophrenia, mood disorders, and drug addiction. The course also expects students to gain an ability to understand and critique research literature as it applies to the formal study of behavior.

GPLS 737 PROSEMINAR IN EXPERIMENTAL DESIGN 2

This course is designed to promote strengths in critical thinking, experimental design, and the development of testable hypotheses. Skills in written and oral scientific communication are emphasized. The course format consists of a series of two-hour sessions once a week. Each student does three presentations during the term: a critical analysis of a scientific paper, including identification of hypothesis, predictions, and alternative hypotheses; a proposal based on a previous research experience; and a research project based on a hypothetical data set. For the second and third presentations, students write proposals in the format of National Institutes of Health predoctoral fellowship applications. Students revise their proposals after receiving oral and written critiques by faculty and students. This course is intended for neuroscience-oriented PhD students in various programs who are about to complete their coursework.

GPLS 750 TOPICS IN MOLECULAR MEDICINE 2

This course is aimed at developing the skills necessary for understanding and discovering how changes in gene function cause human disease. The course revolves around topics that use inherited disease processes to illustrate the physiological consequences of molecular, cellular, and genetic phenomena. Recent breakthroughs in the identification of disease-related genes are presented and extended to a discussion about their impact on cell and organ function. Critical reading and discussion of landmark and/or timely papers are stressed. In this way, students learn interesting, state-of-the-art material while developing skills and expertise in integrative biology and molecular medicine. Topics change yearly but have included: paralysis; malignant hyperthermia; cardiac arrhythmias; congestive heart failure; glomerulitis-Alport syndrome; cystic fibrosis, Liddle's syndrome; hyperinsulinemia of infancy; Type 2 diabetes mellitus; influenza; migraine headache and neurogenic inflammation; and Duchenne dystrophy. Two or three one-hour classes per topic consist of interactive discussions after assigned readings and brief lectures. This course is required for all molecular cell biology and physiology students and open to others.

GPLS 755 READINGS IN MOLECULAR SIGNALING AND STRUCTURE 1

This course teaches advanced students contemporary topics of scientific importance pertaining to the interface between macromolecular structure and intracellular signaling pathways. The course revolves around reading and presenting a series of manuscripts relevant to molecular signaling and structure. Manuscripts are selected by the course director(s) for presentation by the students, focusing on features that will complement the student's thesis research plan. Students work on each manuscript as a team and present the product. New knowledge, critical assessment, and the understanding of methodology are stressed. Students relate their own scientific work to the contents of the paper. Students develop new knowledge and analytical skills. In later sessions, students apply these skills by presenting and discussing their independent research projects and reviewing research projects by other students in the class. This course is required for Molecular Signaling and Structure Training Program (MSSTP) students. *Prerequisite: GPLS 601. Completion of GPLS 616 and 709 is recommended.*

GPLS 769 ADVANCES IN IMMUNOLOGY 2

This course will comprise immunologic topics chosen by faculty and students. The material will come mainly from the primary literature, and this will be a discussion-heavy course. Students will be expected to write short summaries of the papers before class begins. In addition, question sets will be prepared by the instructors after the discussions, and students will complete them before the next class.

GPLS 775 INTERFACE OF PAIN, AFFECT AND ADDICTION 3

This course integrates various topics in pain, affect, and addiction research, including circuits and behaviors; molecular mechanisms and chemical synapses; neuroimaging and neuromodulation; and treatments. The format of the course is lecture-based discussions, and evaluation is based on participation, a presentation, and a National Research Service Awards-style grant application.

GPLS 781 TRANSLATIONAL PSYCHIATRY..... 3

The primary goal of this course is to provide students with an opportunity to integrate molecular and systems models of the brain into the context of thought disorder and mental illness and the translation of this work into the clinical setting. The course uses a paired teaching technique (basic scientist paired with clinician) time for integration and discussion. Field trips to imaging facilities, virtual reality labs, and clinical research facilities facilitate a better understanding of translational research. Coursework includes a "translational" grant-writing exercise, a mock review, and student presentations. The course culminates in a "reviewed" grant proposal on innovative translational research.

GPLS 790 ADVANCED CANCER BIOLOGY 3

This course introduces students to the fundamentals of cancer from diagnosis to treatment as well as the latest research discoveries. The course begins with the biology of cancer cells, the stages of cancer, and the types of tumors, and ends with topics related to animal models for studying cancer. Lectures include tumor suppressors; oncogenes; signal transduction; disruption of growth control networks; DNA damage; oncopharmacology; drug design; robotics; and common forms of cancer. This course is required for all molecular and cellular cancer biology students.

GPLS 791 TRANSLATIONAL RESEARCH SEMINAR 2

This seminar course is designed to give scientists (graduate students or postdoctoral fellows), clinicians, and other interested parties the basic information to assess the therapeutic and diagnostic potential of basic science research discoveries. It also provides students with the tools to approach translational research in their present and future work. The course covers the core competencies in clinical and translational research, and each session addresses core thematic areas. Students meet once a week for a 90-minute period for 10 weeks. Faculty members give a 40-minute lecture, followed by a 20-minute PowerPoint presentation by a student. The presentation is followed by a 30-minute discussion in which all students are encouraged to participate. Students are given a take-home short answer question, based on each lecture. The student presentations and short answers count toward the final grade. An assigned paper also is given.

GPLS 799 MASTER'S THESIS RESEARCH .....1 TO 6

Required enrollment for students engaged in master's thesis studies.

GPLS 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

GPLS 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

HGEN 601 BASIC HUMAN GENETICS I 4

This course provides an introduction to the application of basic genetic principles to the study of human health and disease. An overview of basic human genetics is provided in Mendelian genetics, cytogenetics, population genetics, molecular cytogenetics, oncocytogenetics, and clinical applications of principles. The importance and implication of genetic disease at the levels of the population and individual families are discussed.

HGEN 602 BASIC HUMAN GENETICS II 4

Introductory material in basic genetic principles, with emphasis on biochemical and molecular approaches to the study of human health and metabolic disease, is provided. Primary genetic defects underlying a diversity of disorders are

discussed. Subjects will include molecular and biochemical genetics; immunogenetics; cancer genetics; neurogenetics; and developmental genetics. Clinical applications of metabolic and molecular studies are discussed. *Prerequisite: Biochemistry.*

HGEN 608 HUMAN GENETICS SEMINAR..... 1

Graduate students, faculty and guests participate in the presentation and critical review of current topics and interests in the field of human genetics. *Prerequisite: Consent of the program director.*

HGEN 609 SPECIAL PROBLEMS IN GENETICS.....1 TO 3

Topics vary from term to term.

HGEN 610 GENETIC COUNSELING SEMINAR..... 1

Through case presentation, group discussion, and role-playing with first-year master's in genetic counseling students and faculty, second-year students evaluate their role and improve their skills in the genetic counseling process. The medical, psychosocial, and ethical issues encountered in concurrent clinical rotations will be thoroughly explored. Recent literature relevant to these issues also will be reviewed.

HGEN 611 WORKING WITH SUPPORT GROUPS..... 2

This two-semester course will give students hands-on experience with genetic support groups. Each student will be assigned a local, regional, or national support group to work with during their first year of study. Students will assist the group in organizing weekly, monthly, or annual meetings and other activities of the group, including newsletter distributions, sending information packets to interested individuals, updating packet materials, etc. The student will spend at least one day with the family of a child with a genetic disorder, interview a parent of a child with a genetic disorder, and write a final paper describing the experience. Students also attend a rotation at the Genetic Alliance in Washington, D.C.

HGEN 615 CLINICAL APPLICATIONS WORKSHOP..... 1

This course is designed to give first- and second-year students a forum to critically evaluate current topics in the genetics profession and develop clinical skills that will enhance clinical practice. Students will participate in group discussions of current topics in genetics literature. They also will complete a series of assignments and presentations designed to develop creative educational tools and improve familiarity with genetics activities and resources.

HGEN 620 INTRODUCTION TO GENETIC COUNSELING..... 2

This course is designed to introduce the principles of the field of genetic counseling. The lecture series will cover the history behind the development of genetic counseling as a profession, and the concepts of nondirectiveness and patient autonomy will be emphasized throughout the course. Applications of genetic counseling in medical care also will be demonstrated, with special attention to the psychosocial aspects of the field. This course is designed to complement HGEN 728-Clinical Genetics I, and, along with HGEN 621, will help prepare students for clinical rotations the following year.

HGEN 621 GENETIC COUNSELING: PRINCIPLES AND PRACTICE 2

This course is designed to complement HGEN 620 and introduce the student to advanced topics in genetic counseling. Genetic counseling in specific practice areas such as cancer genetics, assisted reproductive technology, and teratology will be presented. Client-centered counseling theory and multicultural counseling also will be addressed. To emphasize the psychosocial aspects of genetic disease, guest lecturers who have direct experience with a genetic disease will discuss their experiences. The course is designed to fine-tune students' sensitivity to psychosocial issues and to prepare them for clinical rotations. *Prerequisite: HGEN 620 or equivalent.*

HGEN 700 PSYCHOSOCIAL GENETIC COUNSELING 3

Through didactic lectures, case discussion, and role-playing, students learn to identify and understand the psychosocial aspects of genetic counseling and the impact of genetic knowledge on the individual and the family. Human development and the theoretical underpinnings of counseling models and psychotherapy, as they relate to genetic counseling, are reviewed. The course focuses on specific techniques of the counseling process, including the rationale for the technique, the timing of the technique, and the evaluation of the technique. Students learn to differentiate between content and process in the genetic counseling process and formulate a comprehensive biopsychosocial assessment, with an appreciation of the function of race, gender, social class, and sexual orientation in human behavior.

HGEN 701 HUMAN CYTOGENETICS 2

This course covers the normal human karyotype; chromosome identification methods; numerical and structural abnormalities and their clinical correlates; X chromosome gene action; chromosomes and cancer; human population cytogenetics; gene mapping; and karyotype evolution. Students give a seminar on a pertinent topic. *Prerequisite: HGEN 601 or equivalent.*

HGEN 703 RESEARCH FOR GENETIC COUNSELORS 1

This course is designed to introduce the principles of research in the field of genetic counseling. The lecture series will cover an overview of types of research while students create and develop their own research project.

HGEN 718 LABORATORY ROTATION.....1 TO 3

Students participate in one- to three-week rotations in each of the University of Maryland Medical System's clinical service laboratories (cytogenetics, prenatal screening, biochemical, and molecular) to gain an understanding of laboratory techniques and an appreciation for the complexity of genetic testing.

HGEN 720 METABOLIC GENETICS..... 2

This course focuses on the study of mechanisms of gene action as illustrated by inherited biochemical defects in humans. The function and malfunction of enzymes, vitamins, and structural proteins are discussed. The molecular basis of the specific defects is covered. And the clinical features of metabolic diseases, differential diagnosis, and laboratory follow-up are reviewed. Class discussions assume students have a background in basic biochemistry and human genetics. *Prerequisites: Biochemistry and HGEN 602 or equivalent.*

HGEN 728 CLINICAL GENETICS I.....2 TO 4

Topics in this course include collection and interpretation of pedigree information and an introduction to genetic nosology. Normal prenatal and pediatric development and embryology will be reviewed to give the student a better understanding of the disease process. Medical terminology, components of medical charts and physical examinations, and the organizations and administration of medical centers also will be covered.

HGEN 731 CLINICAL GENETICS II 2

This course is designed to complement HGEN 728 and covers all clinical aspects of genetic disease. The lecture series will cover specific genetic disorders and birth defects, organ systems, and both metabolic and dysmorphic syndromes *Prerequisite: HGEN 728 or equivalent.*

HGEN 740 MOLECULAR BASIS OF HUMAN DISEASE..... 2

This course provides students with a detailed analysis of molecular approaches used to characterize the genetic defects of inherited human disorders. Topics include the diversity of technical approaches with emphasis on recent developments; the general utility and limitations of various approaches; the importance of analysis of mutational spectra, and potentials for gene therapy. *Prerequisites: Biochemistry and HGEN 602 or equivalent.*

HGEN 745 CLINICAL TRAINING SITE ROTATION..... 3

Master's in genetic counseling students gain practical experience through clinical rotations, working at clinical training sites approved by the American Board of Genetic Counseling. Each student is supervised on-site by a board-certified genetic counselor or geneticist. Hands-on training

in genetic counseling is essential to each student's learning experience and allows the student to gain confidence and expertise in the field of genetic counseling.

HGEN 750 ADVANCED TOPICS IN GENETIC COUNSELING 2

This course is designed as a forum for discussing the ethical, legal, and societal issues involved with genetic counseling. Guest lecturers from the departments of pastoral care, neonatology, and risk management and the schools of law and social work will present topics relevant to genetic counseling. The National Society of Genetic Counselors' code of ethics is critically analyzed.

HGEN 760 CLINICAL CANCER GENETICS 2

This course is designed to introduce the principles and practice of genetic counseling for hereditary cancer syndromes. Topics that will be covered include cancer epidemiology, terminology and pathology; current prevention, surveillance, and treatment options; clinical characteristics of common and rare hereditary cancer syndromes; genetic risk assessment and testing; and the psychosocial aspects of genetic counseling for hereditary cancer syndromes.

HGEN 780 ADVANCED CLINICAL GENETICS 1

This course is a review of structural fetal abnormalities by organ system (brain, face and neck, limbs, and growth, etc.) from a clinical genetics perspective focusing on embryology, differential diagnosis, prenatal diagnosis, and postnatal prognosis.

HGEN 799 MASTER'S THESIS RESEARCH.....1 TO 12

Required enrollment for students engaged in master's thesis studies.

MANA 601 STRUCTURE AND DEVELOPMENT (ANATOMY, HISTOLOGY, AND EMBRYOLOGY) 9

The purpose of this course is to provide students with a comprehensive understanding of the human body at the gross anatomical and microanatomical levels. The basic concepts of structure as related to function are described in lectures and small group laboratory sessions. Laboratory facilities are provided for cadaver dissection and the examination of histological slides. The course includes instruction in embryology, which is taught in an integrated fashion. The course is offered only in the fall semester.

MEDT 628 SEMINAR 1

This seminar exposes students to topics in biomedical and clinical laboratory science, science education, and laboratory management. Students participate in 15 seminars presented by guest speakers, faculty members, and fellow students. Students take the course for credit research-approved topics and develop their oral presentation skills by presenting seminars. Graduate students must enroll in this course three times. All graduate students from the program must attend seminar during their tenures.

MEDT 630 SCIENTIFIC AND TECHNICAL WRITING 3

A systematic approach helps students write clear and concise scientific and technical communications for specific purposes. Designed for people in technical and scientific fields, this course helps those whose increasing specializations require them to communicate in memoranda, letters, journal articles, reports, presentations, proposals, and progress reports.

MEDT 631 RESEARCH DESIGN 2

This course explores the theory of research design and requires that students show their understanding through integration of design theory into their thesis proposals. The didactic portion of the course is presented during a weekly one-hour class where theory is presented and discussed. The class reviews weekly homework assignments on such topics as hypothesis formulation, design of a research study, and critique of the scientific paper. The assignments serve to meld the theory with its laboratory application. Students present their thesis proposals at the end of the semester.

MEDT 634 TEACHING PRACTICUM MAJOR..... 4

This course provides information and experience to graduate students, preparing them to assume the duties of an instructor in their declared majors. Students prepare lectures and display materials, conduct library research, and evaluate and assess instructional techniques. *Prerequisite: Adequate background in the major subject.*

MEDT 635 TEACHING PRACTICUM MINOR..... 2

Graduate students teach in a declared minor subject from a variety of areas in clinical laboratory science education in the undergraduate program. Students help faculty members in preparation of lecture and demonstration materials, library research, and evaluation and assessment of instructional techniques. Special assignments enable students to strengthen their knowledge in selected areas. *Prerequisite: Competence in minor subject.*

MEDT 638 SPECIAL TOPICS.....1 TO 4

Graduate students work on subjects of interest not offered otherwise as a formal course. The study program consists of special reading assignments, reports, or research projects under the supervision of a faculty member.

MEDT 639 MANAGEMENT PRACTICES IN LABORATORY SCIENCES .....1 TO 6

Graduate students work on special subjects in the field of management not offered as a formal course. Under the supervision of a faculty member, students learn how to carry out new strategies or conduct the business of running a clinical or research laboratory daily. Students also take part in long-range laboratory planning.

MEDT 654 ADVANCED TOPICS IN LABORATORY SCIENCES..... 2

This course exposes students to emerging technologies in the clinical laboratory. The didactic portion of the course provides an in-depth study of the theory and basic mechanisms of function for each of the topics selected. After the introduction of each topic of study, various applications are examined with the use of current research articles. Students are expected to show active participation in the presentation of the journal articles discussed. At the end of the term, students submit a paper outlining the advantages and disadvantages of a selected technology. This course is designed to teach students to develop the skills necessary to maintain up-to-date knowledge on new technologies and continue to grow as members of an ever-evolving clinical laboratory science.

MEDT 661 ADVANCED HEMATOLOGY..... 2

This course focuses on the theoretical and practical aspects of hematological disorders, including red cell disease, white cell diseases, and disorders of hemostasis. Emphasis is on comprehensive theory, laboratory practices, and current treatment modalities. In case-study format and open discussion, the course covers the correlation of laboratory findings and disease processes.

MEDT 671 MOLECULAR AND CELL BIOLOGY 3

Lectures cover the principles of molecular and cell biology. Students learn the theories behind basic molecular biology techniques, including gel electrophoresis; hybridization techniques; PCR; Southern blot; and site-directed mutagenesis. The second part of the course covers applications of molecular biology, including DNA vaccines; bioremediation; molecular diagnostics; and gene therapy.

MEDT 680 LABORATORY MANAGEMENT..... 3

This course is an overview of laboratory management in four areas: personnel, operations, regulations, and finance. Additional emphasis is on trends in laboratory services, laboratory accreditation and licensure, and accreditation procedures. Topics include organizing, planning, controlling, and supervisory functions of the management process; leadership styles; performance evaluation; the interview process; professional liability; teaching techniques; problem-solving; and professional responsibility and ethics. The program recommends that laboratory management track students take this course in their second year.

MEDT 687 QUALITY CONTROL AND REGULATIONS IN LABORATORY SCIENCES..... 2

This course focuses on the application of basic statistical principles to the maintenance of quality control in the laboratory. The second part of the course prepares students for the workforce. Students gain skills and knowledge to be current, efficient, and compliant with the latest regulatory issues, whether working in a clinical laboratory, research setting, or the biotechnology industry.

MEDT 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

MEES 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

MEES 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

MHS 600 INTRODUCTION TO LIBRARY RESOURCES AND SCHOLARLY WRITING..... 1

This course is designed to provide learners the opportunity to develop skills in accessing relevant online library resources and engaging in scholarly writing. The portion of the course focusing on library resources teaches and strengthens lifelong research and information competency skills by introducing students to the nature of research and the role of the library in the research process. Students learn the core concepts of information retrieval and essential techniques for finding, evaluating, analyzing, organizing, and presenting information. The topics covered include using online catalogs to locate books and other library resources; developing research strategies; exercising critical thinking to evaluate information; applying critical and search techniques to electronic databases; understanding citation formats; and using the internet as a research tool. The scholarly writing portion of the course will place emphasis on organization, effective conveyance of thoughts through written words, and writing for multiple types of audiences. Students will have the opportunity to improve their academic writing and research skills as they write a literature review or a proposal. Emphasis is placed on conventions of scholarly writing and organizational strategies as well as grammar, editing, and usage.

MHS 601 INTRODUCTION TO RESEARCH ADMINISTRATION..... 3

This course provides an overview of the complex environment that supports the academic research enterprise from a historical and evolutionary perspective, including examples of seminal studies and research controversies. Students consider the partnerships between the federal government, industry, and academic and clinical research institutions. The course explores the design and implementation human research studies and covers a variety of topics, including components, general principles, and issues in academic research.

MHS 602 LEGAL AND ETHICAL ISSUES FOR HEALTH, HUMAN SERVICES, AND CLINICAL PROFESSIONALS..... 2

This eight-week, 2-credit online course explores ethical and legal issues that are timely and germane to health professionals. The course is based on the premise that to act in an ethical manner means to engage in conduct according to accepted principles, and that to improve moral confidence and moral action, we must prepare the next generation of health professionals with the requisite ethical resources, tools, and skills. A case-based learning design will be used to engage students in ethical discussion, exploration, and analysis with the goal of determining ethical and legal action that is sound and logical. The course will prepare students to make ethical health care decisions.

MHS 605 PERSPECTIVES ON GLOBAL HEALTH 3

This course is an overview of the field of global health. The focus is on analyzing and responding to major global health challenges and international policies. Analysis covers national and transnational health trends, including major communicable and noncommunicable disease burdens. The World Health Organization and other international health interventions that address the determinants of health and disease and current and emerging global health priorities, such as disaster relief and infectious diseases are assessed. Topics include key legal issues, ethics, and models of reform to global health programming and their applications. Skills are developed in analysis, leadership, teamwork, and communication in a global context. This is the first of two core courses toward the global health certificate, and it lays the global health framework for MHS 610's global health applications and challenge at the local or community level.

MHS 608 RESEARCH SEMINAR I 3

This 3-credit seminar course is designed to give students basic information regarding health sciences research discoveries. It also provides students with the tools to approach translational research in their present and future work. The course covers the core competencies in clinical and translational research, and each session addresses a core thematic area.

MHS 609 RESEARCH SEMINAR II..... 3

This course is a continuation from Research Seminar I. Research groups work with a faculty mentor to prepare future clinicians to interpret relevant literature and be aware of the social, psychological, economic, and cultural determinates of health. The course uses strategies to incorporate the principles of health promotion and disease prevention to promote optimal health care outcomes and to minimize health disparities. *Prerequisites: PREV 600, PREV 621, MHS 608.*

MHS 610 NATIONAL AND INTERNATIONAL APPROACHES TO HEALTH CARE AT THE COMMUNITY LEVEL 3

This course applies the concepts, theories, and principles of the field of global health presented in MHS 605 to the practical challenges facing global health professionals at the community implementation level. Each student selects a specific global health priority for a given national or geopolitically defined population to examine at the local/community level. Students explore how this local health plan differs from, and interacts with, national and international plans for the same health issue. The student's selected case then will be the primary focus for applying needs assessment methodologies, including epidemiological methods; mapping local, national, and global policy processes (based on students' work in MHS 605); identifying strategies for building local infrastructure and workforce capacity; analyzing financial opportunities and limitations; and assessing the impact of macro changes in the global economy, political environment, and human rights and legal systems on the locally identified health structures and systems. Each student completes a final project report that will summarize findings regarding scope, options, outcomes, and a recommended action plan for improving the health status of the local population group each student has studied.

MHS 612 INTRODUCTION TO INTEGRATIVE HEALTH AND BIOLOGICAL AND BODY-BASED INTERVENTIONS 3

In this course, students examine the fundamental concepts of integrative health and wellness (IHW), including the history, philosophies, and methods of prominent integrative therapies. Perceived differences between and limitations of traditional "allopathic" medicine and IHW "nontraditional" medicine are identified. Patients' motivations and patterns of use of IHW approaches are explored. Components of the five major areas within IHW as identified by the National Institutes of Health are introduced. These areas include alternative medical systems; body-based systems (massage, chiropractic, rolfing); mind-body medicine; biological approaches (herbal medicine, nutritional approaches, pharmacological therapies, Ayurveda); and bioelectromagnetics (energy healing). The state of basic scientific knowledge and data from controlled trials relating to the safety, efficacy, and mechanisms of action of integrative therapies are presented. In the second half of the course, an overview of the scientific evidence for the integrative biological and body-based approaches are provided. Theories for how these approaches function to affect health are examined, such as psychoneuroimmunology, the role of inflammation, and the gut microbiome. Key practice, legal, and ethical issues facing CAM researchers and practitioners are reviewed.

MHS 622 IMPROVING QUALITY OF CARE IN HEALTH SYSTEMS..... 3

This course explores health policy, finance, and system issues that are timely and germane to health professionals. The course is based on the premise that to practice in today's complex health care environment, students must understand the economic and theoretical underpinnings of the health system. A case-based learning design is used to engage students in discussion, exploration, and analysis with the goal of improving the safety and quality of care provided in health systems. This course will prepare students to make informed health care decisions related to practice, health finance, and patient safety.

MHS 628 INTEGRATIVE HEALTH AND WELLNESS COACHING..... 3

Students learn the fundamentals of health coaching, a process of guiding and empowering clients to make and sustain choices to achieve health and wellness. The course provides a review of the frameworks and techniques of health coaching from a holistic perspective, including assessment, identification of goals and barriers, development of action plans, implementation strategies, and monitoring progress. Students will learn and apply health behavior change theories and models as well as interventions from integrative health and wellness. Learning activities include a review of empirical research; class discussions; peer coaching activities; independent assignments; and a class compilation of personal, social, lifestyle, and medical resources to encourage client wellness. Peer coaching sessions allow students to experience the role of a health and wellness coach and that of a coaching client.

MHS 630 ESSENTIALS OF CHRONIC INFECTIOUS EPIDEMIOLOGY..... 3

In the past 15 years, there has been an unprecedented rise in chronic disease impacted by behavior and policy, infectious disease outbreaks, and new mechanisms of spread in the United States. Clinicians must consider the biosocial impact of globalization and environmental change upon health and disease. This course presents fundamental concepts of epidemiology to assist new clinicians in their efforts to critically evaluate health and medical literature, participate in monitoring and surveillance of disease, and interpret data in their individual practice, community, and nation to improve care in their practice and professional sphere.

MHS 633 CLINICALLY APPLIED CONCEPTS IN SOCIAL AND BEHAVIORAL HEALTH..... 3

This core course focuses on the proposition that health is driven by behaviors of the patient, community, or society, and by the health professional. The course discusses six behavior theories that effect health promotion practice whether with a patient or the environment in which the patient lives and works. It integrates these behavior theories into three levels of activity (individual, community, societal) and defines their outcomes within the social determinants of health. In illustrating these theories and their outcomes, the course also defines and provides an overview of nine health issues common in health care delivery. *Prerequisites: MHS 600 and MHS 602.*

MHS 636 ADVANCED SKILLS IN INTEGRATIVE MIND-BODY INTERVENTIONS..... 3

This course is designed to provide students with an evidence-based and experiential understanding of mind-body approaches to promoting health and healing disease. Students are provided with an overview of the scientific evidence for the efficacy and mechanisms of action of mind-body therapies for health promotion and the treatment of disease. Students learn advanced skills in approaches that promote and/or rely on the connection between the mind and body. These include meditation; mindfulness; guided imagery; hypnosis; acupuncture; yoga; Tai chi; Qigong; spirituality and energy therapies; journaling; and creative art therapies. Students participate in experiential learning by practicing mind-body approaches and interacting with an integrative health provider to increase their self-awareness of the interconnections between the emotional, physical, mental, social, and spiritual aspects of health.

MHS 652 LEADERSHIP AND COMMUNICATION 3

Students learn effective management and communication skills through case-study analysis, reading, and class discussion. The course covers topics such as effective listening; setting expectations; delegation; coaching; performance; evaluations; conflict management; negotiation with senior management; and leading with integrity. *Prerequisite: MHS 600.*

MHS 698 SPECIAL TOPICS .....1 TO 3

In this special topics course, participants learn about common sources of stress and burnout in the field of death and dying, resiliency and self-care, and why professionals need to diligently practice resiliency-building strategies throughout their careers. Participants learn and practice several strategies to build resiliency and will reflect on their experiential learning. At the end of the course, students will have produced a personalized resiliency-building tool kit to build resiliency and prevent burnout.

MHS 700 CAPSTONE PRESENTATION 3

The capstone is designed to be a supervised health science learning experience and a demonstration of the substantive application of the knowledge and skills that have been acquired in the courses taken as part of the MS in Health Science Program. The capstone functions as the practice experience and the culminating experience for the program. The MS in Health Science capstone experience includes the following components: development of a capstone proposal; delivery of an oral presentation at UMB and at the field placement site as appropriate; preparation of a capstone portfolio.

NURSING: NDNP, NPHY, NRSG, NURS –
See all course descriptions at
https://surfs.umaryland.edu/SIMS/bwckschd.p_disp_dyn_sched

PALC 601 PRINCIPLES AND PRACTICE OF HOSPICE AND PALLIATIVE CARE..... 3

In this introductory course, participants learn about the patient/family-centric model of palliative care, the interdisciplinary team concept, models of care in hospice and palliative care, and regulatory aspects of these practice models. Participants also learn about education and self-care for practitioners, operational aspects of hospice and palliative care, the application of analytic inquiry and evidence-based discovery, and implications for community outreach.

PALC 602 PRINCIPLES AND PRACTICES OF PALLIATIVE CARE EDUCATION 3

This course provides participants with a solid grounding in the principles of adult learning, how to assess knowledge and learning differences, principles of instructional design, and barriers to teaching and learning. Participants will be prepared to perform an audience analysis and deliver learning materials to patients, families, caregivers, health care providers, and other stakeholders.

PALC 603 COMMUNICATION AND HEALTH CARE DECISION-MAKING 3

This course lays the foundation for effective communication with patients, families, and colleagues. Clear and compassionate communication skills are essential when determining patient and family goals, preferences, and choices during advanced illness, and developing a plan of care to support these preferences. A significant portion of this course is devoted to communication techniques, including delivering serious news, facilitating family conferences, enhancing team communication, and participating in the shared decision-making process. Introductory content on moral principles and ethical decision-making also are explored.

PATH 602 SYSTEMIC PATHOLOGY..... 3

This course covers in-depth the disease entities and disease processes of the following organ systems: blood vessels; heart; lungs; head and neck; gastrointestinal tract; liver and biliary tract; pancreas; kidneys; lower urinary tract and male genital system; female genital tract; breast; endocrine system; skin, bones, joints and soft tissue; peripheral nerves and skeletal muscles; central nervous system; and eyes. Neonatal, forensic, and environmental pathology topics are also presented as they relate to the organ systems. Instruction is by lecture, laboratory, and computer. The course is offered only in the spring semester.

PATH 603 GENERAL PATHOLOGY 3

This course covers the major subdivisions of general pathology: cellular adaptations; tissue inflammation and repair; neoplasia; environmental and nutritional pathology; and diseases of infancy and childhood. Laboratory sessions include a brief introduction to the following topics, as they relate to anatomic pathology: accessioning; patient identification; protected health information; proper laboratory attire and personal protective equipment; common fixatives; and histologic tissue processing and staining. Instruction is by lecture, laboratory, and computer. The course is offered only in the fall semester.

PATH 608 AUTOPSY PATHOLOGY 3

This course provides didactic and clinical practical autopsy procedure/performance experience during the second year of study of the Pathologist Assistant Program. The student will become proficient in all phases of the human post-mortem examination, adult and fetal/pediatric, including review of consent forms, death certifications, and medical records; decedent identification; evisceration; organ block dissection; description of findings; and preparation of post-mortem reports. Students receive basic instruction in the function of the autopsy service and the hospital morgue. Practical aspects of specimen photography also are presented during the course. Students are exposed to basic concepts of the medicolegal investigation of death in a one-month rotation at Maryland's Office of the Chief Medical Examiner, where the students receive hands-on instruction in forensic autopsies.

PATH 609 SURGICAL PATHOLOGY 3

This course provides didactic and clinical practical experience during the second year of study in the Pathologist Assistant Program. The student will become proficient in all phases of anatomic pathology dissection with respect to surgically excised specimens, including specimen identification; tissue triaging for ancillary studies; review and interpretation of clinical data; gross specimen description; sectioning and sampling; intraoperative consults and frozen sections; specimen photography; and cancer staging by gross pathology.

PATH 751 CLINICAL PATHOLOGY AND MICROBIOLOGY 3

This course provides the Pathologist Assistant Program student with a working knowledge of clinical pathology, including hemodynamic disorders; thromboembolic disease and shock; genetic disorders; diseases of the immune system; diseases of white blood cells, lymph nodes, spleen, and thymus; red blood cell and bleeding disorders; and infectious diseases/ medical microbiology. Instruction is by lecture, laboratory, and computer. The course is offered only in the spring semester.

PATH 789 SPECIAL TOPICS: PATHOLOGY ..... 1 TO 3

This special-topics course for Pathologist Assistant Program students comprises two separate summer term courses, one at the beginning of the first year and one between the first and second years. In the first-year special topics course, students are given a primer in human anatomy, histology, and embryology and follow a self-study based introduction to medical terminology. Instruction is by lecture and computer. The special topics course between the first and second year provides an introduction to surgical pathology dissection; intraoperative consult and staining; autopsy procedure; medical photography; medical ethics; more in-depth medical terminology; molecular diagnostics; immunohistochemistry; histology; and additional general anatomic pathology topics, including laboratory safety and governing/regulating bodies. Instruction is by lecture, computer, and observation and limited practical applications in surgical pathology and histology and hospital and forensic autopsy pathology. The courses are offered only in the summer semester.

PHAR 600 PRINCIPLES OF DRUG DISCOVERY 3

This interdisciplinary, modular-based course describes the interrelationship among the disciplines of the pharmaceutical sciences and establishes the basic theoretical background essential to the drug design and development process. A progression of pharmaceutical sciences content is presented and considers the drug discovery process, beginning with traditional drug design and optimization of drug structure, continuing with principles of pharmacology, including macromolecular structure, genomics, and proteomics, and followed by modern drug discovery methods based on knowledge of the structure and pharmacology of target molecules.

PHAR 601 PRINCIPLES OF DRUG DEVELOPMENT.....1 TO 3

This interdisciplinary, modular-based course describes the interrelationships among the disciplines of pharmaceutical sciences and establishes basic theoretical background essential for the drug design and development process. Built upon subject matter presented in PHAR 600-Principles of Drug Discovery, the course covers the areas of pharmaceutics, biopharmaceutics, pharmacokinetics, and drug metabolism. Integrative competency is developed and demonstrated in the final module.

PHAR 602 APPLIED PHARMACOKINETICS..... 3

This course focuses on drug absorption, distribution, metabolism, and excretion coupled with dosage and the parameters of clearance, volume of distribution, and bioavailability. These processes determine the concentration of drug at the site of action in the body. The course covers the quantitative relationship between dose and effect as a framework to interpret measurement of drug concentrations in biological fluids and pharmacokinetic principles using mathematical processes and descriptive parameters that describe the time course of drugs in the systemic circulation and the relationship of drug concentrations to observed effect.

PHAR 608 INTRODUCTION TO LABORATORY RESEARCH.....1 TO 2

This course provides students with the opportunity to perform mini-research projects in faculty research laboratories.

PHAR 610 PHARMACEUTICAL FORMULATION AND UNIT PROCESSES..... 2 OR 4

This course addresses the rational design and formulation of dosage forms and the processes and equipment in their large-scale manufacture. Consideration is on how the interplay of formulation and process variables affects the manufacturability of the dosage form and its performance as a drug-delivery system.

PHAR 615 PSC ETHICS AND BIOSTATISTICS.....1 TO 2

Recent decades have seen examples of challenges to ethics in scientific research. With the goal of providing complete and contemporary training in research, this course exposes students to acceptable and unacceptable ethical behaviors. To help students understand the issues and aid in discussions, this course is heavily case-based. Students gain training in appropriate experimental design and ways of conducting experiments and analyzing data. Students also learn to identify ethical issues in a practical sense by critical review of manuscripts. This course is offered to graduate students (MS and PhD) and to pharmacy (PharmD) students. Knowledge gained in the course is considered an integral component of students' research training in pharmaceutical sciences.

PHAR 620 MODERN METHODS OF DRUG DELIVERY 2

This course focuses on the rationale for existing and future drug-delivery systems. Students explore underlying physical, chemical, and biological bases for each system and identify benefits and drawbacks. Examples of delivery systems include inhalation aerosols, transdermal patches, microspheres, implants, and tablets. Emphasis is on biopharmaceutics and transport properties and barriers associated with each method of delivery. The course also stresses written and oral presentation skills through student presentations and paper critique sessions.

PHAR 621 MOLECULAR BIOPHYSICS.....1 TO 3

This course focuses on physical aspects of the structure and function paradigm of biological and pharmaceutical molecules. Designed for experimentally and theoretically/computationally oriented graduate students in pharmaceutical, chemical, biochemical, and medical sciences, this course offers students exposure to basic theories and computational methods for studying the mechanisms of biological systems at an atomic level of detail.

PHAR 622 ADVANCED PHARMACOGENOMICS..... 1

Interindividual variability in drug effects and the lack of reliable prediction of this variability have been recognized as major

barriers to safe and efficient therapeutics. Genetic makeup is one of the intricate factors that has substantial influence on drug efficacy or toxicity. Pharmacogenomics deals with heredity and effects on drug response. It combines traditional pharmaceutical sciences with contemporary knowledge of genes, proteins, and SNPs. The objective of this course is to enable the student to understand basic pharmacogenomic principles and their potential use for developing better and safer drugs.

PHAR 628 BIOANALYTICAL AND PHARMACOLOGICAL METHODS .....1 TO 3

This course describes techniques and strategies for isolating, detecting, and analyzing experimental data. Topics range from methods relevant to small molecules, tissues, and cells to methods relevant to whole animals.

PHAR 638 PHARMACOMETRIC DECISION-MAKING 3

This course covers the theoretical and practical application of statistics and experimental design to help students use tools in research problems. The class discusses and uses computer programs to analyze data representing actual experimental situations. *Prerequisites: PHAR 602 or PHAR 663.*

PHAR 639 SPECTROMETRIC METHODS .....1 TO 3

This course introduces students to spectrometric techniques for the elucidation of molecular structure and to the analysis of pharmaceutically important materials. The methodologies covered include ultraviolet-visible, infrared, nuclear magnetic resonance, and mass and fluorescence spectrometry. The class includes discussions of physical principles, instrumentation involved, exercises in the interpretation of spectrometric data, and examples of application.

PHAR 651 RECENT ADVANCES IN PHARMACOLOGY..... 1

This course provides students with an understanding of recent progress in basic and clinical pharmacology research, from new concepts in pharmacology to new techniques and trends in pharmacology.

PHAR 653 ADVANCED PHARMACOLOGY I 4

Advanced Pharmacology I and II cover mechanisms by which pharmacological agents interact with the living organism to provide students with a rational basis for investigations in biomedical research. Topics include the pharmacodynamics and biochemical and physiological effects of drugs on biological systems, including the central and peripheral nervous system and the endocrine, renal, respiratory, and cardiovascular systems. Lectures supplement weekly conferences and discussion groups.

PHAR 654 ADVANCED PHARMACOLOGY II..... 4

Advanced Pharmacology I and II cover mechanisms by which pharmacological agents interact with the living organism to provide students with a rational basis for investigations in biomedical research. Topics include the pharmacodynamics and biochemical and physiological effects of drugs on biological systems, including the central and peripheral nervous system and the endocrine, renal, respiratory, and cardiovascular systems. Lectures supplement weekly conferences and discussion groups.

PHAR 662 CLINICAL PHARMACOKINETICS 2

After successful completion of this course, students should be able to describe the principles of and most current approaches to therapeutic drug monitoring;, describe the mechanism of and predict the effects of metabolic drug interactions (induction vs. inhibition); give the rationale for dose adjustments in special populations, including elderly, obese, liver, and kidney disease patients; apply pharmacokinetic principles, in a scientific manner, to solve a clinical problem/question; and provide a succinct, well-written pharmacokinetics consult note.

PHAR 663 STATISTICS FOR PHARMACOMETRICS I..... 3

The field of pharmacometrics requires good understanding of statistical concepts. This course provides the basic statistical principles required for a pharmacometrician. This introductory-level course also strengthens the student's understanding of pharmacokinetic-pharmacodynamic modeling aspects. The course material is tailored for pharmacometricians. *Prerequisite: PHMX 601.*

PHAR 665 DOSE-RESPONSE TRIALS..... 3

Knowledge of designing and analyzing dose response is an important component of a drug development or regulatory review. Basics of the variety of dose-response designs such as parallel, cross-over, flexible-dose, titration, withdrawal, adaptive, and enrichment trials are explained. Students perform clinical trial simulations for supporting the choice of appropriate designs and analyses. Innovative designs and data analysis make characterizing dose response feasible within the realms of drug development. The information generated from such trials is key for the approval of new drugs and drug product labeling. *Prerequisite: PHMX 601.*

PHAR 666 COMMUNICATIONS AND NEGOTIATIONS 2

This course improves students' abilities to communicate and negotiate strategically. Students identify their communication styles and learn how to compensate for any weaknesses. Scientists in life sciences work with interdisciplinary scientists with diverse backgrounds. Pharmacometrics has not reached its full potential yet and is breaking new ground. To influence key decisions during drug development, during regulatory review, or in clinics, pharmacometricians need to communicate in a manner that is simple, persuasive, and effective. Implementation of model-based drug development calls for change from current practice, and such changes are often resisted. Scientists who lack authority to implement solutions need to master effective negotiation skills amid diverse opinions, thereby leading the team toward consensus.

PHAR 667 ORGANIC SYNTHESIS IN DRUG DESIGN .....1 TO 2

Students are taught the application of synthetic organic chemistry to drug design. The course includes instruction in a range of standard functional group transformations and chemical mechanisms. Discussion then shifts to apply this synthetic chemistry knowledge to the synthesis of peptides, peptoids, small molecules, and natural products. Protecting group chemistry and solid phase synthesis also are discussed.

PHAR 702 ASPECTS OF SOLID DOSAGE FORMS..... 3

A survey of the performance and processing of solid dosage forms. As most pharmaceuticals are prepared from powders, emphasis is on identifying, measuring, and controlling those properties that decide the processing characteristics of powdered materials. *Prerequisites: PHAR 535, physical chemistry (calculus-based), or consent of the instructor.*

PHAR 705 PSC JOURNAL CLUB 1

This course is designed as a forum for students to present research projects to a peer audience and to help students thoroughly disseminate, analyze, and critique research related to the pharmaceutical sciences. Students will be introduced to interdisciplinary research topics. Journal discussions will be coordinated with department seminar speakers' research interests.

PHAR 707 DRUG TRANSPORT AND METABOLISM..... 3

This course provides basic knowledge about drug absorption at different sites in the human body (e.g., intestine, blood-brain barrier, kidney, liver) and the physicochemical and pharmaceutical factors and pathophysiologic conditions that influence drug penetration. This course allows students to understand the choice of a particular absorption route and dosage form. Additionally, the interplay of drug metabolism and drug transport is discussed.

PHAR 708 COMPREHENSIVE EXAM SEMINAR (THIRD YEAR, FALL SEMESTER) 1

An oral presentation given in the fall of Year 3 as part of the graduate student's advancement to PhD candidacy, this seminar focuses on the student's thesis project.

PHAR 709 DEPARTMENTAL SEMINAR 1

This oral presentation, given close to the commencement of a student's PhD research, focuses on the student's thesis research.

PHAR 747 INTERMEDIATE PKPD MODELING..... 3

A detailed study of the principles of drug transport, distribution, biotransformation, binding, and excretion, with emphasis on quantitative aspects and measurement of these processes.

PHAR 751 DRUG DESIGN..... 3

This course covers applications of chemical and biological principles to the rational design of drugs. Topics include targets of biologically active molecules, approaches to studying ligand and target interactions, overview of drug discovery, agents acting on specific targets, combinatorial chemistry, computation chemistry, and structure activity relationships.

PHAR 755 TOPICS IN METALLOBIOCHEMISTRY..... 2

This course introduces basic concepts pertaining to metal ions in biological systems. Topics include metal ions in proteins, cofactors and metal clusters, metal ion transport and storage and regulation, and metalloenzymes. There is a series of two-hour lectures on specific topics, followed by student presentations of recent research articles from the literature on the topics. Students are graded on their paper selection, presentation, analysis of the paper, and intellectual contribution. *Prerequisites: PHAR 600, 601.*

PHAR 758 SPECIAL TOPICS (PROJECT).....1 TO 7

Research projects are selected from a set of predefined projects provided by the Center for Translational Medicine (CTM). Students also use projects from their organizations toward the research. Projects need to be identified by the end of the first year. CTM staff guide the students on these projects. *Prerequisites: PHMX 747, 759.*

PHAR 759 STATISTICS FOR PHARMACOMETRICS II..... 3

Understanding clinical trial data with binary, ordinal, count, and time-to-event outcomes requires specific understanding of statistical concepts. This intermediate-level course introduces application of statistical techniques such as logistic regression, Poisson regression, and survival analysis. The course also demonstrates simulation techniques associated with discontinuous outcomes. R software is used to demonstrate the application of statistical aspects. Simulated and real data from experiments and clinical trials are employed for practice and homework. *Prerequisites: PHMX 638, 663.*

PHAR 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

PHAR 858 SPECIAL TOPICS.....1 TO 6

Topics vary from term to term.

PHAR 898 PRE-CANDIDACY RESEARCH.....1 TO 6

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

PHAR 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

PHMX 601 BASIC PHARMACOMETRIC TOOLS..... 3

Pharmacometric projects require mastery of new and advanced tools to conduct modeling and simulation. Students are introduced to Phoenix, NONMEM, and R. Basic operations such as importing and restructuring data, performing summary statistical analysis, and plotting are taught. The goal, however, is not to provide the theory to interpret the data or the analysis output; other courses in the pharmacometrics program are designed to complement the tools training received in this course. This is a mandatory course to be taken in the first semester of the MS program.

PHMX 602 BASIC PKPD MODELING 3

Understanding pharmacokinetics (PK) and pharmacodynamics (PD) provides the pivotal basis for dosing and related decision-making during drug development and its use in clinic. This course provides training in the fundamentals of PK and PD modeling and their application to decision-making. Theoretical concepts pertaining to analyzing PKPD data, in an average subject and from mechanistic and statistical points of view, are taught. The course also includes hands-on training using standard modeling and simulation software. This is a mandatory course to be taken in the first semester of the MS program.

PHMX 638 INTERMEDIATE PKPD MODELING I..... 3

Knowledge of conducting pharmacometrics analysis is an important component of the drug development and regulatory project. However, integrating all the different pieces together is equally important. This course guides students on the process of framing the appropriate questions, engineering the analysis, interpreting the results, and influencing the decision-making process in drug development. This course integrates the essence of all of the coursework in the program and allows students to appreciate the totality of a typical pharmacometrics project that is essential for decisions regarding new drug development. *Prerequisites: PHMX 602, 663.*

PHMX 663 STATISTICS FOR PHARMACOMETRICIANS I 3

The field of pharmacometrics requires a sound understanding of statistical concepts. This course provides the basic statistical principles required for a pharmacometrician. This introductory-level course strengthens the student's understanding of pharmacokinetic-pharmacodynamic modeling aspects. The course material is tailored for pharmacometricians. *Prerequisite: PHMX 601.*

PHMX 665 DOSE-RESPONSE TRIALS..... 3

Knowledge of designing and analyzing dose response is an important component of drug development and regulatory review. Basics of the variety of dose-response designs such as parallel, cross-over, flexible-dose, titration, withdrawal, adaptive, and enrichment trials are explained. Students perform clinical trial simulations for supporting the choice of appropriate designs and analyses. Innovative designs and data analysis make characterizing dose-response feasible within the realms of drug development. The information generated from such trials is key for the approval of new drugs and drug product labeling. *Prerequisite: PHMX 601.*

PHMX 666 STRATEGIC COMMUNICATION AND NEGOTIATIONS 2

This course improves students' abilities to communicate and negotiate strategically. Students identify their communication styles and learn how to compensate for any weaknesses. Scientists in life sciences work with interdisciplinary scientists with diverse backgrounds. Pharmacometrics has not reached its full potential yet and is breaking new ground. To influence key decisions during drug development, during regulatory review, or in clinics, pharmacometricians need to communicate in a manner that is simple, persuasive, and effective. Implementation of model-based drug development calls for change from current practice, and such change is often resisted. Scientists who lack authority to implement solutions need to master effective negotiation skills amid diverse opinions, thereby leading the team toward consensus.

PHMX 747 INTERMEDIATE PKPD MODELING II 3

Conducting population analyses and interpreting complex data sets are pivotal for several decisions, such as "go-no-go" dose selection for various patients. This course presents theoretical concepts pertaining to analyzing PKPD data (collected from several subjects) from the mechanistic and statistical points of view. Because data from several subjects are analyzed simultaneously, the course includes advanced modeling techniques such as nonlinear mixed- effects modeling. Further, advanced modeling such as physiologically based PK modeling and absorption-metabolism simulations are introduced. This course also includes hands-on training in standard modeling and simulation software. *Prerequisites: PHMX 638, 663.*

PHMX 759 STATISTICS FOR PHARMACOMETRICIANS II..... 3

Understanding clinical trial data with binary, ordinal, count, and time-to-event outcomes requires specific understanding of statistical concepts. This intermediate-level course introduces application of statistical techniques such as logistic regression, Poisson regression, and survival analysis. This course also demonstrates simulation techniques associated with discontinuous outcomes. R software is used to demonstrate the application of statistical aspects. Simulated and real data from experiments and clinical trials will be employed for practice and homework. *Prerequisites: PHMX 638, 663.*

PHSR 605 INTRODUCTION TO CER-PCOR FOR THE HEALTH CARE PROVIDER..... 3

This course provides an overview of comparative effectiveness and patient-centered outcomes research (CER-PCOR) geared toward clinicians and covers a wide range of topics, including CER-PCOR history, definitions, and the evolution of key terms. The course also covers identifying and engaging stakeholders; evidence-based medicine; current policy issues; government and private sector roles and programs; PCORI, AHRQ, NIH, HHS, and FDA programs; CMS and private insurer uses; patient engagement and advocacy; and application to clinical decision-making.

PHSR 610 PHARMACY, DRUGS, AND THE HEALTH CARE SYSTEM..... 3

This course encompasses an examination of the principal components of the U.S. health care system with special emphasis on their relationship to the provision of drugs and pharmacy services.

PHSR 620 INTRODUCTION TO HEALTH BEHAVIOR THEORY..... 3

This course covers medical sociology, psychology, social psychology, and interpersonal communication theories and research as they relate to the pharmacy practice system that involves patients, pharmacists, physicians, nurses, and other health care professionals.

PHSR 631 COMPUTING AND ANALYTC METHODS FOR OBSERVATIONAL STUDIES..... 3

This course focuses on programming tools and techniques for analyzing observational data using SAS and R; best practices for storing, manipulating, and analyzing large data sets used in health outcomes studies; and programming statistical regression models for observational, non-randomized studies.

PHSR 650 CER AND PHARMACOECONOMICS I 3

This course is designed to familiarize students with economic structure, conduct, and performance of the pharmaceutical industry. The course includes such topics as prices and profits in the industry; productivity; cost; economies of scale; innovation; economic effects of regulation; cost benefit and cost effectiveness of pharmaceuticals; and efficiency of drug-delivery systems. *Prerequisite: One undergraduate economics course or consent of the instructor.*

PHSR 655 CER AND PHARMACOECONOMICS II..... 3

This course focuses on advanced analytical methods used in comparative effectiveness research (CER) and pharmacoeconomics studies; the identification and assessment of uncertainty in CER and pharmacoeconomics studies; and the development of a statistical analysis plan for CER and pharmacoeconomics studies.

PHSR 670 HEALTH EDUCATION PROMOTION PROGRAM PLANNING 3

Health education is a scientific process designed to achieve voluntary behavioral changes to improve health status. Health promotion uses health education to promote health and prevent disease. The PRECEDE Model is used to demonstrate the analytical process to explore health problems and identify and assess the behavioral and nonbehavioral factors associated with them in order to develop and evaluate interventions. This course addresses health education at the level of the individual, the family, and the community at large. Because the relationship between practitioner and patient is often a major determinant of outcome, health promotion in the clinical setting is given emphasis. *Cross-listed with PREV 650.*

PHSR 701 RESEARCH METHODS I..... 3

This course is designed to introduce students to the concepts of scientific research in pharmacy practice and administrative science. Topics to be discussed include the scientific method and problem-solving processes, social science measurement, and several specific methods of research. *Co-requisite: Introduction to Biostatistics.*

PHSR 702 RESEARCH METHODS II 3

This course is designed to give research tools to design studies in the impact of pharmaceutical (or other) interventions or policies in actual practice settings. Unlike clinical trials where subjects are randomized to treatment or placebo arms, health services researchers typically are forced to use nonexperimental designs with secondary data. This course will take you through the pitfalls of such designs and show you how to deal with them. *Prerequisites: Research Methods I and an upper-level graduate course in multiple regression.*

PHSR 704 PHARMACOEPIDEMIOLOGY..... 3

This course is an introduction to the field of pharmacoepidemiology that uses quantitative research methods to examine questions of benefit or risk in regard to the use of marketed medications. The course is intended to offer useful techniques to medical and health researchers who wish to assess the utilization, effectiveness, and safety of marketed drug therapies. *Prerequisites: Introduction to Biostatistics and Principles of Epidemiology. Cross-listed with PREV 705.*

PHSR 705 INTRODUCTION TO CER AND PCOR..... 3

This course provides an overview of comparative effectiveness and patient-centered outcomes research (CER/PCOR) covering a wide range of topics including history, definitions, and evolution of key terms. Additional topics include identifying and engaging stakeholders; evidence-based medicine and health technology assessment; current policy issues; government and private sector roles and programs; PCORI, AHRQ, NIH, HHS, and FDA programs; CMS and private insurer uses; the role of cost/QALY; patient engagement and advocacy; evolving methods and standards resources; and methods and policy controversies.

PHSR 706 HEALTHCARE QUALITY AND PERFORMANCE MEASURES 3

This course provides an informative overview of health care quality improvement through an evaluation of quality and quality measures in varying aspects of health care and health care services.

PHSR 708 SPECIAL PROJECT .....1 TO 6

Students are given the opportunity to work with a faculty member on individual and specialized projects/research. The project/research provides students direct experience in the collection, organization, and analysis of data.

PHSR 709 GRADUATE SEMINAR 1

The graduate seminar is conducted weekly to inform students and faculty about new research and current issues. There is a different presenter each week. The speaker may be a graduate student, postdoctoral fellow, resident, faculty member, or guest who presents a current topic in the educational or pharmaceutical field. Seminar attendance is mandatory for all graduate students while in residency.

PHSR 722 ADVANCED TOPICS IN PHARMACOEPIDEMIOLOGY..... 3

The purpose of this course is to engage students in the techniques of pharmacoepidemiology through case studies and by working through an actual drug safety investigation. Drug safety is addressed in the context of science and the law through readings, debates, and discussions with invited guests. Using the FDA's Adverse Event Reporting System database and medical literature, students devise the epidemiological characteristics of a drug safety signal. Based on the characteristics of the signal, the team designs a pharmacoepidemiological study to further evaluate the safety signal. *Prerequisites: PREV 600, PREV 620, and PHSR 704 or consent of the instructor. Cross-listed with PREV 722.*

PHSR 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

PHSR 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

PHSR 899 DOCTORIAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

PREV 600 PRINCIPLES OF EPIDEMIOLOGY..... 3

This introductory course presents a comprehensive overview of the concepts and methods of modern epidemiology. A major emphasis is placed on understanding the strengths and limitations of epidemiologic study designs. Bias, confounding, effect modification, and causal inference are covered in detail, and students are given the opportunity to apply these concepts in critiques of the published epidemiologic literature. Learning approaches include lectures, readings, discussions, in-class exercises, and workshops.

PREV 601 APPLIED EPIDEMIOLOGY.....1 TO 2

This introductory course is designed to challenge students to apply epidemiologic concepts and methods to analysis of data on current issues. Students choose a relevant question, develop testable hypotheses, conduct descriptive analyses, report and discuss results, and consider study limitations. Each step in the process is supported by lectures and student presentations of their findings to the class. The primary source of data for student projects is adverse event reports to the FDA. Student evaluation is based on class presentations and participation. Students registering for 2 credits are expected to complete a final written paper in manuscript form.

PREV 602 MANAGEMENT OF CLINICAL TRIALS..... 3

This course emphasizes the practical application of organizing, managing, and conducting clinical trials. An overview of clinical trials theory and design characteristics provides the background necessary to conduct single-center and multicenter studies. Topics encompass essential management functions and responsibilities by primarily focusing on the role of the research coordinator in enrollment, randomization, follow-up visits, timely reporting of adverse drug reactions and events, and study close-out. The role and function of specialized committee structures in multicenter trials are demonstrated. There are presentations and discussions on applied methodology using examples from several recent and ongoing clinical studies.

PREV 611 DISEASE MODELS IN EPIDEMIOLOGY..... 3

Models are an important tool for understanding infectious disease epidemics. Each student develops and analyzes a basic mathematical model on a system of their choice. They also are introduced to the core theory for infectious diseases, teach basic skills needed to read a theory paper, and cover special topics selected by the students. *Prerequisites: PREV 600 and PREV 620.*

PREV 613 NUTRITIONAL EPIDEMIOLOGY..... 3

This course is taught through lectures, hands-on class demonstrations and activities, and discussions of assigned readings during 15 three-hour sessions. After an introduction to basic principles of nutritional epidemiology, the topics to be covered will include dietary assessment and analyses; collecting and analyzing anthropometry and body composition data; physical activity measurement and analyses; principles and applications of biomarkers; relationship between diet and risk of developing diseases (e.g., diabetes, cardiovascular, cancer, infection); international nutritional epidemiologic research; and the global application of methods relevant to nutrition and disease risk across the life span. In addition, the students will critique and discuss papers selected from the literature.

PREV 616 INTRODUCTION TO CLINICAL AND TRANSLATIONAL RESEARCH AT UMB 2

This course provides an overview of the basic skills, attitudes, and resources needed for developing and implementing a clinical or translational research project. The emphasis is on how to obtain these skills and resources on the UMB campus.

PREV 619 INTRODUCTION TO SAS 1

This course provides students with comprehensive experience in the application of epidemiological and biostatistical methods available in the Statistical Analysis System (SAS). Hands-on experience in weekly workshops is gained by conducting analyses of existing data designed to answer a research question. *Prerequisites: PREV 620 or consent of the instructor and knowledge of basic principles of epidemiology.*

PREV 620 PRINCIPLES OF BIOSTATISTICS 3

This course is designed for students to develop an understanding of statistical principles and methods as applied to human health and disease. Topics include research design; descriptive statistics; probability; distribution models; binomial, Poisson, and normal distribution; sampling theory and statistical inference. *Prerequisites: Knowledge of college algebra required; calculus recommended.*

PREV 621 BIOSTATISTICAL METHODS 3

This course is designed to introduce students to a broad range of methods used in biomedical and public health research and to provide hands-on data analysis experience. Topics to be covered include the role of statistics in science; properties of distributions; exploratory data analysis; inference about means, proportions and survival distributions; and introduction to multivariable methods. *Note: PH 621/PREV 621 does not satisfy the biostatistical requirements for MS or PhD students in epidemiology but is an appropriate course for other graduate degree programs.*

PREV 625 COMMUNITY-BASED PARTICIPATORY RESEARCH METHODS 3

This course provides a comprehensive understanding of the ways in which social scientists, health professionals, and community members can collaborate to address public health problems through research that leads to improvements in health, quality of life, and community change. Students and faculty from multiple scholarly disciplines examine the approaches to community-based participatory research that go beyond the domain of a single discipline. Students receive training in the skills needed to apply mixed methods (qualitative and quantitative) of approaches to designing, implementing, and evaluating public health programs and community-based participatory research. Attention is given to the scholarly debates and practical/logistical issues in conducting community-based participatory research. Ethical principles of social justice are applied to public health program planning and evaluation that uses community-based participatory methodology. Required for students in the Community and Population Health concentration of the MPH program.

PREV 627 VACCINOLOGY 2

Vaccinology is an emerging science that deals with all aspects of the development and use of vaccines and vaccination programs. The Center for Vaccine Development (CVD) at the University of Maryland is a world-famous research center that creates vaccines in the laboratory and tests them at all levels, including pre- and post-licensure field studies. This course is taught by CVD faculty and experts from other areas, including government and industry. The full range of issues in vaccinology is covered, including the current status of vaccines and vaccination programs and political, economic, and ethical considerations. There is particular emphasis on policy in vaccine implementation.

PREV 633 APPLICATION OF LEGAL AND REGULATORY ISSUES IN CLINICAL RESEARCH 2

This multidisciplinary course covers application of legal and regulatory topics critical to performing clinical research, including the informed consent process; privacy and confidentiality issues; investigational new drug (IND) applications; financial disclosure and conflict of interest; the institutional review board (IRB) process; recruitment and retention strategies; data safety monitoring plans; and quality management and clinical research conduct issues.

PREV 634 HEALTH INFORMATICS..... 4

The course provides a comprehensive introduction to the field of health informatics, combining perspectives of medicine, public health, social science, and computer science. Particular attention is given to the diverse use of computers and information technology in health care and the biomedical sciences, including specific applications and general methods, current issues, capabilities, and limitations of health informatics. Health informatics studies the organization of medical information, the effective management of information using computer technology, and the impact of such technology on medical research, education, and patient care. The field explores techniques for assessing current information practices, determining the information needs of health care and biomedical research professionals and other workers and patients, developing systems using computer technology, and evaluating the impact of these systems. The course covers a wide range of health informatics applications relevant to health care delivery organizations, government agencies, biomedical researchers, and commercial entities. The course provides an overview of major health informatics techniques aimed at optimizing the use of information to improve the quality of health care, reduce cost, provide better education for providers and patients, and conduct medical research more effectively. *Prerequisites: Experience with computers and a passing familiarity with biology and/or medicine is useful.*

PREV 645 SPECIAL TOPICS IN LAW AND MEDICINE: CRITICAL ISSUES IN HEALTH CARE..... 3

This interdisciplinary course is open to students from the schools of law, medicine, social work, nursing, pharmacy, dentistry and the graduate schools at UMB and the University of Maryland, Baltimore County. The course is designed to provide students with an opportunity to reflect on the legal, ethical, and policy issues surrounding a number of health care delivery problems; expose participants to the basic skills necessary to analyze problems from a legal, ethical, and policy perspective; and offer participants from different disciplines an opportunity to interact and share information and perspectives about their professions. A variety of teaching techniques, including case studies, simulations, and panel discussions, will be used to explore such topics as medical malpractice; rights of patients to refuse treatment; informed consent and substituted consent in medical decision-making; confidentiality vs. duty to disclose medical information; regulation of experimental drugs; and health care reform. Students will have an opportunity to work in multidisciplinary teams to analyze a health care problem and develop a position paper on a health care policy issue. *Cross-listed with LAW 648B.*

PREV 648 INTRODUCTION TO HEALTH SYSTEM AND HEALTH POLICY MANAGEMENT 3

Lectures, seminars, readings, and small-group discussions are designed to convey an understanding of health care systems and their structure, function, and effectiveness. Topics include principles of management; municipal, state, national, and foreign organizational systems; HMOs; health care costs; cost containment and quality; regulations; planning and evaluation; health manpower; and applied problem solving.

PREV 649 INTRODUCTION TO PREVENTIVE MEDICINE.....1 TO 3

This seminar course emphasizes the applications of epidemiology, statistical reasoning, and preventive medicine to clinical practice. The role of the physician and other health professionals in the primary and secondary prevention of disease is discussed. Topics include relationships among physicians, hospitals, nursing homes, regulatory agencies, third-party payers, and the law. *Prerequisites: PREV 600, PREV 620, and consent of the instructor.*

PREV 650 HEALTH EDUCATION AND PROMOTION PROGRAM PLANNING 3

This course presents a scientific process designed to achieve voluntary behavioral change to improve health status. Health promotion uses health education to promote health and prevent disease. The analytical process used to explore health problems, the identification of factors associated with them, and the development and evaluation of interventions are covered. *Cross-listed with PHSR 670.*

PREV 651 MOLECULAR BIOLOGY IN PUBLIC HEALTH RESEARCH 1

This course, which uses the basics of molecular biology as the basis for a discussion of molecular methods frequently used in population-based health studies, is tailored to students planning to take advanced epidemiology courses such as Molecular Epidemiology, Cancer Epidemiology, and Epidemiology of Infectious Disease, but who might be unfamiliar with recent developments in molecular biology.

PREV 652 HEALTH ECONOMICS 3

This course provides an analysis of health as an economic good. Using microeconomic theories, the course examines the behavior of health care providers, consumers, markets, and firms. The underlying assumptions applicable to market economics are critically examined within the context of the health economy. Special problems of health economics are considered, including assumptions of market competition, the demand and supply of medical care and health insurance, the role of government, and equity.

PREV 659 OBSERVATIONAL STUDIES IN EPIDEMIOLOGY 3

This course provides an in-depth examination of study designs, including case control and cohort studies. Special emphasis is placed on possible biases that can occur in epidemiologic research. Special topics also will be addressed in detail, including screening, misclassification, and questionnaire construction. *Prerequisite: PREV 600.*

PREV 664 CRITICAL ISSUES IN GLOBAL HEALTH 3

This series of seminars, lectures, and reading assignments is designed to give students an overview of the global health problems facing the world and equip them with tools to navigate the world of international health. The course focuses on teaching students about the global burden of disease and the pattern of disease variations between and within countries. It addresses cross-cutting issues such as poverty, environmental degradation, and the impact of globalization on health. Topics include maternal and child health, gender and violence, nutrition, water, and sanitation.

PREV 668 ENVIRONMENTAL AND OCCUPATIONAL HEALTH 3

This course addresses the components of the environment, potential hazardous exposures and their implications, and the best practices to prevent and control them. Environmental exposures play a significant role in disease causation, particularly as risk factors for cancer, asthma, and other chronic diseases, and exposures in occupational settings are an important part of environmental exposures. This course consists of didactic lectures, in-class discussions, student presentations, and visits to environmental and occupational sites.

PREV 681 EPIDEMIOLOGY OF AGING 3

This course covers applications of the principle and methods of epidemiology and public health to the study of aging. There is a review of health assessment techniques that are potentially useful for conducting epidemiological studies of older people; the epidemiology of selected disease common to old age; primary, secondary, and tertiary prevention, as applied to older people, focusing on psychosocial and environmental aspects of health; differing ideas of long-term care and their roles in the prevention, intervention, and treatment of illness in older people. Students learn how to critically evaluate and present research in a specific area of gerontological epidemiology with faculty supervision. *Prerequisite: PREV 600 or consent of the instructor. Cross-listed with GERO 681.*

PREV 701 CANCER EPIDEMIOLOGY 3

This course combines different strands of knowledge — molecular biology, pathology, epidemiological methods — and clinical and social sciences into an exploration of modern cancer epidemiology, prevention, and control, domestically and internationally. Emphasis is placed on cancers of high prevalence or unique biological characteristics that illustrate interesting epidemiological or etiological characteristics. Comparison of cancer rates and evidence for the causes of these differences are explored. The goal is to encourage students to think creatively about the cancer problem and explore research opportunities that will contribute meaningfully to reduced cancer morbidity and mortality. A combination of lectures, seminars, and class activities is used.

PREV 702 ADVANCED QUANTITATIVE METHODS..... 2

This course covers issues relating to causal inferences, the study of methods and models used to understand what causes what in our world. Different causal frameworks are explored and used to address problems relating to study design, confounding, modeling, validity, and inference. Readings are assigned each week, and students complete one midterm assignment and a final exam. The course is useful to anyone designing and conducting clinical research. A background in foundational epidemiological methods and biostatistics is recommended. *Prerequisites: PREV 600 and PREV 720 or consent of the instructor.*

PREV 703 COMPLEX DISORDERS SEMINAR..... 1

This seminar series includes speakers from inside and outside of the University. The speakers focus on topics including the difficulties of defining phenotypes, the problems involved in identifying genetic variation, and the statistical issues involved in correlating multiplicity of genotype data with that of phenotypic data. Speakers address these topics by discussing their research in areas including leukodystrophies, bipolar disorder, prostate cancer, and eye diseases. Outside speaker seminars are followed by discussions.

PREV 704 MOLECULAR EPIDEMIOLOGY PRACTICUM..... 3

This course involves three three-month assignments across the nine-month school year and should be taken after completion of the first year of coursework. *Prerequisite: Completion of first-year courses.*

PREV 705 PHARMACOEPIDEMIOLOGY..... 3

This course provides an introduction to the field of pharmacoepidemiology using quantitative research methods to examine the benefits or risks of marketed medications. The course is intended to offer techniques to medical and health researchers who wish to assess the use, effectiveness, and safety of marketed drug therapies.

PREV 707 COST EFFECTIVENESS IN PREVENTION AND TREATMENT 3

A three-semester hour graduate course for master's and doctoral students in the health sciences. This course is a component in the core methods for public health sciences, especially focusing on the preventive measures in health care. Cost-effectiveness analysis is an integral part of the design and development of interventions, so that optimal decisions can be made in selecting the alternative to be implemented. Additionally, the evaluation of outcomes should include an empirical cost-effectiveness analysis (CEA) to improve the body of knowledge available to future work. These techniques also are applied in randomized clinical trials. This course examines principles and techniques of CEA in health care from a prevention perspective. Participants learn key elements of the economist's analysis of costs and effect to achieve a comparative and incremental cost-effectiveness analysis. Student projects design and conduct a hypothetical and empirical CEA. *Prerequisites: PREV 600, PREV 720 or the equivalent.*

PREV 709 INTRODUCTION TO HEALTH SERVICES RESEARCH 2

The purpose of this course is to explore health research topics and methods common to health services research as it is applied to problems relevant to public policy. The focus is on a core set of methods used in policy-related research. Course topics, discussion, and materials will be useful to health care students interested in understanding how health services research addresses important population health and social issues. The goal of the course is to develop a basic foundation for understanding of the practice and outcomes of policy-related health services research. The course faculty is interdisciplinary and experienced in conducting health services research applied to clinical populations.

PREV 710 CLINICAL AND TRANSLATIONAL RESEARCH PROJECT DESIGN AND IMPLEMENTATION.....1 TO 2

This course provides hands-on experience in clinical and/or translational research project development and implementation. Students must have an idea for a clinical or translational research question involving human subjects at the beginning of the course, and they will work with a mentor outside of the course with content expertise for the research question. The student's research question ultimately will be developed into a research protocol and CICERO application. *Prerequisites: PREV 600, PREV 616, and PREV 633.*

PREV 711 GENETIC EPIDEMIOLOGY 3

This course provides students with an overview of basic methods in genetic epidemiology, with application to common complex diseases such as coronary heart disease, Type 2 diabetes, and obesity. The course will begin with a review of basic human genetics and proceed to a description of methods used to dissect the genetic contribution to human disease and to map genes. Topics include: assessment of familial aggregation; heritability analysis; segregation and linkage analysis; genetic association studies; and linkage disequilibrium mapping. The course will involve a computer lab, and students are expected to complete a data analysis project using genetic analysis software and write up their results as a course project. *Prerequisites: PREV 600, PREV 619, PREV 620, or their equivalents, or consent of the instructor; a background in basic human genetics is helpful.*

PREV 715 INJURY EPIDEMIOLOGY AND PREVENTION..... 3

This course helps students understand basic models of injury causation, principles of injury prevention and control, how to design epidemiologic studies of risk factors for injury, and how to evaluate public health interventions designed to address the problem of injuries. *Prerequisites: PREV 600 or PH 600-Principles of Epidemiology.*

PREV 716 CHRONIC DISEASE EPIDEMIOLOGY..... 3

The purpose of this course is to provide students with an introduction to chronic disease epidemiology. Students are introduced to the application of epidemiologic methods in the context of major chronic diseases in order to determine disease risk factors and determinants; disease burden in a population and its subpopulations; efficacy and effectiveness of prevention and treatment interventions; and guidelines for individual treatment and public health disease control. Students acquire the skills to interpret, evaluate, and design basic chronic disease epidemiology research projects; locate and interpret chronic disease surveillance data; and design public health programs for chronic disease surveillance and control. *Prerequisite: Must have completed an introductory epidemiology course (PREV 600) or have an exception from instructor; completion of an introductory biostatistics course is recommended.*

PREV 720 STATISTICAL METHODS IN EPIDEMIOLOGY 3

This course provides instruction on the specific statistical techniques used in the analysis of epidemiological data. Topics include treatment of stratified and matched data; detection of interaction; conditional and unconditional logistic regression; survival analysis; and proportional hazards models. *Prerequisites: PREV 600, PREV 620, and consent of the instructor.*

PREV 721 REGRESSION ANALYSIS 2

This course covers basic principles and theory of regression techniques. Topics include simple and multiple linear regression, robust regression, regression diagnostics, and logistic and Poisson regression analysis. The emphasis of this course is on learning the biomedical research application and interpretation of regression techniques. *Prerequisites: PREV 619 and PREV 720 or consent of the instructor.*

PREV 722 ADVANCED TOPICS IN PHARMACOEPIDEMIOLOGY.....1 TO 3

The purpose of this course is to engage students in the techniques of pharmacoepidemiology through case studies and by working through a drug safety investigation. Drug safety

will be addressed in the context of science and the law through readings, debates, and discussions with invited guests from the FDA, a pharmaceutical company/consulting agency, and a law firm. Students will work together as an investigative team under the direction of the instructor. Using the FDA's Adverse Event Reporting System database and medical literature, students will work up the epidemiological characteristics of a drug safety signal. Based on the characteristics of the signal, the team will design a pharmacoepidemiological study to further evaluate the safety signal. *Prerequisites: PREV 600, PREV 620, PREV 705/PHSR 704, or consent of the instructor.*

PREV 723 SURVIVAL ANALYSIS 2

This course examines methods of analysis for time to event data, including nonparametric methods; Kaplan-Meier analysis; log-rank and Wilcoxon tests; Cox proportional hazards models; time-dependent covariates; discrete time models; and parametric methods. *Prerequisite: PREV 720 or consent of the instructor.*

PREV 747 EPIDEMIOLOGY AND PREVENTIVE MEDICINE RESEARCH PRACTICUM I 3

This course provides guided experience in epidemiologic research over two semesters. Students are expected to complete a data-based project that includes analysis of data and preparation of manuscript-to-report findings. *Prerequisites: PREV 619, PREV 720 (or concurrent enrollment), and PREV 600 previously. Students must successfully complete PREV 747 in order to register for PREV 748.*

PREV 748 EPIDEMIOLOGY AND PREVENTIVE MEDICINE RESEARCH PRACTICUM II..... 2

This course provides guided experience in epidemiologic research over two semesters. Students are expected to complete a data-based project that includes analysis of data and preparation of manuscript-to-report findings. *Prerequisites: PREV 619, PREV 720 (or concurrent enrollment), and PREV 600 previously. Students must successfully complete PREV 747 in order to register for PREV 748.*

PREV 749 INFECTIOUS DISEASE EPIDEMIOLOGY: A GLOBAL PERSPECTIVE 3

This course is taught through lectures and discussions of case examples, including outbreak investigations and assigned readings. After an introduction to basic principles of infectious disease epidemiology, the topics will be covered according to mechanisms of transmission: contact and air-, vehicle- and vector-borne. Sessions will cover nosocomial infections and hospital infection control and vaccines to prevent infectious diseases. Discussions also will address problems based on outbreak investigations. Students will prepare a presentation and a report on an infectious disease and take a short written exam and progressive review of an unknown infectious disease outbreak. Students are encouraged to attend other conferences and seminars with infectious disease epidemiology topics during the semester. *Prerequisite: Basic knowledge of medical microbiology.*

PREV 758 HEALTH SURVEY RESEARCH METHODS 3

This course leads students through the steps in survey research, from developing a survey questionnaire to administering it and analyzing the data. The results of the survey are presented in a paper. *Prerequisites: PREV 620 or consent of the instructor.*

PREV 780 MOLECULAR EPIDEMIOLOGY 3

This course covers the theoretical framework of the discipline of molecular epidemiology but focuses on the practical application of a basic knowledge of the field that will enable students to critically read the literature and incorporate the techniques into epidemiological research. Students should have at least a limited background in biological sciences. Those with more advanced training also will find the course of interest. *Prerequisite: A prior course in molecular biology.*

PREV 789 SPECIAL STUDIES AND RESEARCH IN PREVENTIVE MEDICINE .....1 TO 6

This individually planned and closely supervised course provides experience in the epidemiology of significant preventive medicine topics. *Prerequisites: PREV 600 and 620 or equivalent.*

PREV 794 CAUSAL INFERENCE 2

This course covers issues relating to causal inferences, the study of methods and models used to understand what causes what in our world. Causal frameworks are explored and used to address problems relating to study design, confounding, modeling, validity, and inference. Readings are assigned each week, and students complete one midterm assignment and a final exam. The course is useful to those designing and conducting clinical research. A background in foundational epidemiological methods and biostatistics is recommended.

PREV 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

PREV 801 LONGITUDINAL DATA ANALYSIS 3

Analysis of longitudinal and clustered data includes topics in matrix algebra; longitudinal data analysis; marginal and mixed-effects general linear models, residual analysis and diagnostics; generalized linear models, including marginal (GEE methods); and mixed-effects models for repeated measures and other clustered data. *Prerequisites: PREV 620 and PREV 721 (PREV 721 may be taken concurrently).*

PREV 802 STATISTICS FOR MOLECULAR BIOLOGY..... 2

Three topics are covered in this course: statistical design and analysis of experiments; DNA or protein sequence alignment; and analysis of gene expression data from microarray experiments. *Prerequisites: PREV 720 and 721 or consent of the instructor.*

PREV 803 CLINICAL TRIALS AND EXPERIMENTAL EPIDMIOLOGY 3

This course presents a rigorous overview of the experimental method as applied in therapeutic evaluations and demonstrates causal associations between risk factors and clinical outcomes. The history of the experimental method and its clinical applications are studied in detail. Guest speakers of unique expertise and experience in clinical trials also are drawn upon. *Prerequisites: PREV 600 or equivalent and at least one semester of biostatistics.*

PREV 808 TOPICS IN EPIDEMIOLOGY .....1 TO 3

This is an individual program of study undertaken with faculty supervision in one or more substantive area of epidemiology. Through assigned reading and critical discussion, the student becomes knowledgeable in a specialized area of epidemiology, with particular emphasis on recent advances. Preparation of a critical review of the literature suitable for publication is required. *Prerequisite: Consent of the instructor.*

PREV 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

PREV 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

PTRS 688 SPECIAL TOPICS IN PHYSICAL REHABILITATION SCIENCE .....1 TO 3

Special topics listings are graduate-level special interest courses developed by faculty members of the PhD program in physical rehabilitation science. Topics regularly include Foundations of Rehabilitation Science (FRS) I and II, which cover literature on contemporary issues and research methods pertaining to key topics in the field of movement and rehabilitation science. Theoretical, biological, physical, behavioral, and computational approaches to understanding the control of movement in the context of rehabilitation are explored. Applications are made to the analysis of common disorders of movement control that impair function and to contemporary therapeutic approaches used in rehabilitation. Topics include stroke, spinal cord injury, Parkinson's disease, and movement.

PTRS 702 GRADUATE SEMINAR IN TEACHING I 1

This course covers learning theories and relevant teaching methods for the adult learner. Laboratory experiences are attached to a physical therapy course taught concurrently with this course. Students act as teaching assistants in that course, which revolves around a three-hour weekly experience as a

laboratory assistant. They are filmed while teaching a short section of a lab, then evaluate themselves. The students keep an information sheet about their experiences as a laboratory assistant. Permission from the program director or instructor is necessary to enroll in this course.

PTRS 703 GRADUATE SEMINAR IN TEACHING II..... 1

This course covers assessment techniques and curriculum construction. Students participate in the teaching of labs to the Master of Physical Therapy students and are involved in creating assessment tools for these students. In addition, they must give one or two lectures to these students and lead laboratory sessions. They also construct and justify a curriculum for physical therapy students. *Prerequisite: PTRS 702.*

PTRS 709 REHABILITATION BIOMECHANICS.....1 TO 3

This course covers theoretical applications of the principles of biomechanics, Kinematics, Kinetics, and transarticular forces and moments.

PTRS 712 MOTOR BEHAVIOR 2

This course covers fundamental concepts of motor behavior as related to the physical rehabilitation science curriculum and provides exposure to the research-based subdiscipline of motor behavior. The course also covers the major theories of motor development and control with a description of changes in motor skills behavior across the life span and the accompanying changes in growth and aging.

PTRS 718 APPLIED HUMAN ANATOMY, TRUNK 3

Students attend lectures and laboratory sessions required by the Human Anatomy course (PTAB 400) and concerning the trunk. This course covers the body from head to toe, including the musculoskeletal, nervous, integumentary, cardiovascular, and gastrointestinal systems. Emphasis is on the applied/functional anatomy. Students also dissect the human body, submit an anatomical literature review paper on a topic of interest, lecture on one region, and assist in the laboratory. Permission from the program director or instructor is necessary to enroll in this course.

PTRS 719 APPLIED HUMAN ANATOMY, UPPER EXTREMITY 3

Students attend lectures and laboratory sessions required by the Human Anatomy course (PTAB 400) and concerning the upper extremity. This course covers the body from head to toe, including the musculoskeletal, nervous, integumentary, cardiovascular, and gastrointestinal systems. Emphasis is on the applied/functional anatomy. Students also dissect the human body, submit an anatomical literature review paper on a topic of interest, lecture on one region, and assist in the laboratory. Permission from the program director or instructor is necessary to enroll in this course.

PTRS 720 APPLIED HUMAN ANATOMY, LOWER EXTREMITY 3

Students attend lectures and laboratory sessions required by the Human Anatomy course (PTAB 400). They cover the body from head to toe, including the musculoskeletal, nervous, integumentary, cardiovascular, and gastrointestinal systems. Emphasis is on the applied/functional anatomy. Students also dissect the human body, submit an anatomical literature review paper on a topic of interest, lecture on one region, and assist in the laboratory. Permission from the program director or instructor is necessary to enroll in this course.

PTRS 780 CENTRAL NERVOUS SYSTEM PLASTICITY 2

This course explores published experimental evidence characterizing plasticity during the development of the nervous system, normal neuronal and glial functions, and the mechanisms underlying recovery of neurological function after central or peripheral nerve injuries. Students read and discuss classic original literature and formulate theoretical constructs for the role of physical rehabilitation interventions designed to promote or simplify plasticity within the nervous system. Lecture and discussion topics include a historical overview of regeneration and plasticity research; collateral sprouting; denervation super-sensitivity; synaptic redundancy; axonal regeneration; synaptogenesis; competitive interactions; behavioral substitution; and critical periods. *Prerequisite: Basic neuroscience course.*

PTRS 788 SEMINAR IN REHABILITATION SCIENCE 1

The seminar meets each week with PhD students, postdoctoral fellows, and guest speakers presenting current research interests and findings. First-year students lead discussions of relevant research articles under the guidance of faculty members who have research interests in the particular area of discussion. Students later present results of projects in which they are involved, again under faculty guidance. Students in the PhD program must register for the seminar for at least four terms.

PTRS 798 INDEPENDENT STUDY .....1 TO 3

Under the supervision of a faculty advisor, students pursue independent study of a topic, research involvement, or independent project development related to the practice of physical therapy. The student and advisor select the course format with a contractual agreement signed before course registration. Topic areas commonly include rehabilitation biomechanics, motor behavior, and plasticity in the central nervous system. Permission from the program director or instructor is necessary to enroll in this course.

PTRS 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

PTRS 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

REGS 603 DRUG, BIOLOGIC, AND DEVICE REGULATION 6

This online course is designed to orient students of diverse professional backgrounds to several practical elements that underpin drug, biologic, and device regulation in the United States and around the world. It provides the core for the curriculum and is a prerequisite for all other courses. Elements that are explored include the legal framework for drug regulation, including events that have shaped today's framework; ethical issues in drug/biologic/device development and drug/biologic/device use; global regulatory guidance approaches; types of communications with the FDA, including investigational new drug application (IND), new drug application (NDA), and abbreviated new drug application (ANDA) requirements, and 510(k) clearance and premarket approvals/biologics licensing applications (PMA/BLA) approval requirements; chemistry, manufacturing, and control (CMC) issues; and post-marketing topics.

REGS 614 DRUG DISCOVERY 6

Pharmaceutical sciences are fundamental to the discovery of new medicines and impact the clinical success in treating disease. This online course is designed to orient students from diverse professional backgrounds on the basics of drug/biologics discovery; drug/biologics chemistry and functional groups; medicinal chemistry approaches to optimizing drug action; principles of pharmacology; biological and target considerations in drug and biologics design; issues of drug resistance; and how drugs and biologics are metabolized and eliminated from the body.

REGS 621 CLINICAL RESEARCH 6

Well-designed clinical research is essential in the development process of a medication or device and in generation of the knowledge base for evidence-based medicine and health policy. This online course is designed to uncover the ingredients of clinical research and orient students on several important issues with current clinical studies. Students will learn how to design and implement clinical studies. The role of each clinical phase in drug/device development and their study designs and regulatory issues will be explored. The course also will discuss the principles of the International Conference on Harmonization Good Clinical Practice guidelines and how to successfully manage clinical trials. Additionally, knowledge of personalized medicine and behavioral/social issues in drug use will be taught.

REGS 631 DRUG AND BIOLOGICS DEVELOPMENT..... 6

Drug candidates and active pharmaceutical ingredients need to be successfully delivered and must exhibit acceptable toxicology. This course follows drug discovery and examines key aspects of drug development, including drug

formulation and quality; stability testing; pharmacokinetic characterization; bioequivalence; preclinical toxicology; methods of bioanalysis; and nonclinical and clinical good laboratory practices. Aspects of biologics also are discussed.

REGS 641 REGULATED PRODUCTS IN THE MARKETPLACE..... 6

FDA approval for the marketing of a drug or other regulated product (e.g., biologics, vaccines, medical devices, laboratory tests) is a major milestone in a product's lifecycle. But it doesn't stop there. Once on the market, how a drug is used and by whom, entry of competing products into the marketplace, and changes in medical care can change the benefit-risk balance. This course covers the breadth of clinical research and surveillance activities that take place in the post-approval phase of a regulated medical product's lifecycle. This includes pharmacovigilance and risk management activities, pharmacoepidemiology, pharmacoeconomics, comparative effectiveness, and drug utilization research. The course is designed to prepare students to communicate across the pre-/post-marketing divide, evaluate the need for post-marketing studies, and critically interpret and apply the results of such studies.

SOWK 804 RESEARCH METHODS IN SOCIAL WORK I..... 3

This course offers an introduction to conceptual understanding, fundamental research skills, and design and measurement necessary for students to do advanced social work research. The course covers historical trends in social work research problems, hypothesis formulation, selection and testing of measurement strategies, and diverse research designs, including experimental, quasi-experimental, single subject, survey, and quantitative design.

SOWK 805 DATA ANALYSIS I 3

This course's focus is on how to select and do the appropriate quantitative data analysis strategies. The course provides conceptual understanding and skills necessary for selection of appropriate statistical procedures, computer computation of procedures, and appropriate interpretation of statistical measures. Content includes basic descriptive statistics through an introduction to the General Linear Model using multiple regression and correlation analysis. *Prerequisite: Consent of the instructor.*

SOWK 806 RESEARCH METHODS IN SOCIAL WORK II 3

This course offers advanced conceptual understanding of the skills used in complex research design and measurement as part of advanced social work research. The course covers advanced hypothesis formulation development, selection and testing of measurement strategies in complex research designs, including experimental, quasi-experimental, single subject, survey, and quantitative design. *Prerequisites: Grade of B or better in SOWK 804 and SOWK 805.*

SOWK 807 DATA ANALYSIS II..... 3

This course provides conceptual understanding of multivariate statistics. Students develop skills to use statistical software to conduct analyses and interpret the statistics. Students become skilled in using these techniques to analyze results of research designs used for social work research. Emphasis is on the relationship of data analysis and research design. *Prerequisites: SOWK 804 and a grade of B or better in SOWK 805.*

SOWK 808 SOCIAL WORK KNOWLEDGE AND THEORY 3

This course examines the nature of knowledge and the processes of knowledge building within the context of the application of scientific methods and the development of generalizations from social work practice, wisdom, and experience. The focus is on knowledge and theory construction, history of ideas, and knowledge building in social work. Psychological and social science perspectives help students examine theory development in social work.

SOWK 809 MULTILEVEL MODELING..... 3

This course is intended to introduce multilevel modeling for analyzing nested or multiple-level data. Students will identify situations where multilevel modeling should be used, compare and contrast multilevel modeling with other data analysis techniques, and conduct multilevel data analyses. Finally, students will write a journal article based on a multilevel analysis using a data set of their choice. *Prerequisite: Consent of the instructor.*

SOWK 810 RESEARCH PRACTICUM I 3

This course enhances students' ability to do significant and methodologically rigorous social work research in a substantive area. Each student participates as part of a research team to design, carry out, analyze, and distribute a research project. Students select the research topic, design, and measures for the study. *Prerequisites: SOWK 804 and SOWK 805.*

SOWK 811 RESEARCH PRACTICUM II..... 3

This course expands knowledge learned in SOWK 810 to enhance students' ability to do significant and methodologically rigorous social work research in a substantive area. The student research team will finish collecting data as planned during SOWK 810; enter, organize, and analyze the data collected; and write a journal article that is ready to submit for publication review. *Prerequisite: SOWK 810.*

SOWK 812 INTEGRATIVE SEMINAR..... 3

This seminar focuses on the relationship between theory and research methods in the development of research questions and a design. It discusses the meaning of theory and theoretical frameworks; the difference between theoretical and conceptual frameworks; the difference between theories and logic models; different approaches to theory and research within different disciplines and in interdisciplinary work; the connections between research and context (history, policy, practice); the role of researcher passions and values in the construction and implementation of research projects; and the role of ethics in theoretical development and research design. After the seminar, students will have a clearer understanding of what to expect in the dissertation process and a rough outline of the structure of a dissertation proposal. *Prerequisites: SOWK 804, SOWK 805, SOWK 806, SOWK 807, SOWK 810, SOWK 811, SOWK 826.*

SOWK 814 INTERVENTION RESEARCH..... 3

The evolution of social work practice calls for implementing systematic methods for developing and testing macro and micro social work interventions. This requires social work scholars to integrate their practice knowledge and wisdom with theories of social problems. Furthermore, scholars must undertake deliberate strategies for implementing methods of documenting and evaluating interventions to respond to social problems affecting systems of all sizes (e.g., individual, family, group, and neighborhood). The purpose of this advanced research seminar for PHD students is to introduce participants to the five steps of intervention development, testing, and dissemination and provide opportunities for practicing elements of these stages based on their individual social work practice and research interests. Students demonstrate competence to develop or adapt a social work intervention and prepare a research proposal to test the efficacy of the intervention. *Prerequisites: SOWK 804, SOWK 805, SOWK 806, SOWK 807, SOWK 810, SOWK 811, SOWK 826.*

SOWK 815 STRUCTURAL EQUATION MODELING 3

This course is intended to introduce students to structural equation modeling. Students identify situations where structural equation modeling should be used, compare and contrast structural equation modeling with other data analysis techniques, and conduct structural equation data analyses. Finally, students write a journal article based on a structural equation analysis using a data set of their choice. *Prerequisites: SOWK 804, SOWK 805, SOWK 806, and SOWK 807, or consent of the instructor.*

SOWK 826 QUALITATIVE RESEARCH METHODS 3

This course provides introduction to qualitative research and its role in the development of social work knowledge. It covers material on paradigms underlying qualitative inquiry, basic ideas, and major methods. The course fosters students' ability to conduct qualitative research through gathering and analyzing data.

SOWK 827 SEMINAR IN ADVANCED QUALITATIVE DATA ANALYSIS: GROUNDED THEORY..... 3

This advanced seminar is offered for doctoral students who want to learn about qualitative data analysis for current or future research or who want to do a qualitative dissertation or a mixed-method dissertation. Most introductory courses offer students the opportunity to work on the early phases of

a qualitative project (e.g., data gathering, writing a proposal) but not the opportunity to work on the later phases, such as data analysis and writing. The seminar is designed to take up where these courses leave off by focusing on qualitative data analysis. Doctoral students have the opportunity to go into more depth in one of the major qualitative research traditions (grounded theory), learn a variety of techniques for data analysis, and have opportunities to develop their ideas and present their work. Grounded theory is one of the most developed methods of qualitative data analysis. *Prerequisite: Consent of the instructor.*

SOWK 834 COMPARATIVE SOCIAL POLICY 3

This course emphasizes comparative analysis of national approaches to social policy in different societies. It provides a comparative analysis of dimensions of social welfare systems, including social security, social services, and health care policy. It covers methodology of comparative analysis with attention to governmental involvement in social policy, the nature of public and private sector relations, and the assessment of social policy regarding the analytical ideas of adequacy, equity, inclusiveness, comprehensiveness, effectiveness, and efficiency. *Prerequisite: Consent of the instructor.*

SOWK 835 THEORIES AND PRACTICE OF SOCIAL WORK TEACHING..... 3

This course focuses on the development of teaching skills used for social work education. Students learn teaching strategies and classroom methodologies. Students develop and deliver sample lectures that include the use of audiovisual materials.

SOWK 838 SELECTED TOPICS IN SOCIAL WORK 3

Faculty members design and carry out a course devoted to a special topic area. To monitor content and quality, faculty members submit a detailed course outline to the program director before the course is added to the semester course schedule. *Prerequisite: Consent of the instructor.*

SOWK 897 INDEPENDENT STUDY .....1 TO 3

Students select topics of professional interest and study with a graduate faculty member who has competence in the subject. The study plan must include a provision for tutorial conferences and a formal paper or report. The student's advisor, instructor, and doctoral program committee must approve the study before registration. This course is repeatable to a maximum of 6 credits. *Prerequisite: Completion of core courses.*

SOWK 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

SOWK 899 DOCTORIAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

THAN 604 DEATH AND DYING: ETHICAL AND LEGAL CONSIDERATIONS..... 3

This course provides participants with the information and skills needed to address ethical and legal concerns related to palliative and end-of-life care. Participants will learn the theoretical foundations of health care ethics, including the Hippocratic Oath, ethical principles, virtue ethics, deontology, utilitarianism, and care-based ethics. The relationship between law and ethics will be clarified. The focus of society and medicine in delaying death and addressing human suffering will be discussed. Emphasis will be placed on developing a knowledge base of key concepts and strategies that can be used to prevent and resolve problems that are specific to palliative and end-of-life care, including advance directives; cardiopulmonary resuscitation; suffering; withholding and withdrawing life-sustaining treatments; organ donation; and assisted suicide.

THAN 605 PALLIATIVE CARE 3

In this course on end-of-life care, participants will learn practical skills to assist people who are facing incurable illnesses such as cancer, severe cardiovascular disease, and progressive neurodegenerative diseases. Palliative care focuses on symptom control and amelioration of suffering, which often are underemphasized in conventional health care training. Topics include pain and symptom management strategies, both conventional and complementary; determination of terminal prognosis; hospice care; palliative care emergencies; and discussion of advance directives. Participants will enjoy creative and thoughtful reflection activities that allow them to deeply engage in the topics covered in this course.

THAN 606 CARING FOR THE BEREAVED 3

In this second fall course, participants will learn the prominent theories of grieving and grief reaction as well as empirically based therapeutic interventions available to support and care for the bereaved. Participants will learn to distinguish between anticipatory grief, normal grief, and complicated grief and to identify factors that affect the grieving process. This course also explores reflective practice and self-care for the end-of-life care professional while learning to support those who are dying and those who are grieving.

THAN 609 PSYCHOSOCIAL PERSPECTIVES IN AGING 3

This course explores the psychological and social aspects of adult development within the context of the process of aging. Upon completion of this course, students will be able to describe the major psychological and sociological theories of aging and adult development; understand the physical, psychological, social, and health changes that occur during aging; evaluate the biological, psychological, intellectual, and social dimensions along which developmental changes occur in adult aging and their implications for the aging individual, family, and society; understand the importance of an individual's cultural context while progressing through the life course; and identify research trends and theories regarding several aspects of the aging process (e.g., death and dying, mental health, positive affect, personality, chronic disease, and social roles).

TOXI 601 ADVANCED TOXICOLOGY I 3

This is the first of a two-semester course that includes lectures and discussions covering basic principles of toxicology and mechanisms by which chemicals cause diseases and environmental damage. Topics include target organ toxicity, major classes of toxic agents, and mechanisms of cell injury and cell death. Offered in sequence in the fall and spring semesters.

TOXI 602 ADVANCED TOXICOLOGY II..... 3

The second of a two-semester course that includes lectures and discussions covering basic principles of toxicology and mechanisms by which chemicals cause diseases and environmental damage. Topics include target organ toxicity, major classes of toxic agents, and mechanisms of cell injury and cell death. Offered in sequence in the fall and spring semesters.

TOXI 607 FORENSIC TOXICOLOGY..... 3

Lectures include discussion of principles underlying forensic and clinical toxicology, mechanism of action of drugs and other poisons, methods of detection and quantitation of drugs and poisons in tissues and body fluids, and interpretation of analytical procedures for the detection and estimation of drugs and chemicals in biological samples. Offered in the fall semester in even-numbered years.

TOXI 608 RESEARCH IN TOXICOLOGY.....2 TO 4

Designed for students without research experience, this course provides training in how to design and conduct research studies, beginning with a two-week, classroom-based introduction to hypothesis-driven research and experimental approaches used in mechanistic studies in toxicology. For the rest of the semester, each student works individually with a faculty mentor to develop and complete a small lab-based or epidemiology research project. A written report is generated and results of the project are presented at the end-of-the-semester seminar.

TOXI 609 METHODS IN TOXICOLOGY .....1 TO 3

Permission and credit are arranged individually. Students become familiar with laboratory methods used by faculty members to study the effect of toxins and environmental pollutants on living systems. May be taken for credit more than once.

TOXI 611 EXPOSURE, RISK, AND PUBLIC HEALTH 2

This course focuses on the challenges in determining human health risks related to complex environmental problems. Beginning with a discussion of the principles of chemical risk assessment, this course examines how risk analysis is used in the development and implementation of regulatory policies to protect public health. Lectures address how to evaluate strengths and weaknesses of the risk assessment process, with an emphasis on characterizing exposure and evaluating toxicological data within the public health context. Case studies are used to demonstrate different approaches to these problems.

TOXI 618 SEMINAR IN TOXICOLOGY..... 1

Students, guests, and faculty members review and discuss original research and recent advances in toxicology.

TOXI 621 RISK ASSESSMENT AND MANAGEMENT..... 3

This course is designed to teach students the basic principles that apply to risk assessment of the environmental and human health effects of hazardous chemicals. The course features lectures and case studies to introduce students to environmental regulations that impact the use, environmental release, and cleanup of chemical contaminants. Student will learn how to evaluate relationships between exposure to chemicals and health outcomes and how regulations are developed to protect human health. *Cross-listed with ELS Risk Assessment and Management in a Regulatory Context (School of Law).*

TOXI 625 AQUATIC TOXICOLOGY..... 3

This course is designed to provide students with a broad perspective on the subject of aquatic toxicology. It is a comprehensive course in which a definitive description of basic concepts and principles, laboratory testing, and field situations, as well as examples of typical data and their interpretation and use by industry and water resource managers, are discussed. The toxicological action and fate of environmental pollutants are examined in aquatic ecosystems, whole organisms, and at the cellular, biochemical, and molecular levels. Attention is given to the impact of specific chemical pollutants (e.g., trace metals, nutrients, pesticides, PCBs, and PAHs). The field of biomonitoring, including the detailed description of a range of commonly employed biomarkers, is discussed. Classes consist of lectures by the instructor and guest speakers in addition to group discussions. *Cross-listed with MEES 743-Aquatic Toxicology.*

TOXI 799 MASTER'S THESIS RESEARCH.....1 TO 6

Required enrollment for students engaged in master's thesis studies.

TOXI 898 PRE-CANDIDACY RESEARCH.....1 TO 8

Required enrollment for students engaged in doctoral dissertation studies before their admission to candidacy.

TOXI 899 DOCTORAL DISSERTATION RESEARCH.....1 TO 12

Required enrollment for students engaged in doctoral dissertation studies.

Administration

Graduate School

Bruce E. Jarrell, MD, FACS, Dean

Roger J. Ward, EdD, JD, MPA, Vice Dean

Erin Golembewski, PhD, Senior Associate Dean

Flavius Lilly, PhD, MA, MPH, Senior Associate Dean

James N. Reynolds, MBA, Assistant Vice President, Fiscal and Academic Affairs

Keith T. Brooks, MEd, Assistant Dean

Mary Jo Bondy, DHEd, PA-C, Assistant Dean of Academic Programs, MSHS Administrative Director

Jenny Owens, ScD, MS, Executive Director, Graduate Research Initiative District

Reba Cornman, Director, Geriatrics and Gerontology Education and Research Program

Kevin Engler, MDE, Academic Support Coordinator

Erin Hager, MA, MFA, Academic Support Coordinator

Sharon Gillooly, Senior Instructional Technology Specialist

Stephanie Zinger, MA, Senior Marketing Specialist

Celeste Gerhart, Administrative Analyst

Laniara McCoy, Business Services Specialist

Nyasha Williams, Assistant Director, Admissions and Student Enrollment

Theresa Murray, Program Management Specialist

Theresa Brimer, Academic Program Specialist

Jade Grant, Academic Program Specialist

Malinda Hughes, MA, Chief of Staff, Academic Affairs and the Graduate School

University of Maryland, Baltimore

Jay A. Perman, MD, President

Bruce E. Jarrell, MD, FACS, Chief Academic and Research Officer, Senior Vice President

Stephen N. Davis, MBBS, FRCP, FACE, MACP, Vice President, Clinical Translational Science

Susan Gillette, JD, General Counsel and Vice President

James L. Hughes, MBA, Chief Enterprise and Economic Development Officer and Vice President

Kevin P. Kelly, JD, Chief Government Affairs Officer and Associate Vice President

Jennifer B. Litchman, MA, Chief Communications Officer, Vice President, and Special Assistant to the President

Peter J. Murray, PhD, Chief Information Officer and Vice President

E. Albert Reece, MD, PhD, MBA, Vice President for Medical Affairs

Dawn M. Rhodes, MBA, Chief Business and Finance Officer and Vice President

Thomas J. Sullivan, CFRE, MS, Chief Philanthropy Officer and Vice President

Roger J. Ward, EdD, JD, MPA, Chief Accountability Officer, Vice President, Operations and Planning

School Deans

Mark A. Reynolds, DDS, PhD, MA, School of Dentistry

Donald B. Tobin, JD, Francis King Carey School of Law

E. Albert Reece, MD, PhD, MBA, School of Medicine

Jane M. Kirschling, PhD, RN, FAAN, School of Nursing

Natalie D. Eddington, PhD, FAAPS, FCP, School of Pharmacy

Richard P. Barth, PhD, MSW, School of Social Work

University System of Maryland (USM)

Robert L. Caret, PhD, Chancellor

Jeff Neal, Vice Chancellor for Communications and Marketing

Joann Boughman, Senior Vice Chancellor for Academic and Student Affairs

David Mosca, Director of Auditing

Joseph Vivona, Chief Operating Officer and Vice Chancellor for Administration and Finance

Donald F. Boesch, Vice Chancellor for Environmental Sustainability

Leonard Raley, Vice Chancellor for Advancement

Patrick J. Hogan, Vice Chancellor for Government Relations

J. Thomas Sadowski, Vice Chancellor for Economic Development

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D'Ana Johnson

Robert R. Neall

Robert L. Pevenstein

Louis Pope

Frank M. Reid III

William A. "Will" Shorter Jr., Student Regent (term expires June 30, 2018)

FACULTY

The Graduate Faculty directory includes Regular (R), Associate (A), and Special (S) members.

Abrams, Thomas, (R), Associate Professor, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, University of Washington, 1981; BA, Carleton College, 1972.

Abulseoud, Osama, (S), Staff Scientist, Chemistry and Drug Metabolism, School of Medicine. MSc, Cairo University, 1996; MD, Cairo University, 1991.

Acheson, David, (A), Associate Professor, Epidemiology and Public Medicine, School of Medicine. MD, University of London, 1988; BS, University of London, 1977.

Addison, Odessa, (A), Assistant Professor, Physical Therapy and Rehabilitation Science. PhD, University of Utah, 2012; DPT, University of Utah, 2005; BS, University of Utah, 2003.

Adebamowo, Clement, (R), Professor, Epidemiology and Public Health, School of Medicine. DSc, Harvard University, 2004; MD, University of Jos, 1984.

Adebamowo, Sally, (A), Assistant Professor, Epidemiology and Public Health, DSc., Harvard University, 2014; MS., University of London, 2011; MBBS, University of Ibadan, 2007.

Ahmed, Zubair, (R), Professor, Otorhinolaryngology-Head and Neck Surgery, School of Medicine.

Ahn, Haksoon, (A), Associate Professor, School of Social Work. PhD, Brandeis University, 2009; MA, Brandeis University, 2004; MA, Yonsei University, 1995.

Ahuja, Bhoomika, (A), Clinical Assistant Professor, School of Dentistry. PhD, University of California, Los Angeles, 2011; BDS, Bhavnagar University, 2005.

Aichelmann-Reidy, Mary Beth, (R), Assistant Professor, Biomedical Sciences, School of Dentistry. Certificate of Periodontics, University of Pittsburgh, 1989; DDS, Stony Brook University, 1987; BS, Georgetown University, 1983.

Akintade, Bimbola, (A), Assistant Professor, Organizational Systems and Adult Health, School of Nursing. MBA, University of Maryland University College, 2012; PhD, University of Maryland, 2011; BSN, University of Maryland, 2003.

Albrecht, Eugene, (R), Professor, Obstetrics and Gynecology, School of Medicine. PhD, Rutgers University, 1972; MS, University of Vermont, 1967; BA, University of Vermont, 1965.

Albrecht, Jennifer, (A), Assistant Professor, Epidemiology and Public Health, School of Medicine. PhD, University of Maryland School of Medicine, 2012; BA, State University of New York at Buffalo, 1987.

Albuquerque, Edson, (R), Professor and Chair, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, Escola Paulista de Medicina, 1962; MD, University Federal of Pernambuco, 1959; BS, Salesiano College, 1953.

Aldrich, Jane, (R), Professor, Pharmaceutical Sciences, School of Pharmacy. PhD, University of Michigan, 1983; BS, Michigan State University, 1976.

Alger, Bradley, (R), Professor, Physiology, School of Medicine. PhD, Harvard University, 1977; BA, University of California, Berkeley, 1972.

Alkondon, Manickavasagom, (A), Assistant Professor, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, University of Delhi; MSc, University of Madras, 1976.

Alley, Dawn, (A), Assistant Professor, Epidemiology and Public Health, School of Medicine. PhD, University of Southern California, 2006; BS, University of Southern California, 2002.

Alon, Gad, (R), Associate Professor Emeritus, Physical Therapy and Rehabilitation Science, School of Medicine. PhD, University of Maryland, 1979; MS, Medical College of Virginia, 1975; BS, University of Maryland, 1972.

Ambalavanar, Ranjinidevi, (A), Research Assistant Professor, Biomedical Sciences, School of Dentistry. PhD, University of Liverpool, 1992; BVSc, University of Peradeniya, 1984.

Ambulos Jr., Nicholas, (A), Assistant Professor, Microbiology and Immunology, School of Medicine. PhD, University of Maryland, 1987; BS, University of Rochester, 1982.

Amelung, Pamela, (A), Assistant Professor, Organized Research Center for the Genetics of Asthma and Complex Diseases, School of Medicine, MD, University of Maryland, 1987, BA, University of Maryland, 1982

Ament, Seth, (A), Assistant Professor, Anatomy and Neurobiology, School of Medicine. PhD, University of Illinois, 2010; AB, Harvard University, 2003.

Amos, Veronica, (A), Assistant Professor and Assistant Director of Nurse Anesthesia, Organizational Systems and Adult Health, School of Nursing. MS, University of Maryland, 2007; MS, University of Maryland, 2000; BSN, University of Maryland, 1999.

Amr, Sania, (R), Professor Emeritus, Epidemiology and Public Health, School of Medicine. MS, University of Maryland, 1997; MD, University Paul Sabatier, 1977; MS, University Paul Sabatier, 1976.

An, Songon, Assistant Professor, Chemistry and Biochemistry

Anseloni, Vanessa C. Zilli, (A), Research Assistant Professor, Biomedical Science, School of Dentistry. PhD, University of Sao Paulo, 1997; BS, University of Sao Paulo, 1994.

Antalis, Toni M., (R), Professor, Physiology, School of Medicine. PhD, Rice University, 1981; BS, Furman University, 1975.

Anthony, Bruno, (R), Associate Professor, Psychiatry, School of Medicine. MA, MPhil, PhD, Columbia University, 1981; BA, University of Pennsylvania, 1973.

Antony, Paul, (R), Assistant Professor, Microbiology and Immunology, School of Medicine. MD, University of Michigan 2000; BS, University of Michigan, 1994.

Archibald, Sarah, (A), Instructor, Graduate School. PhD, University of Maryland, Baltimore County, 2012; MA, George Mason University, 2003; BS, State University of New York at Buffalo, 1999.

Atamas, Sergei, (A), Assistant Professor, Microbiology and Immunology, School of Medicine. PhD, First Moscow Medical Institute, 1989; MD, Crimea State Medical Institute, 1984.

Aurelian, Laure, (R), Professor, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, Johns Hopkins University, 1966; MS, Tel Aviv University, 1962.

Azad, Abdu, (R), Professor, Microbiology and Immunology, School of Medicine. PhD, Johns Hopkins University, 1976; MPH, University of Tehran, 1970; DPharm, University of Tehran, 1966.

Azimzadeh, Agnes, (R), Associate Professor, Surgery, School of Medicine. PhD, Institute of Molecular and Cellular Biology of the Center for National Scientific Research, 1992; MS, University Louis Pasteur, 1986; BS, University Louis Pasteur, 1984.

Bachur, Nicholas, (R), Professor, Greenebaum Cancer Center, School of Medicine. MD, University of Maryland, 1961; PhD, University of Maryland, 1961; AB, Johns Hopkins University, 1954.

Baer, Maria R., (R), Professor, Molecular Medicine, School of Medicine. MD, Johns Hopkins University, 1979; BA, Harvard University, 1973.

Bai, Guang, (A), Assistant Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Ulm, 1988; MS, Fourth Military Medical College, 1983; MD, Fourth Military Medical College, 1978.

Balcer-Kubiczek, Elizabeth, (A), Associate Professor, Radiation Oncology, School of Medicine. PhD, University of Maryland, 1981; MS, University of Warsaw, 1967.

Bambrick, Linda, (A), Assistant Professor, Anesthesiology, School of Medicine. PhD, University of Alberta, 2002; PhD, University of Alberta, 1986; BS, University of Toronto, 1981.

Banerjee, Arnob, (R), Assistant, Microbiology and Immunology, School of Medicine. MD, Columbia University, 2002; PhD, Columbia University, 2002; BS, Brown University, 1993.

Barnes, Douglas, (A), Associate Professor, Oral Health Care Delivery, School of Dentistry. MS, University of Maryland, 1992; DDS, University of Maryland, 1983; BA, Western Maryland College, 1979.

FACULTY (CONTINUED)

Barry, Eileen M., (R), Associate Professor, Microbiology and Immunology, School of Medicine. PhD, Medical College of Virginia; BA, University of Delaware, 1985.

Barry, Kathryn, (A), Assistant Professor, Epidemiology and Public Health. PhD, Yale University, 2011; MPH, Yale University, 2005; BS, Tufts University, 2003.

Barth, Richard, (R), Dean, School of Social Work. PhD, University of California, Berkeley, 1982; MSW, University of California, Berkeley, 1979; AB, Brown University, 1975.

Bartlett, Stephen, (R), Professor, Surgery, School of Medicine. MD, University of Chicago, 1979; BA, Johns Hopkins University, 1975.

Barton, Joseph, (A), Assistant Professor, Neurology, School of Medicine. PhD, University of California, Berkeley, 2004; MBA, Massachusetts Institute of Technology, 1984; MS, Rensselaer Polytechnic Institute, 1977.

Bashirelahi, Nasir, (R), Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Louisville, 1968; MS, University of Louisville, 1965; PharmD, Tehran University, 1962.

Basile, John, (R), Assistant Professor, Oral and Experimental Pathology, School of Dentistry, MA, DMSc, Harvard School of Dental Medicine, 2002, DDS, State University of New York, 1993, BA, Cornell University, 1989

Baskakov, Ilia V., (A), Associate Professor, Anatomy and Neurobiology, School of Medicine. PhD, Shemyakin-Ovchinnikiv Institute Russia, 1996; MS, Lomonosov Moscow University, 1992; BS, Lomonosov Moscow University, 1990.

Bastian, Amy, (S), Assistant Professor, Neurology. PhD, Washington University, 1995; BS, University of Oklahoma, 1990.

Battani, Kathryn, (A), Program Director, Health Promotion and Policy, School of Dentistry. MS, University of Maryland, Baltimore, 2008; BS, University of Maryland, Baltimore, 2002.

Baulch, Janet E., (A), Assistant Professor, Molecular Medicine. PhD, California State University, 2000; BSc, California State University, 1992.

Baumgarten, Mona, (R), Adjunct Professor, Epidemiology and Public Health, School of Medicine. PhD, McGill University, 1990; MS, McGill University, 1981; BS, Concordia University, 1978.

Bavoil, Patrik, (R), Associate Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of California, Berkeley, 1982.

Beardsley, Robert S., (R), Professor, Pharmaceutical Health Services Research, School of Pharmacy. PhD, University of Minnesota, 1977; MS, University of Minnesota, 1974; BSP, Oregon State University, 1972.

Bechtel, Roy, (A), Assistant Professor, Physical Therapy and Rehabilitation Science, School of Medicine. PhD, University of Maryland, 1998; MA, New York University, 1982, BS; University of Maryland, 1979.

Beitelshees, Amber, (A), Assistant Professor, Medicine. PharmD, University of Florida, 2001;

Belcher, John, (R), Professor, School of Social Work. PhD, Ohio State University, 1987; MSW, University of Kentucky, 1981; BS, George Mason University, 1976.

Belkin, Alexey, (A), Assistant Professor, Biochemistry and Molecular Biology, School of Medicine, PhD, Moscow State University, 1989; MS, Moscow State University, 1983.

Belkoff, Stephen, (R), Assistant Professor, Surgery, School of Medicine. PhD, Michigan State University, 1990; MS, Michigan State University, 1986; BA, Michigan State University, 1985.

Bellin, Melissa H., (R), Associate Professor, School of Social Work. PhD, Virginia Commonwealth University, 2006; MSW, Virginia Commonwealth University, 1998; BA, Stanford University, 1995.

Benavent, Vanessa, (A), Clinical Assistant Professor, Neural and Pain Sciences, School of Dentistry. MS, New Jersey School of Dentistry, 2012; DDS, University of Maryland, Baltimore, 2009; BS, University of Puerto Rico at Mayaguez, 2005.

Benavides, David, (A), Assistant Professor, Neurology. MD, University of Texas Southwestern, 2010; PhD, University of Texas Southwestern, 2010; BS, St. Mary's University, 2000.

Benevento, Louis, (R), Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Maryland, 1967; MS, Rensselaer Polytechnic Institute, 1964; BS, Rensselaer Polytechnic Institute, 1962.

Bennett, Robert, (A), Assistant Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Nebraska, 1967; MS, University of Nebraska, 1962; BA, Carleton College, 1960.

Bentzen, Soren, (R), Professor, Epidemiology and Public Heath, School of Medicine. MSci, University of Aarhus, 1994; PhD, University of Aarhus, 1986; MSc, University of Aarhus, 1981.

Bergey, Gregory, (A), Professor, Neurology, School of Medicine. MD, University of Pennsylvania, 1975; AB, Princeton University, 1971.

Bergman, Stewart, (A), Professor, Oral Surgery, School of Dentistry. MS, University of Maryland, 1986; DDS, State University of New York, 1968; BA, Brooklyn College, 1964.

Berlin, Lisa, (R), Assistant Professor, School of Social Work. PhD, Pennsylvania State University, 1994; MS, Pennsylvania State University, 1990; BA, Barnard College, 1986.

Berndt, Rita, (R), Professor, Neurology, School of Medicine. PhD, SUNY-Downstate, 1977; MA, SUNY-Downstate, 1975; BA, University of Maryland, 1971.

Bernstein, Steven L., (R), Associate Professor, Neuroscience, School of Medicine. MD, Pennsylvania State University, 1985; PhD, Cornell University, 1982; BSc, Philadelphia College of Pharmacy and Science, 1975.

Berry, Andrea Ahn-Yee, (A), Assistant Professor, Pediatrics, School of Medicine. MD, University of Pennsylvania, 2003; BA, Columbia College, 1998.

Bever Jr., Christopher, (R), Professor, Neurology, School of Medicine. MD, University of Rochester, 1975; AB, Washington University, 1971.

Bindon, Susan L., (A), Assistant Professor, Partnerships, Professional Education, and Practice, School of Nursing. DNP, University of Maryland, 2011; MS, University of Maryland, 2010; BSN, University of Pittsburgh, 1984.

Black, Lindsay, (R), Professor, Biochemistry and Molecular Biology, School of Medicine. PhD, Stanford University, 1967; BS, University of Chicago, 1962.

Black, Maureen, (R), Professor, Pediatrics, School of Medicine. PhD, Emory University, 1978; MA, University of Southern California, 1973; BA, Pennsylvania State University, 1967.

Blanchard, Thomas, (R), Associate Professor, Microbiology and Immunology, School of Medicine. JD, Case Western Reserve University, 2002; PhD, University of Massachusetts, Amherst, 199; BS, University of Massachusetts, Lowell, 1985.

Blanpied, Thomas A., (A), Assistant Professor, Physiology, School of Medicine. PhD, University of Pittsburgh, 1995; MS, University of Pittsburgh, 1991; BA, Yale University, 1987.

Blattner, William, (R), Professor, Medicine, School of Medicine. MD, Washington University, 1970; AB, Washington University, 1966.

Blaustein, Mordecai, (R), Professor and Chair, Physiology, School of Medicine. MD, Washington University, 1962, BA, Cornell University, 1957.

Blitzer, Miriam, (R), Professor and Interim Program Director, Human Genetics, School of Medicine. PhD, University of Pittsburgh, 1981; MS, University of Pittsburgh, 1980; BA, University of California, Irvine, 1974.

Bloch, Robert, (R), Professor, Physiology, School of Medicine. PhD, Harvard University, 1972; AB, Columbia University, 1967.

Bode, Claire, (A), Assistant Professor, Family and Community Health, School of Nursing. DNP, University of Maryland School of Nursing, 2015; MS, University of Maryland School of Nursing, 2010; BSN, Catholic University of America, 1980.

FACULTY (CONTINUED)

Bondy, Mary Jo, (A), Director of Graduate Studies, Graduate School. DHEd, AT Still University, 2011; PA, Duke University Medical School, 1993; MHS, Duke University Medical School, 1993.

Born, Catherine, (A), Associate Professor, School of Social Work. PhD, University of Maryland, 1982; MSW, University of Maryland, 1973; BA, University of Maryland, 1972.

Boyman, Liron, (A), Research Associate, Physiology, School of Medicine. PhD, Tel Aviv University, 2010; BSc, Tel Aviv University, 2004.

Brandt, Nicole, (A), Assistant Professor, Pharmaceutical Health Services Research, School of Pharmacy. PharmD, University of Maryland, 1997; BS, State University of New York, 1993.

Braver, Elisa R., (A), Associate Professor, Epidemiology and Public Health, School of Medicine. PhD, Johns Hopkins Bloomberg School of Public Health, 1990; MHS, Johns Hopkins Bloomberg School of Public Health, 1977; BA, Johns Hopkins University, 1975.

Bress, Lisa, (A), Assistant Clinical Professor, Health Promotion and Policy, School of Dentistry. MS, University of Maryland, 1994; BS, University of Maryland, 1993.

Bright, Charlotte, (R), Associate Professor, School of Social Work. PhD, Washington University, 2008; MSW, University of Iowa, 2000; BM, University of Iowa, 1998.

Brindle, Timothy J., (S), Instructor, Physical Therapy and Rehabilitation Science, School of Medicine. PhD, University of Kentucky, 2001; MS, Beaver College, 1989; BS, SUNY, 1987.

Bromberg, Jonathan, (R), Professor, Surgery, School of Medicine. PhD, Harvard Graduate School of Arts and Sciences, 1983; MD, Harvard Medical School, 1983; AB, Harvard College, 1977.

Brookes, Neville, (R), Associate Professor, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, Leeds University, 1967; PharmS, Bath University, 1962.

Brotemarkle, Rebecca, (A), Assistant Professor, Organization Systems and Adult Health, School of Nursing. PhD, Johns Hopkins University, 2013; MSN/MBA, Johns Hopkins University, 2004; BSN, University of Maryland, Baltimore County, 1986.

Brotman, Rebecca, (A), Associate Professor, Epidemiology and Public Health, School of Medicine. PhD, Johns Hopkins University, 2007; MPH, Johns Hopkins University, 2001; BA, Washington University, 1996.

Brown, Blanche, (A), Assistant Professor, Family and Community Health, School of Nursing. DNP, University of Maryland School of Nursing, 2015; MSN, Catholic University of America, 1996; BSN, Widener University, 1990.

Brown, Clayton, (R), Associate Professor, Epidemiology and Public Health, School of Medicine. PhD, Johns Hopkins University, 2001; MS, University of California, 1995; BS, University of Oregon, 1981.

Brown, Jessica, (A), Assistant Professor, Epidemiology and Public Health, School of Medicine. PhD, University of Maryland, Baltimore County, 2006; MA, University of Maryland, Baltimore County, 2004; BA, University of New Hampshire, 1998.

Bruno, Vincent, (A), Assistant Professor, Microbiology and Immunology, School of Medicine. PhD, Columbia University, 2004; BS, Carnegie Mellon University, 1996.

Bucci, Enrico, (R), Professor, Biochemistry and Molecular Biology, School of Medicine. PhD, University of Rome, 1965; MD, University of Rome, 1956; MC, Liceo-Mamiani, 1950.

Buchanan, Robert, (A), Professor, Psychiatry, School of Medicine. MD, New Jersey Medical School, 1980; BS, Lehigh University, 1976.

Buckley, Kathleen M., (R), Associate Professor, Family and Community Health, School of Nursing. PhD, University of Maryland, 1997; MS, University of Maryland, 1976; BS, University of Maryland, 1973.

Bundy, Elaine, (A), Assistant Professor, Family and Community Health, School of Nursing. DNP, University of Maryland, 2011; MS, University of Maryland, 2009; BSN, University of Maryland, 1979.

Burda, Charon, (A), Assistant Professor and Director, Family and Community Health, School of Nursing. DNP, University of Maryland, 2016; MSN, University of Maryland School of Nursing, 2003; BSN, Notre Dame College of Maryland, 1992.

Burger, Angelika M., (R), Associate Professor, Pharmacology and Experimental Therapeutics, School of Medicine. PhD, University of Bradford, 2004; MSc, Johannes Gutenberg University, 1993; PhD, Johannes Gutenberg University, 1992.

Burry, Caroline, (R), Assistant Professor, School of Social Work. PhD, University of South Carolina, 1995; MSW, University of Georgia, 1980; BA, Furman University, 1978.

Buxbaum, Jerome, (A), Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. FAGD, University of Maryland, 1976; DDS, University of Maryland, 1955; BS, University of Maryland, 1951.

Buzza, Marguerite, (A), Research Associate, Center for Vascular and Inflammatory Diseases, School of Medicine. PhD, Monash University, 2004; BSc, Monash University, 1996.

Cagle, John, (R), Assistant Professor, School of Social Work. PhD, Virginia Commonwealth University, 2008; MSW, Virginia Commonwealth University, 1998; BS, Mary Washington College, 1995.

Callahan, Christine, (A), Research Specialist, School of Social Work. PhD, Catholic University of America, 2012; MSW, Virginia Commonwealth University, 1993; BA, Houghton College, 1984.

Capra, Norman, (R), Associate Professor and Program Director, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Alabama, 1976; MS, University of Alabama, 1975; BS, Birmingham Southern College, 1969.

Carbonetti, Nicholas, (R), Associate Professor, Microbiology and Immunology, School of Medicine. PhD, University of Leicester, 1985; BS, University of Birmingham, 1981.

Carey, Gregory B., (A), Assistant Professor, Microbiology and Immunology and Center for Vascular and Inflammatory Diseases, School of Medicine. PhD, Virginia Commonwealth University, 1995; BSc, Virginia Commonwealth University, 1990 AA, College of the Bahamas, 1986.

Caridha, Artur, (A), Assistant Professor, Universities at Shady Grove, School of Nursing. MD, University of Tirana, 1986; PhD, University of Tirana, 1995; BS, University of Maryland, 2007.

Carneiro da Silva, Joana, (A), Associate Professor, Microbiology and Immunology, School of Medicine. PhD, University of Arizona, 2000; BSc, Faculty of Sciences, Lisbon, Portugal, 1992.

Carney, James, (S), Assistant Professor, Radiation Oncology, School of Medicine. PhD, Loyola University, 1994; BS, Niagara University, 1989.

Carpenter Jr., William, (A), Professor, Psychiatry, School of Medicine. MD, Wake Forest University, 1962; BS, Wofford College, 1958.

Carrier, France, (R), Assistant Professor, Biochemistry and Molecular Biology, School of Medicine. PhD, University of Montreal, 1988; MSc, University of Montreal, 1986; BSc, University of Quebec at Trois-Riviéres, 1983.

Carroll, Mary, (A), Assistant Professor, Family and Community Health, School of Nursing. PhD, University of Maryland, 2007; MS, University of Maryland, 1996; BSN, Bowie State University.

Cartee, Deborah, (A), Instructor, Health Promotion and Policy, School of Dentistry. MS, University of Maryland, Baltimore, 2008; BS, University of Maryland, Baltimore, 2002.

Catania, Selen, (A), Research Associate, Center for Vascular and Inflammatory Disease, School of Medicine. PhD, Jozsef Attila University, 1999; BS, Middle East Technical University, 1993.

Ceraul, Shane, (A), Assistant Professor, Microbiology and Immunology, School of Medicine. PhD, Old Dominion University, 2005; MS, Old Dominion University, 2001; BS, Christopher Newport University, 1997.

Chaffin, Charles, (R), Associate Professor, Physiology, School of Medicine. PhD, University of Wisconsin, 1996; MS, University of Wisconsin, 1992; AB, Ripon College, 1989.

Chang, Yen-Pei Christy, (R), Human Genetics, School of Medicine. PhD, Johns Hopkins University, 1994; BS, Virginia Polytechnic Institute, 1988.

Chang, Yung-Feng, (R), Professor, Oral and Craniofacial Biological Sciences, School of Dentistry. PhD, University of Pittsburgh, 1966; MS, National Taiwan University, 1960; BS, National Taiwan University, 1958.

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Zito, Julie, (R), Professor, Pharmaceutical Health Services Research, School of Medicine. PhD, University of Minnesota, 1984; MS, University of Connecticut, 1972; BS, St. John's University, 1966.

Zohar, Yonathan, (S), Associate Professor, Biological Sciences. PhD, University of Pierre and Marie Curie, 1982; MS, Hebrew University of Jerusalem, 1976; BS, Hebrew University of Jerusalem, 1974.

Zou, Ying, (A), Associate Professor, Pathology, School of Medicine. PhD, University of Texas Southwestern Medical Center, 2004; MD, Peking University, 1995.

Policies

The following are the major policies related to graduate students at the University of Maryland, Baltimore (UMB). This citation is not all-inclusive. A general index of University System of Maryland (USM) and UMB policies and procedures governing the University community is available on the University's website: *www.umaryland.edu/policies/#student*.

Appeal of Academic Dismissal

An appeal of academic dismissal must be submitted to the office of the dean of the Graduate School in writing within 10 working days of the student's receipt of the notice of dismissal. The letter of appeal should include: (a) the basis for the appeal; (b) a summary of discussions, if any, between the student and representatives of the student's program, such as the student's mentor and the student's graduate program director (GPD); and (c) the outcome or remedy proposed by the student. The letter may include additional relevant evidence or information.

The dean of the Graduate School will inform the GPD of the appeal by transmitting the student's letter of appeal within five working days of receipt of the appeal.

Grounds. The following are grounds for appeal: (1) incorrect calculation of grade-point average; (2) misapplication of standards for academic performance and satisfactory progress by the graduate program of the Graduate School; (3) differential application of standards for academic performance and satisfactory progress for the student appealing compared to other similar students; or (4) circumstances that had not been known and that might be relevant to the dismissal.

Disposition. The dean of the Graduate School may: (1) act on the appeal; (2) appoint a designee to collect additional information for the dean of the Graduate School; or (3) constitute a three-person ad hoc review committee from the Graduate Council Grievance Committee (GCGC). The purpose of the ad hoc committee is to provide an opinion and recommendation to the dean of the Graduate School regarding the appeal.

The dean of the Graduate School will inform the student and the GPD in writing of the method of disposition of the appeal. If a dean's designee is appointed, the student and the GPD will be informed of the name and contact information for the dean's designee. If a GCGC ad hoc committee is constituted, the approved guidelines will be followed.

The dean of the Graduate School's decision with respect to a student's appeal shall be final. The student and the GPD will be informed in writing of the dean's decision.

(Approved and adopted by the Graduate Council, Oct. 19, 1995; revised Nov. 25, 2003; revised May 31, 2005; revised January 2008)

Policy on Arbitrary or Capricious Grading

A. Purpose

These guidelines describe how allegations of arbitrary or capricious grading are handled in coursework at the Graduate School. Arbitrary or capricious means: (a) the assignment of a course grade to a student on some basis other than performance in the course; (b) the assignment of a course grade to a student by unreasonable application of standards different from the standards that were applied to other students in that course; or (c) the assignment of a course grade by a substantial and unreasonable departure from the instructor's initially articulated standards.

These procedures apply only to grades assigned in coursework. Qualifying and comprehensive examinations and defense of theses or dissertations during the progression toward the master's or doctor's degree are to be handled under the Academic Progression* policy.

B. Procedure

1. If a student alleges that a grade has been given in an arbitrary or capricious manner, the student must first discuss the situation with the faculty member responsible for the course within 10 business days of receiving the grade. The student also should contact the department chair or graduate program director if the issue is not resolved within 20 business days of receiving the grade.
2. If a student remains dissatisfied after the discussions required by paragraph 1, the student may file an allegation of arbitrary and capricious grading with the dean of the Graduate School. Allegations should be made in writing in the form of a letter to the dean of the Graduate School within 30 calendar days of the student's receipt of the grade. An allegation should include: (a) the course, program, and semester in which the grade was awarded; (b) the basis for the allegation; (c) the date the student was advised of the grade challenged; and (d) a summary and the dates of any conversations held pursuant to these procedures.
3. Upon receiving an allegation, the Graduate School dean's designee shall forward a copy of it to the faculty member who assigned the grade in question and to the chair or graduate program director.
4. The dean of the Graduate School or designee shall review each allegation of arbitrary and capricious grading and shall dismiss the allegation if: (a) the student has submitted the same, or substantially the same, complaint through any other formal grievance procedure; (b) the allegation does not allege actions that would constitute arbitrary and capricious grading as defined in these procedural guidelines; (c) the allegation was not filed with the dean of the Graduate School within 30 calendar days of the student's notice of the grade; or (d) the student has not conferred with the instructor and the graduate program director or department chair of the program offering the course before filing the allegation. The dean of the Graduate School or designee shall notify the student, faculty member, and chair or graduate program director in writing within one week of receiving the allegation of the disposition of the allegation.
5. If an allegation is not dismissed, the faculty member involved will have two weeks from receipt of the allegation to submit a written response to the dean of the Graduate School.
6. The dean of the Graduate School or designee shall submit the allegation of the student and the response of the faculty member to a grade hearing committee (GHC) consisting of three members (two faculty, one student) appointed by the dean of the Graduate School. The GHC may decide to hear statements from the student and the faculty member, or it may deliberate on the basis of written materials. GHC review may be waived with the consent of the student and the faculty member, in which case the dean of the Graduate School or designee will review the matter and make a determination. If the matter is considered by the GHC, following deliberations, the committee will give its recommendations in writing to the dean of the Graduate School or designee. If the GHC finds arbitrary or capricious grading did occur, its report should include recommendations for action, specifying whom they recommend be responsible for those remedy actions.
7. The dean of the Graduate School or designee will receive the GHC recommendation and make a decision. The decision will be forwarded in writing to the student, faculty member, and program director within two weeks of receiving the GHC recommendation or within two weeks of the waiver of GHC review.

C. Appeals

1. The student, faculty member, or program director may appeal to the dean of the Graduate School for reconsideration of the decision by submitting an appeal in writing to the dean of the Graduate School within 10 days of receipt of a decision.
2. The dean of the Graduate School's decision with respect to an appeal shall be final. The dean will endeavor to make a decision on the appeal within 10 days after its receipt. The dean's decision will be communicated in writing to the student, faculty member, and program director.

(Approved by the Graduate Council, Jan. 18, 1995; revised by a University of Maryland, Baltimore committee, February 1995; approved in revised form by the Graduate Council, April 20, 1995; revised July 2003)

*Policies, guidelines, and standards related to academic progression are outlined in the Academic Standards and Degree Requirements section of this catalog.

Student Academic Misconduct

This document sets out the basic University of Maryland Graduate School, Baltimore (UMGSB) policy and procedures for dealing with various forms of student academic misconduct primarily in coursework. Such misconduct involves significant breaches of integrity that may take numerous forms such as, but not limited to, those listed below:

- Fabrication: The intentional and unauthorized generation or altering of data, information, citation, or result in an academic exercise.
- Falsification: The intentional and unauthorized altering of any information, citation, or result in an academic exercise.
- Plagiarism: The intentional or knowing representation of the words, ideas, or work of others as one's own in an academic exercise — the appropriation of the language, ideas, or thoughts of another and representation of them as one's own original work.
- Cheating: The intentional or attempted use of unauthorized material in an academic exercise.
- Improprieties of authorship: Improper assignment of credit or misrepresentation of material as original without proper referencing of the original authors.
- Facilitating academic dishonesty: The intentional or knowing assistance or attempted assistance of another student to commit an act of academic misconduct.

Student misconduct in research and scholarly work falls under the purview of the University of Maryland, Baltimore County document *Policy and Procedures Concerning Misconduct in Scientific Work* or the University of Maryland, Baltimore document *Policy and Procedures Concerning Misconduct in Scholarly Work*.

All graduate students of the University of Maryland Graduate School, Baltimore (UMGSB) are subject to the standards of academic integrity required by the UMGSB and standards of academic integrity specific to a graduate program approved by the Graduate School. For example, the master's in science nursing programs have additional standards. Students also are subject to the possible penalties for academic misconduct described in this document. Students also must observe any additional standards announced by faculty members for particular courses.

Each faculty member is responsible for maintaining academic integrity in their courses and has the authority, using proper procedures and reasonable judgment, to determine whether a student has engaged in academic misconduct. The faculty member must decide whether the misconduct involves a less serious infraction susceptible to resolution by informal methods or a more serious infraction requiring severe and stigmatizing penalty, such as suspension or expulsion. Once the faculty member has made

an initial determination of academic misconduct, they shall initiate the process explained as follows. The faculty member should make initial determination of academic misconduct within two weeks of the infraction, if possible, and the entire process should be completed within 90 days, if feasible.

I. Less Serious Infractions

Examples of infractions that can be considered less serious are:

- Minor instances of plagiarism or cheating on examinations or papers required for a course.
- Minor fabrication or falsification of data for a laboratory report for a course.
- Facilitating academic dishonesty by students in an academic exercise.

After identifying academic misconduct and providing written notification and obtaining written authorization from the associate dean or the dean's designee, the faculty member has authority to resolve less serious cases of academic misconduct by means of informal methods such as warning, counseling, additional assignments, or grading. A typical penalty that has been exacted is to assign a zero grade for the exercise and compute the course grade including the zero grade for the exercise. The student may be reprimanded by the instructors, and the Graduate School can send letters of reprimand with the threat of dismissal should there be further occurrence. Such informal methods shall not be considered to be severe or stigmatizing. Confidential records of authorized informal actions shall be kept by the associate dean or the dean's designee for use of the Graduate Council Grievance Committee*. The GCGC may release only general statistical summaries of such information and may not release identifying information.

Having made an initial determination of academic misconduct involving a less serious infraction and having consulted the associate dean or the dean's designee for authorization, the faculty member shall observe certain rights of the student. The faculty member shall notify the student in writing within five days, if feasible, of the initial determination of academic misconduct and provide the student an opportunity within five days of notification to give explanation. Should the student fail to offer an explanation within the time frame, seek an extension for a good faith reason, or make a written request to the associate dean or the dean's designee for a full hearing before the GCGC, the informal action shall become final.

The faculty member's informal action shall be final and conclusive and not subject to appeal within the University System of Maryland on grounds related to academic misconduct.

II. More Serious Infractions

Infractions that can be considered more serious include:

- Major instances of plagiarism or cheating on examinations or papers for a course.
- Fabrication or falsification of data for publication, thesis, or dissertation.
- A pattern of, or repeated occurrences of, less serious infractions.

Having made a final determination of more serious academic misconduct, the faculty member shall notify the student in writing within five days, if feasible. The student shall have an opportunity within 10 days to respond and give an explanation to the faculty member before the determination of more serious academic misconduct can be made final by the faculty member.

After making an initial determination of an instance of more serious academic misconduct requiring severe and stigmatizing penalty, the faculty member shall within five days send a letter to the associate dean or the dean's designee. The faculty member's letter shall describe the academic misconduct and recommend suspension, probation, expulsion, or other action commensurate with the seriousness and circumstances of the misconduct. The faculty member shall send a copy of the letter to the student, to the graduate program director, and to the department chair. The associate dean or the dean's designee will notify the registrar, if

appropriate, to prevent the student from dropping the course, thereby evading a penalty. The letter to the student shall include a copy of this policy. The faculty member also shall make reasonable efforts to preserve any evidence that might be needed by the GCGC in the event of an appeal by the student.

III. Appeals and Hearings

When the faculty member has filed with the associate dean or the dean's designee a letter establishing academic misconduct requiring severe or stigmatizing penalty, the student shall have the right to a hearing before the GCGC. The student must file a written request for a hearing with the associate dean or the dean's designee within 10 days of notification. When a student requests a hearing in a case involving severe or stigmatizing penalty, the UMGSB administration shall provide facilities and personnel requested by the chair of the GCGC for the purpose of providing due process. If the faculty member recommends suspension or expulsion, the GCGC shall (unless the student waives the right to a hearing) automatically conduct a hearing to determine if there is enough evidence of misconduct, or history of misconduct, to justify suspension or expulsion.

Upon its notification of a hearing request, the dean of the Graduate School will appoint a three-person committee from among members of the GCGC. The GCGC should conduct an investigation, gather evidence, and interview witnesses to determine the facts. The investigation shall include a statement from the faculty member describing the situation and action, a statement from the student including reason for the hearing request, and all statements by witnesses. The associate dean or the dean's designee shall circulate the statements to GCGC members, noting that confidential items must be kept in a secure location. The GCGC also shall obtain any additional information requested by the faculty member, student, or committee members. If requested by the chair of the GCGC, the associate dean or the dean's designee shall provide the GCGC the record of academic misconduct of any student requesting a hearing. The GCGC should, if necessary, hold a pre-hearing meeting of committee members to discuss the investigation. Copies of all items of evidence should be sent to the faculty member and the student or, if the evidence cannot be copied, the associate dean or the dean's designee should arrange for the evidence to be inspected by these parties at a convenient time.

The GCGC then shall schedule a hearing, conducted by the chair of the GCGC, allowing sufficient time — including continuations if necessary — for the committee to be satisfied that further inquiry would turn up no new material. If feasible, the hearing should be scheduled within 30 days of the GCGC's notice of a hearing request. At least three members of the GCGC must attend a hearing to form a quorum. Hearings will be held in closed session and will be tape recorded. Accidental erasure of the tapes, failure of the recording equipment, or poor quality of the recording will not be grounds for appeal. The faculty member and the student shall attend the hearing. Witnesses may be present at the hearing only during their own testimonies except with the permission of both the student and the chair of the GCGC. Legal counsel for the student or the University may be present at the hearing in an advisory role. Legal counsel shall not function as an advocate. The student shall have the right to state their case, offer explanations and interpretations of each item of evidence and testimony, and ask questions of the faculty member and witnesses. The faculty member may offer interpretations of the evidence and testimony and ask questions as necessary. Each committee member may ask questions. The proceedings of the hearing are to be confidential and are not to be discussed outside the hearing.

Members of the GCGC who are present throughout the hearing shall discuss the case in closed session as soon as possible after the hearing. They then vote on whether to uphold the faculty member's initial determination of academic misconduct. When a faculty member's recommendation of suspension or expulsion is involved, the GCGC also votes whether to uphold the recommendation. No votes in absentia shall be counted.

The GCGC shall send its findings and recommendations in writing to the associate dean or the dean's designee within 10 days of the hearing, if possible. (A dissenting opinion may be submitted and filed by any GCGC member.) The associate dean or the dean's designee will act upon the recommendations of the report and notify the student, faculty member, and other necessary parties of the results of the determination. If the GCGC determines that the faculty member acted improperly or mistakenly in

their initial determination of more serious academic misconduct, it may recommend that the associate dean or the dean's designee expunge the notice of academic misconduct or attach a letter of explanation to the notice. The GCGC may, in its report to the associate dean or the dean's designee, include other penalties. While the GCGC may not impose grade alterations based on the content of the student's work, it has the authority to uphold the grade sanctions recommended by the faculty member if the student is found to have engaged in academic misconduct. The associate dean or the dean's designee's notification letter shall direct the student to the dean of the Graduate School should he or she want to appeal the decision. The GCGC also shall send the dean of the Graduate School the documents and records used as evidence in the case.

The student has the right to appeal to the dean of the Graduate School. The appeal must be in writing and must be filed within 10 days of receiving the GCGC report. The dean will review the GCGC report and may uphold the decision, reverse the decision, modify the decision or penalties, or refer the case back to the GCGC. In any case, the decision of the dean of the Graduate School is final.

The dean of the Graduate School shall maintain a confidential file of academic misconduct communications that shall constitute the student's record of academic conduct. The dean of the Graduate School may place appropriate notations on the student's transcript and provide the academic misconduct record of any student to outside institutions making inquiry appropriate under the federal Buckley Amendment laws.

*The GCGC is composed of three graduate faculty members from each campus — the University of Maryland, Baltimore and the University of Maryland, Baltimore County. GCGC members may be members of the Graduate Council and are appointed by the respective deans of the Graduate School to a term of two years. The initial appointment of one year for two members assures continuity of membership on the committee. Monthly meeting times will be set for the GCGC and any grievances that are filed will be heard at these times. Additional meeting times may be scheduled as needed. When a grievance is filed, all parties of the grievance and the members of the GCGC will be asked if there would be a conflict of interest with members of the committee or any party filing the grievance. The dean of the Graduate School will select three members of the GCGC who have no conflict of interest with any party affected by the grievance to serve on a panel to hear the case. Two members of the panel will be from the campus of the person filing the grievance. A panel may be augmented by two Graduate Student Association members of the Graduate Council (or other selected students) for the deliberation of academic misconduct grievances. The GCGC panel will serve as an informal fact-finding body, taking written statements from all participants and interviewing witnesses. The investigation may take the form of a hearing in which statements from all participants may be reviewed and the participants questioned. Legal counsel may be present at the hearing in an advisory role but shall not function as an advocate. Every consideration will be taken to ensure the confidentiality of witnesses. The GCGC panel will deliberate in closed session and make its recommendations to the associate dean or the dean's designee. Original documents of the proceedings and records of the hearing also will be submitted to the associate dean or the dean's designee.

(Approved and adopted by the Graduate Council, September 1993; revised July 23, 1998; revised Nov. 25, 2002)

Ombuds-Committee

The purpose of the Graduate School Ombuds-Committee (GSOC) is to provide mediation services when disagreements or differences of opinion arise between a graduate student and their advisor or graduate program that: (a) cannot be successfully resolved at the program level; (b) are serious enough in nature to jeopardize the student's ability to complete their training; and (c) do not relate to issues that fall under other policies.* The GSOC will consist of three experienced faculty members appointed by the dean of the Graduate School for a period of two years.**

Rationale: It is recognized that disagreements between students and their advisors occur during training. In most cases, such problems can and should be worked out by the student, advisor, and program, possibly with the assistance of the student's dissertation committee. If this is not possible, however, the situation should be brought to the attention of the associate dean or the dean's designee, who will, in turn, inform the GSOC. The GSOC will assist the student, advisor, and program to develop a strategy to resolve the situation. The GSOC will provide all parties an opportunity for full consideration of their positions and ensure that all relevant Graduate School rules and guidelines are followed.

Procedures:

- The student must first inform the director of their graduate program that a serious problem exists. It is the director's responsibility to review the situation and attempt to resolve it according to the rules and guidelines of the program and any Graduate School rules or guidelines that are applicable.
- In the event that the advisor is also the program director, the program should select another faculty member or form a committee of faculty members from within the program to mediate the problem.
- If efforts at the program level fail to resolve the situation, or if the program fails to act, the student may contact the associate dean or the dean's designee. The student should present the problem to the associate dean or the dean's designee in writing, describing the situation in detail and outlining what was done at the program level to attempt to resolve it.
- The associate dean or the dean's designee will provide the student's information to the GSOC. The GSOC will request information, also to be submitted in writing, from the program director, stating the program's position and describing efforts that were made to resolve the situation. The advisor also may provide input at this time, but such input must be submitted through the program director.
- The GSOC will review all relevant material provided by the student and program director. The GSOC may request additional information and meet with the parties involved. Upon completion of its review, the GSOC will make recommendations for resolution of the situation in writing to the student, advisor, program, and associate dean or the dean's designee.
- The final decision as to the appropriate resolution of all cases will rest with the dean of the Graduate School.
- If a GSOC member has been involved in a matter before it reaches the GSOC, the member will not participate in the deliberations. The associate dean or the dean's designee will name one alternate member to the GSOC for the matter.

*Note, for example, that instances of alleged arbitrary and capricious grading, sexual harassment, student academic misconduct, and other misconduct are dealt with under other Graduate School policies or University policies.

**Initially, the three faculty members will be appointed to staggered terms, as follows: one to a term of one year and two to a term of two years. This will provide for overlapping terms in subsequent years.

FERPA Notice

Pursuant to the Family Educational Rights and Privacy Act (FERPA) and the UMB Confidentiality and Disclosure of Student Records Policy, this notice is given to students to advise them that the following information about a student is directory information subject to disclosure by the University upon request: name; address; telephone listing; date and place of birth; photograph; major field of study; dates of attendance; degrees and awards received; and most recent previous educational institution attended. The directory information concerning a student may be disclosed even in the absence of consent unless the student, within three weeks of the first day of the semester in which the student begins each school year, files written notice informing the University not to disclose information in any or all of the categories. Notice not to disclose may be filed with the office of student affairs at the student's school.

The complete Family Educational Rights and Privacy Act policy — including terms and guidelines of student rights of access to educational records — is published in UMB's *Student Answer Book* and is available at *www.umaryland.edu/policies/#student*.

Graduate Council Grievance Committee Guidelines

Appeal of Academic Dismissal and Academic Misconduct

This is a formal hearing for academic cases that have not been resolved at the department level. After the hearing, which takes place as set forth under "Format," which follows, the GCGC will deliberate in closed session and recommend a decision and action to the dean of the Graduate School. The hearing is chaired by a member of the GCGC. The committee is staffed by the nonvoting administrative assistant of the dean of the Graduate School who will record the hearing for archival purposes only.

Format

a. Chair's introduction and summary of issues and process overview.

b. Department representative's presentation of issues (15 minutes maximum).

c. Student presentation of issues (15 minutes maximum).

d. Optional: Presentation by witnesses (limited to three per side and a maximum of 15 minutes per side)

e. Questions by committee members.

f. All presenters and witnesses are excused.

g. Deliberations by committee members.

h. Written recommendation to the associate dean or dean of the Graduate School (within 15 calendar days, unless extended by the associate dean or dean of the Graduate School, with notice of the extension given to all parties — the grievant(s) and the department — in writing.

Preparation

All materials that the grievance committee are to review must be submitted to the Graduate School at least two weeks (14 days) in advance of the hearing, at which time such materials will be distributed to all parties to the grievance and to the members of the GCGC. Thereafter, to the extent that any of the parties wish to have additional materials considered by members of the committee, such materials must be received by the Graduate School no later than one week (seven days) in advance of the scheduled date of the hearing, at which time all such additional written materials will be distributed to the parties as well as to the members of the GCGC. The Graduate School will pay for reasonable reproduction costs, but the cost of reproducing voluminous packets (i.e., those exceeding 50 pages) will be charged to the submitting party (the student or the department).

The proceedings will be recorded for archival purposes only.

If witnesses are to be called by either side, their names must be received by the Graduate School, in writing, at least one week (seven days) before the hearing.

Presentation of the issues should be concise and relevant. Obviously, the case is complex, or it would not have reached this stage. The points of dispute or ambiguity may be summarized or illustrated by anecdote. Experience suggests that the best approach is to minimize formalized presentations and allow the committee members maximum time for questions.

Attorneys

An attorney is neither necessary nor recommended. The GCGC described herein operates as part of an academic hearing, not a judicial proceeding. However, if the student elects to have counsel present, the University's attorney also must be afforded an opportunity to attend. Accordingly, the student must notify the Graduate School, in writing, at least two weeks (14 days) before the hearing if the student intends to use an attorney. Once a lawyer has contacted the Graduate School on behalf of a student, all contact, written and oral, must be with approval of the Office of General Counsel. The lawyer(s)' presence at the hearing does not change the proceedings. The lawyer(s) will not be able to examine witnesses, ask questions, or otherwise take part in the proceedings, except in an unobtrusive manner, in an advisory capacity to their clients.

ADA Policy

The University of Maryland, Baltimore (UMB) is committed to the principles of equal access and opportunity for persons with disabilities, in compliance with the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. UMB will not discriminate on the basis of disability against a qualified person with a disability in regard to application, acceptance, grading, advancement, training, discipline, graduation, or other aspects related to a student's participation in an academic program of the University of Maryland, Baltimore. This applies to all University students, postdocs, and applicants for admission to the University.

The UMB Accommodation Process is an interactive process between the student, the Office of Educational Support and Disability Services, and the school. UMB will make a reasonable accommodation for a qualified person with a disability to allow the performance of the essential requirements of an academic program. UMB will not make an accommodation if the accommodation alters the academic nature of the program or if it would result in undue hardship to the University or threaten health or safety. For more information, please see *www.umaryland.edu/disabilityservices*.

Technical Standards

The Graduate School does not have uniform technical standards and guidelines for admission and progression. Each school — and in some cases each program — may have its own standards and guidelines. A prospective or enrolled graduate student must consult the appropriate school/program student handbook or website for information about the standards students must satisfy, with or without reasonable accommodation, to be qualified.

Nondiscrimination

The University of Maryland, Baltimore does not discriminate on the basis of race, color, religion, national origin or ancestry, sex, sexual orientation, gender identity or expression, physical or mental disability, marital status, veteran's status, or age in its programs and activities. For more information, please see *http://umaryland.edu/academicaffairs/policies*.

NOTES

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GRADUATE SCHOOL

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www.graduate.umaryland.edu

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