Monroe Park Campus and MCV Campus

2011-12

Graduate and Professional Programs Bulletin

School of Medicine

VCU | Virginia Commonwealth University

The School of Medicine of the then Medical College of Virginia opened on November 5, 1838, as the medical department of Hampden-Sydney College. Full-time clinical faculty members were first appointed in 1928, and improved facilities became available between 1936 and 1941 with the completion of the 600-bed West Hospital, A. D. Williams Clinic and Hunton Hall dormitory, located on the current site of the Main Hospital building. Growth in faculty students and facilities continued after World War II, leading to the development of todays academic health center.

Hospital facilities on the MCV Campus include both in-patient and out-patient facilities. MCV Hospitals of the VCU Health System is licensed for 902 beds. In addition, the hospital at the McGuire Veterans Affairs Medical Center (600 beds) provides excellent patient care, training and research opportunities for the School of Medicine through its affiliation programs.

In the School of Medicine, advanced degree programs are coordinated through the Office of the Associate Dean for Graduate Education, who acts for the dean on all issues related to administration of advanced degree programs. Each advanced-degree program is represented by a faculty member who serves as director for graduate programs. Directors are appointed either by the chair of the department offering graduate degrees or, in the case of interdisciplinary programs, by the dean in consultation with the chairs of participating departments. The directors of graduate programs act on behalf of the programs and hold the responsibility and authority to represent the respective department(s) and their faculty to the school.

Administration

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Assistant Dean for Technology Services

John Ward
Senior Associate Dean for Clinical Affairs

Michelle Whitehurst-Cook
Associate Professor of Family Medicine and Associate Dean for Admissions

Christopher Woleben
Associate Dean for Student Affairs

Isaac K. Wood
Senior Associate Dean for Medical Education and Student Affairs

Accreditation

Genetic counseling (master's degree)
American Board of Genetic Counseling

Medical physics
Commission on Accreditation of Medical Physics Educational Programs

Medicine (M.D.)
Liaison Committee on Medical Education

Public health (master's degree)
Council on Education in Public Health

Mission statement

The mission of the VCU School of Medicine is to provide preeminent education to physicians and scientists in order to improve the quality of health care for humanity. Through innovative, scholarly activity and a diverse educational context, the school seeks to create and apply new knowledge, and to provide and continuously improve systems of medical and science education. Furthermore, the mission includes the development of more effective health care practices to address the needs of diverse populations and to provide distinguished leadership in the advancement of medicine and science.

The primary aim of the School of Medicine is to provide an academic environment appropriate for the education of its students, including undergraduate medical students, advanced-degree (graduate) students and graduate physician house officers, as well as continuing education directed toward the needs of practicing physicians. In the classroom, laboratory, clinic and hospital, the faculty and students are brought together in teaching-learning experiences that promote scientific scholarship and personal growth in knowledge and professional skills applicable to careers in a diverse workplace environment.

The School of Medicine and its faculty have vested responsibilities for the advancement of knowledge through research and for service to the community through application of skills in biomedical knowledge, health care leadership and patient care. Therefore, the school shares with teaching the interdependent and almost inseparable objectives of research and service.

The School of Medicine is located on the MCV Campus of Virginia Commonwealth University.

For comprehensive information on the School of Medicine departments, programs and faculty, please go to the school Web site at www.medschool.vcu.edu.

Faculty and facilities

The School of Medicine consists of 700 full-time faculty, including affiliates, assisted by 630 residents and fellows and more than 700 clinical voluntary faculty. Programs of instruction and research are conducted on campus, at the McGuire Veterans Affairs Medical Center and at affiliated hospitals in an effort to expose the students to the variety of clinical disorders encountered in the eastern U.S. The School of Medicine has established a geographically separate campus at the Inova Fairfax Hospital. Each year, 24 third-year students take all their clinical clerkships at Inova Fairfax Hospital. Their fourth year elective program also is based at the Inova Fairfax Hospital.

Health policies

Virginia Commonwealth University School of Medicine requires that all medical students carry active health insurance. Health insurance benefits must be equal to or greater than those provided by the university health carrier. In addition, it is required that all students complete required immunizations within six months of matriculation and have repeat tuberculosis screening performed prior to the third-year clerkships. For details related to these policies, please visit www.medschool.vcu.edu/studentactivities.

Graduate programs

A complete listing of advanced degree programs including links to departments, programs, contact information and application requirements can be found at www.medschool.vcu.edu/audience/prospective.html.

Graduate programs offering Master of Science and doctoral training in the School of Medicine include:

- Anatomy and Neurobiology
- Biochemistry
- Biostatistics
- Epidemiology (doctoral training only)
- Human genetics
- Medical physics
- Microbiology and immunology
- Pathology (doctoral training only)
- Pharmacology and toxicology
- Physiology

The Department of Human and Molecular Genetics offers a Master of Science in Genetic Counseling (M.S.) and the Department of Epidemiology and Community Health offers the Master of Public Health (M.P.H.) degree. Both of these degree programs are accredited by the appropriate national organizations.

The Department of Human and Molecular Genetics offers a combined degree program that pairs the M.S. in Genetic Counseling and the Ph.D. in Human Genetics. The school partners with the School of Allied Health Professions to offer combined Anatomy and Neurobiology/physical therapy track and Physiology/physical therapy track Ph.D. programs.

Recognizing that graduate education should prepare students for a variety of career options, and that developments in the basic sciences have expanded the breadth of scholarship, the school has developed approaches to interdisciplinary education, particularly in the areas of neuroscience, molecular biology and genetics, immunology, and structural biology.

A two-semester post-baccalaureate certificate program offering training for students seeking admission to professional school (i.e., School of Medicine, School of Dentistry) is available as the Pre-medical Graduate Health Sciences Certificate.

Application and admission to graduate programs

Application forms and instructions for applying to all graduate programs are available on the Graduate School Web site at www.graduate.vcu.edu.

1. The purpose of admission requirements and procedures is to ensure selection of competent students whose motivation, ability, education and character qualify them for graduate study in preparation for a career in science.
2. The following credentials constitute an application and should be sent to Virginia Commonwealth University, Graduate School, Richmond, VA 23284-3051.
    a. Application for admission on a form available to the applicant from either the VCU Graduate School or the VCU Office of International Education. A fee in the form of a check or money order (payable to VCU), must accompany the application. The fee cannot be returned nor credited toward tuition payment.
    b. Official transcripts of all undergraduate and graduate work sent directly from college or university registrars to the Graduate School.
    c. Letters of recommendation from three present or former teachers or others the applicant believes to be qualified to evaluate fitness to engage in graduate study for the degree in the field of choice.
    d. A personal statement from the applicant summarizing motivation, education and aims in pursuing graduate study.
    e. Verbal, quantitative, and analytical portions of the Graduate Record Examination are required. Medical College Admission Test or Dental Aptitude Test may be acceptable in lieu of the GRE for selected programs.
    f. International applicants for whom English is a foreign language must meet departmental admission requirements for performance on the TOEFL (Test of English as a Foreign Language). See section on international students in the Graduate Studies at VCU section of this Web site.
3. Acceptance of an applicant is based upon the recommendation of the director of graduate programs of the relevant program.

While most students matriculate in the fall semester, arrangements may be made to initiate graduate work at other times during the academic year.

Ph.D. programs

General requirements for graduate degrees

1. All full-time graduate students are expected to register for a minimum of 15 credit hours for the fall and spring semesters and six credit hours for the summer session. This requirement includes research. As an example, when students are registered for 10 credits in formal courses, they are expected to undertake five credits of research under the direction of their adviser or any approved faculty member. Research courses shall be graded as S (satisfactory), U (unsatisfactory) or F (fail). Registration for one credit hour is permitted only with prior permission.
2. Students are required to remain in good academic standing through the course of their degree program. Unsatisfactory student performance includes:
    a. The assignment of a grade of U, D or F in any course
    b. Failure to maintain a cumulative GPA of 3.0 or greater
    c. Failure to pass the written or oral comprehensive examination
    d. Failure to pass the final examination

    A student whose performance is unsatisfactory must obtain the approval of the MCV Campus Graduate Committee to gain permission for continuing in the graduate program. The committee elicits the recommendation of the department/program (as represented by the director of graduate studies of the appropriate program) and, as appropriate, the student's adviser in making a determination. Unsatisfactory performance also constitutes grounds for the termination of financial assistance to the student.
3. Students may not take the comprehensive examination for the Ph.D. degree if their overall GPA is less than 3.0 or if the GPA for courses within the major department is below 3.0. Students may not take the final oral examination for the M.S. or Ph.D. degree if their overall GPA is below 3.0. The examining body for the administration of the comprehensive examinations and the final examination is the student advisory committee. For the oral comprehensive examination for Ph.D. students and the final examinations for M.S. students, the body is supplemented by the addition of a representative of the MCV Campus Graduate Committee who chairs the examining body. The representative must be a member of the graduate faculty and is appointed by the chair of the MCV Campus Graduate Committee. The representative holds the responsibility for compliance with protocols appropriate to the examination, including the equitable treatment of the candidate.
4. Copies of the thesis/dissertation consistent with university standards shall be provided to the members of the student's advisory committee three weeks or more before the date of the defense of the thesis/dissertation. Following acceptance of the thesis/dissertation defense schedule by the committee, the student must submit a copy of the thesis/dissertation and a request for scheduling of the final examination to the chair of the MCV Campus Graduate Committee a minimum of ten working days in advance of the examination date. After passing the final examination, it shall be the responsibility of the candidate to present to the dean's office the approved

original thesis/dissertation plus the minimum required number of copies (three for M.S., four for Ph.D.) in final form suitable for binding. In consultation with the office staff, the candidate shall be responsible for the binding and the processing of the thesis through VCU Libraries and for the payment of all charges for these services.

5. A degree is granted only after all requirements have been fulfilled, including payment of all fees to the university, and after submission of the copies of the thesis for binding.
6. VCU currently requires registration for a defined credit hour level during both the didactic and research phases of advanced degree training. For programs requiring the preparation of a thesis or dissertation, there is therefore no obligatory linkage between the accumulation of credit hours and an expectation that a degree be awarded.

   As a guide to monitoring the timely completion of the degree within the present enrollment framework, the accumulation of 80 credit hours for a M.S. degree and 180 credit hours for a Ph.D. degree can be taken as a reasonable measure. These credit hour totals refer to degree programs requiring the preparation of a thesis or dissertation. Unless explicitly stated, the figures cited above apply to Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) programs offered by the School of Medicine.

The student adviser and advisory committee

Students receive guidance and counsel from the director of graduate programs for the appropriate program prior to appointment of the permanent adviser. The permanent adviser holds the primary responsibility for monitoring the development of the student in the program and providing the appropriate guidance and counsel essential to the scholarly development of the student.

An advisory committee, appointed shortly after the permanent adviser is appointed, serves as both an examining and consultative body, functioning to assist the development of the student. Committee members hold a special responsibility as a source of counsel for each student.

1. Each student shall have an adviser and an advisory committee.
2. Appointment of the adviser:
   a. The initial adviser will be the director of the graduate program or his/her designee prior to appointment of the permanent adviser.
   b. A permanent adviser shall be appointed from the graduate faculty by the chair of the MCV Campus Graduate Committee upon recommendation of the chair of the student's major department. Appointment should be made no later than the beginning of the fall semester following matriculation. A change in the permanent adviser may be made by the chair of the MCV Campus Graduate Committee upon recommendation of the chair of the major department.
3. Duties of the adviser:
   a. The adviser shall, with the student's advisory committee, have responsibility for guiding the student's academic program.
   b. The adviser shall develop a plan for the student's didactic program with the student.
   c. The adviser shall, on the basis of the proposed didactic and scholarly program for the student, identify members of the faculty to comprise the student's advisory committee and elicit their agreement to serve, the adviser serving as the chair of the committee.
   d. The adviser shall supervise the student's research work and dissertation preparation and be one of the examiners of the dissertation (Ph.D.).
   e. At the close of the spring semester, the adviser shall submit to the program director or the chair of the MCV Campus Graduate Committee a report covering the progress of the student. Copies of the report should be provided to the student and the membership of the student advisory committee by the adviser.
4. The student's advisory committee:
   a. The student's advisory committee shall be appointed no later than the end of the fall semester of the second year after matriculation by the chair of the MCV Campus Graduate Committee, upon recommendation of the student's adviser, review by the graduate program director and recommendation of the chair of the department of the permanent adviser. Appointment of the student advisory committee must be done within three months of the appointment of the permanent adviser and prior to the administration of comprehensive (or final) examinations. The composition of the advisory committee shall be such that significant areas of the student's scholarly program are represented in the expertise of the faculty members.
      i. The committee for the Ph.D. candidate shall consist of a minimum of five members as follows: the student's adviser; two other members of the graduate faculty of the department/program in which the student is enrolled; and at least two other members of the graduate faculty from departments other than the one in which the student is enrolled (where feasible, from two different departments).
      ii. A faculty member who is not a member of the graduate faculty may be appointed to a student advisory committee if approved by the MCV Campus Graduate Committee. Appointment is made by the dean of the Graduate School.
   b. Duties of the student's advisory committee:
      i. The advisory committee functions as an advisory body to ensure that timely progress toward degree completion is being achieved, as an examining body participating as appropriate for the intended degree in written qualifying examinations and conducting the oral qualifying examination and final examination, and as a consultative body to provide scholarly counsel.
      ii. The student's advisory committee shall work with the student's adviser in guiding the student's graduate program and shall meet at least annually. It is strongly recommended that the advisory committee meet with the student prior to administration of the comprehensive examination(s) by the committee.
      iii. The student's advisory committee shall recommend and approve a degree program (including foreign language if applicable) for the student as soon as it is practical. The proposed program should be filed with the chair of the MCV Campus Graduate Committee no later than the third semester of study.
      iv. The student's advisory committee shall conduct the oral comprehensive and final examination.

Doctor of Philosophy

1. Advanced graduate study leading to the Doctor of Philosophy degree is offered in the departments of Anatomy and Neurobiology, Biochemistry and Molecular Biology, Biostatistics, Epidemiology and Community Health, Human and Molecular Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics. The departments of Radiology and Radiation Oncology administer the Ph.D. degree in medical physics.
2. A minimum of 30 credit hours exclusive of research credits is generally required. In practice, a minimum of four years of study, including research, is necessary to complete all requirements.
3. For all Ph.D. programs, a period of residence of at least two consecutive semesters is required. In the context of Ph.D. training, "residence" refers to full-time enrollment, equivalent to enrollment of nine or more credit hours in a given academic term. The School of Medicine recommends that doctoral students maintain "residency" status for one academic year (fall and spring semesters), usually during the initial year of study. This recommendation is to ensure that the didactic component of training is not prolonged. Students should register in each academic term as a means of ensuring that timely progress toward degree completion is achieved. The specific requirements for residency will be detailed by the individual programs. A time limit of seven calendar years, beginning at the time of first registration, is placed on work to be credited toward the doctor of philosophy degree.

Admission to candidacy

The development of the individual as an independent research scientist is a critical component of the Ph.D. degree. The potential for such development is assessed on the basis of both mastery of subject matter and research competency as judged in the context of written and oral examinations administered at the level of department or program. Students are admitted to candidacy by the dean on the

basis of completing examinations as required and the recommendation of the faculty adviser, student advisory committee and graduate program director.

Comprehensive examinations

In order to advance to doctoral candidacy, the student must pass both written and oral comprehensive examinations. The written examination(s) generally focus(es) on the subject matter deemed critical as a foundation in the particular program. The written examination is largely based on material covered in required course work and its application to theoretical and practical problems. The oral examination, which follows successful completion of the written examination(s), is administered to assess the ability of the candidate to integrate information and display an appropriate mastery of problem-solving capabilities.

1. To advance to candidacy, the student shall take written and oral examinations designed to determine the potential of the individual for development as an independent research scientist. Advancement to candidacy should preferably take place prior to initiating the third academic year in the program. The written examination is administered by the student's department/program. In the event of failure of the written comprehensive examination, the student, with the approval of the MCV Campus Graduate Committee, may be permitted to repeat the written examination.
2. After passing the written examination(s), the student is eligible for the oral examination. The oral examination is conducted by the student's advisory committee and is chaired by a graduate faculty member representing the MCV Campus Graduate Committee who serves as a voting member of the examining committee. The oral examination is to be administered no later than six months after passing the written examination. (Departments/programs may require a shorter interval.)
3. The oral examination is scheduled through the Office of Graduate Education. An announcement of the candidate's name, department/program and the time and place of the examination shall be posted at least 10 working days in advance of the examination. If a written document prepared by the candidate is a component of the examination, the document shall be provided to the members of the examining committee at least 10 working days in advance of the examination. The oral comprehensive examination is open to all members of the faculty. Faculty members in attendance may ask questions of the candidate, but their questions shall not be presented until after the advisory committee has completed its questions. Faculty members other than those on the advisory committee shall not vote on the success or failure of the candidate. If a student fails the oral examination, the student may be reexamined with the approval of the MCV Campus Graduate Committee.
4. A favorable vote of the examining committee (all members of body being required to vote) with no more than one negative vote, is required to pass the examination. Members of the examining committee must vote on the performance as either pass or fail.
5. The oral examination must be completed successfully at least six months before submission of the dissertation.

Dissertation research

1. The student must conduct a substantial original investigation under the supervision of the permanent adviser and prepare a dissertation reporting the results of this research and analyzing its significance in relation to existing scientific knowledge.
2. The body of experimental work to be incorporated into the dissertation is subject to the approval of the membership of the student advisory committee. The advisory committee should, therefore, be formally consulted as the research project nears completion to ensure that there is agreement with respect to the material deemed necessary and sufficient for incorporation into the dissertation. Such consultation will normally occur in the form of a meeting of the advisory committee with the student. The faculty adviser has a responsibility to advise the student when the meeting of the advisory committee for this purpose should take place.
3. The dissertation is prepared in an acceptable form and style with the counsel of the faculty adviser. The faculty adviser determines when the dissertation document can serve as the basis for the final oral examination (or dissertation defense). With the approval of the faculty adviser, the final oral examination by the advisory committee is scheduled and the dissertation document is distributed to the advisory committee. Distribution of the dissertation document to the advisory committee will usually occur at least ten working days in advance of the final oral examination. The Office of Graduate Education is informed of the scheduling of the final oral examination ten working days in advance of the examination. The Office of Graduate Education will then post an announcement of the final oral examination to include the name and department of the candidate together with the title of the dissertation and the day, place and time of the final oral examination.
4. The final oral examination is conducted by the student advisory committee at a specified time and place, is chaired by the faculty adviser and is open to all members of the faculty. The subject matter of the examination is limited to the content of the candidate's dissertation and related areas. A favorable vote of the advisory committee with no more than one negative vote shall be required to indicate that the candidate has passed the final oral examination. All advisory committee members must vote. The outcome of the final oral examination is reported to the Office of Graduate Education. If the examination is not passed, the Student Advisory Committee must recommend a course of action for the student. The committee might, for example, recommend that a re-examination be scheduled, or that a major revision of the dissertation (including added data collection and/or analysis) be required prior to rescheduling of the examination, or that the student be terminated from the program or other action as deemed appropriate by the committee. A majority of the committee membership must concur in the recommended course of action. The recommendation must be communicated in writing to the appropriate graduate program director for approval within five working days of the examination. The program, acting through the graduate program director, shall accept the recommendation of the committee or determine an alternative within an additional five working days. The course of action approved by the program will be communicated in writing to the student by the graduate program director. The graduate program director shall inform the Office of Graduate Education of the School of Medicine in writing as to the action taken.

   If a re-examination is the recommended course of action, a representative of the MCV Campus Graduate Committee will be appointed to serve as the chair of the examining committee.
5. The student advisory committee approves the dissertation document as acceptable following the final oral examination. Approval of the dissertation as acceptable is indicated by the signature of all members of the advisory committee on the signature page of the dissertation. Approval of the dissertation by the advisory committee must be unanimous.

Termination of enrollment

The university reserves the right to terminate the enrollment of any student for unlawful, disorderly or immoral conduct or for persistent failure to fulfill the purposes for which he or she was matriculated.

A student enrolled in a graduate program under the supervision of the MCV Campus Graduate Committee may be dismissed from the school in which he is enrolled for failure to meet academic requirements prescribed by his school or failure to exhibit the attitudes and skills deemed necessary to function within his chosen scientific discipline.

Any action by a graduate student in a program under the supervision of the MCV Campus Graduate Committee considered to be unprofessional conduct shall constitute cause for disciplinary action.

Unprofessional conduct includes, but is not limited to:

1. Fraud or deceit in gaining admission to the university, i.e., false or obviously misleading representations on the admission application
2. An act that violates the established legal standards regarding conduct of one person toward society (i.e., stealing, lying, cheating and slander)
3. Conviction of a felony involving moral turpitude
4. Plagiarism or other scientific misconduct

Master's programs

Advanced graduate study leading to the Master of Science degree is offered in the departments of Anatomy and Neurobiology, Biochemistry and Molecular Biology, Biostatistics, Human and Molecular Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics. The Department of Epidemiology and Community Health offers the Master of Public Health degree; the Department of Human and Molecular Genetics also offers the Master

of Science degree in genetic counseling; and the departments of Radiology and Radiation Oncology administer the Master of Science degree in medical physics.

General requirements for graduate degrees

1. All full-time graduate students are expected to register for a minimum of five credit hours for the fall and spring semesters and six credit hours for the summer session. This requirement includes research. As an example, when students are registered for 10 credits in formal courses, they are expected to undertake five credits of research under the direction of their adviser or any approved faculty member. Research courses shall be graded as S (satisfactory), U (unsatisfactory) or F (fail). Registration for one credit hour is permitted only with prior permission.
2. Students are required to remain in good academic standing through the course of their degree program. Unsatisfactory student performance includes:
    a. The assignment of a grade of U, D or F in any course
    b. Failure to maintain a cumulative GPA of 2.5 or greater
    c. Failure to pass the written or oral comprehensive examination
    d. Failure to pass the final examination

    A student whose performance is unsatisfactory must obtain the approval of the MCV Campus Graduate Committee to gain permission for continuing in the graduate program. The committee elicits the recommendation of the department/program (as represented by the director of graduate studies of the appropriate program) and, as appropriate, the student's adviser in making a determination. Unsatisfactory performance also constitutes grounds for the termination of financial assistance to the student.
3. Students may not take the comprehensive examination for the Ph.D. degree if their overall GPA is less than 2.5 or if the GPA for courses within the major department is below 3.0. Students may not take the final oral examination for the M.S. or Ph.D. degree if their overall GPA is below 3.0. The examining body for the administration of the comprehensive examinations and the final examination is the student advisory committee. For the oral comprehensive examination for Ph.D. students and the final examinations for M.S. students, the body is supplemented by the addition of a representative of the MCV Campus Graduate Committee who chairs the examining body. The representative must be a member of the graduate faculty and is appointed by the chair of the MCV Campus Graduate Committee. The representative holds the responsibility for compliance with protocols appropriate to the examination, including the equitable treatment of the candidate.
4. Copies of the thesis/dissertation consistent with university standards shall be provided to the members of the student's advisory committee three weeks or more before the date of the defense of the thesis/dissertation. Following acceptance of the thesis/dissertation defense schedule by the committee, the student must submit a copy of the thesis/dissertation and a request for scheduling of the final examination to the chair of the MCV Campus Graduate Committee a minimum of ten working days in advance of the examination date. After passing the final examination, it shall be the responsibility of the candidate to present to the dean's office the approved original thesis/dissertation plus the minimum required number of copies (three for M.S., four for Ph.D.) in final form suitable for binding. In consultation with the office staff, the candidate shall be responsible for the binding and the processing of the thesis through VCU Libraries and for the payment of all charges for these services.
5. A degree is granted only after all requirements have been fulfilled, including payment of all fees to the university, and after submission of the copies of the thesis for binding.
6. VCU currently requires registration for a defined credit hour level during both the didactic and research phases of advanced degree training. For programs requiring the preparation of a thesis or dissertation, there is therefore no obligatory linkage between the accumulation of credit hours and an expectation that a degree be awarded.

    As a guide to monitoring the timely completion of the degree within the present enrollment framework, the accumulation of 80 credit hours for a M.S. degree and 180 credit hours for a Ph.D. degree can be taken as a reasonable measure. These credit hour totals refer to degree programs requiring the preparation of a thesis or dissertation. Unless explicitly stated, the figures cited above apply to Master of Science and Doctor of Philosophy programs offered by the School of Medicine.

The student adviser and advisory committee

Students receive guidance and counsel from the director of graduate programs for the appropriate program prior to appointment of the permanent adviser. The permanent adviser holds the primary responsibility for monitoring the development of the student in the program and providing the appropriate guidance and counsel essential to the scholarly development of the student.

An advisory committee, appointed shortly after the permanent adviser is appointed, serves as both an examining and consultative body, functioning to assist the development of the student. Committee members hold a special responsibility as a source of counsel for each student.

1. Each student shall have an adviser and an advisory committee.
2. Appointment of the adviser:
    a. The initial adviser will be the director of the graduate program or his/her designee prior to appointment of the permanent adviser.
    b. A permanent adviser shall be appointed from the graduate faculty by the chair of the MCV Campus Graduate Committee upon recommendation of the chair of the student's major department. Appointment should be made no later than the beginning of the fall semester following matriculation. A change in the permanent adviser may be made by the chair of the MCV Campus Graduate Committee upon recommendation of the chair of the major department.
3. Duties of the adviser:
    a. The adviser shall, with the student's advisory committee, have responsibility for guiding the student's academic program.
    b. The adviser shall develop a plan for the student's didactic program with the student.
    c. The adviser shall, on the basis of the proposed didactic and scholarly program for the student, identify members of the faculty to comprise the student's advisory committee and elicit their agreement to serve, the adviser serving as the chair of the committee.
    d. The adviser shall supervise the student's research work and thesis preparation and be one of the examiners of the thesis (M.S.).
    e. At the close of the spring semester, the adviser shall submit to the program director or the chair of the MCV Campus Graduate Committee a report covering the progress of the student. Copies of the report should be provided to the student and the membership of the student advisory committee by the adviser.
4. The student's advisory committee:
    a. The student's advisory committee shall be appointed no later than the end of the fall semester of the second year after matriculation by the chair of the MCV Campus Graduate Committee, upon recommendation of the student's adviser, review by the graduate program director and recommendation of the chair of the department of the permanent adviser. Appointment of the student advisory committee must be done within three months of the appointment of the permanent adviser and prior to the administration of comprehensive (or final) examinations. The composition of the advisory committee shall be such that significant areas of the student's scholarly program are represented in the expertise of the faculty members.
        i. The committee for the M.S. candidate shall consist of a minimum of three members as follows: the student's adviser (who serves as chair of the committee); one other member of the graduate faculty of the department/program in which the student is enrolled; and one other member of the graduate faculty from a department other than the one in which the student is enrolled.
        ii. A faculty member who is not a member of the graduate faculty may be appointed to a student advisory committee if approved by the MCV Campus Graduate Committee. Appointment is made by the dean, School of Graduate Studies.
    b. Duties of the student's advisory committee:

i. The advisory committee functions as an advisory body to ensure that timely progress toward degree completion is being achieved, as an examining body participating as appropriate for the intended degree in written qualifying examinations and conducting the oral qualifying examination and final examination, and as a consultative body to provide scholarly counsel.

ii. The student's advisory committee shall work with the student's adviser in guiding the student's graduate program and shall meet at least annually. It is strongly recommended that the advisory committee meet with the student prior to administration of the comprehensive examination(s) by the committee.

iii. The student's advisory committee shall recommend and approve a degree program (including foreign language if applicable) for the student as soon as it is practical. The proposed program should be filed with the chair of the MCV Campus Graduate Committee no later than the third semester of study.

iv. The student's advisory committee shall conduct the oral comprehensive and final examination.

Master of Science

1. Advanced graduate study leading to the Master of Science degree is offered in the departments of Anatomy and Neurobiology, Biochemistry and Molecular Biology, Biostatistics, Human and Molecular Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics. The Department of Epidemiology and Community Health offers the Master of Public Health degree; the Department of Human and Molecular Genetics also offers the Master of Science degree in genetic counseling; and the departments of Radiology and Radiation Oncology administer the Master of Science degree in medical physics.
2. A minimum of 24 semester course hours is required, exclusive of research credits. In practice, it is found that two years of study are usually necessary to complete the requirements. A time limit of five calendar years, beginning at the time of first registration, is placed on work to be credited toward the Master of Science degree. Generally a maximum of one-third of the hours required for a master's degree may be transferred from another VCU program or outside institution and applied toward the degree upon recommendation of the student's director of graduate programs with the concurrence by the chair of the MCV Campus Graduate Committee.
3. Each student must conduct an original investigation under the supervision of the permanent adviser, prepare a thesis reporting the results of this research and analyze its significance in relation to existing scientific knowledge. This study is reported in a thesis prepared in acceptable form and style.
4. The body of experimental work to be incorporated into the thesis is subject to the approval of the student advisory committee members. The advisory committee should, therefore, be formally consulted as the research project nears completion to ensure that there is agreement with respect to the material deemed necessary and sufficient for incorporation into the thesis. Such consultation will normally occur in the form of a meeting of the advisory committee with the student. The faculty adviser has a responsibility to advise the student when the meeting of the advisory committee for this purpose should take place.
5. The thesis is prepared in an acceptable form and style with the counsel of the faculty adviser. The faculty adviser determines when the thesis document can serve as the basis for the final oral examination (or thesis defense). With the approval of the faculty adviser, the final oral examination by the advisory committee is scheduled and the thesis document is distributed to the advisory committee. Distribution of the thesis document to the advisory committee should take place at least ten working days in advance of the final oral examination. The Office of Graduate Education is to be informed of the scheduling of the final oral examination ten working days in advance of the scheduled date. The Office of Graduate Education then identifies a representative of the MCV Campus Graduate Committee to chair the examination, and provides an announcement of the final oral examination, which includes the name and department of the candidate together with the title of the thesis and the day, place and time of the final oral examination.
6. The final oral examination is conducted by the student advisory committee at the designated time and place and is open to the faculty. A representative of the MCV Campus Graduate Committee serves as the chair of the examination committee and is a voting member of the examination committee. The subject matter of the examination includes the subject matter of course work as well as the content of the thesis. A favorable vote of the advisory committee with no more than one negative vote is required to indicate that the candidate has passed the final oral examination. All members of the examination committee must vote. The outcome of the final oral examination is reported to the Office of Graduate Education. If the outcome is negative, the final oral examination may be retaken with the approval of the MCV Campus Graduate Committee. Advance approval is requested in writing by the department on behalf of the candidate.
7. The student advisory committee approves the thesis document as acceptable after the final oral examination has been successfully completed. Approval of the thesis as acceptable is indicated by the signature of all members of the advisory committee on the signature page of the thesis. Approval of the thesis by the advisory committee must be unanimous. A thesis is not required for completion of the Master of Genetic Counseling Program. In lieu of the thesis, students in this tract are required to successfully pass comprehensive oral and written examinations.

Master of Public Health

The M.P.H. degree is offered in three tracks (epidemiology, generalist and social and behavioral science). A minimum of four semesters of full-time study (45 credit hours) is necessary to complete the degree requirements. All M.P.H. students are required to conduct a scientific investigation on a topic relevant to human and public health. The research project is conducted under the guidance of a faculty adviser and a preceptor with expertise in the topic area. The student must prepare a report of the research and give an oral presentation to the department.

Termination of enrollment

The university reserves the right to terminate the enrollment of any student for unlawful, disorderly or immoral conduct or for persistent failure to fulfill the purposes for which he or she was matriculated.

A student enrolled in a graduate program under the supervision of the MCV Campus Graduate Committee may be dismissed from the school in which he is enrolled for failure to meet academic requirements prescribed by his school or failure to exhibit the attitudes and skills deemed necessary to function within his chosen scientific discipline.

Any action by a graduate student in a program under the supervision of the MCV Campus Graduate Committee considered to be unprofessional conduct shall constitute cause for disciplinary action.

Unprofessional conduct includes, but is not limited to:

1. Fraud or deceit in gaining admission to the university, i.e., false or obviously misleading representations on the admission application
2. An act that violates the established legal standards regarding conduct of one person toward society (i.e., stealing, lying, cheating and slander)
3. Conviction of a felony involving moral turpitude
4. Plagiarism or other scientific misconduct

Certificate programs

The School of Medicine offers a Post-baccalaureate Graduate Certificate in Premedical Basic Health Sciences.

MCV Campus Graduate Committee

The assembled directors of graduate programs and the associate dean for graduate education form the MCV Campus Graduate Committee, with the associate dean serving as chair of the committee. This committee holds the responsibility for ensuring appropriate administration of graduate programs, reviewing modifications of didactic courses, new course offerings and new programs, reviewing proposed modifications of program curricula to ensure maintenance of standards of quality, avoid duplication and comply with the missions of the school, and for recommending action to the dean. The committee members provide the pool of candidates from which the school representatives to the University Graduate Council are chosen.

The School of Medicine follows the policies of the Graduate School with regard to the modification of existing courses, curricula and programs as well as the introduction of new offerings. Proposals will normally come from the faculty

acting through departmental bodies charged with the responsibility of monitoring academic training. In the case of offerings in interdisciplinary areas, these will normally require the input and approval of departments whose faculty and students are participants. The associate dean for graduate education in the School of Medicine may assist in the coordination of the proposal process. Proposed changes and additions are, under University guidelines, subject to review by the Curriculum Committee of the school. The MCV Campus Graduate Committee serves as the Curriculum Committee for the School of Medicine. On approval by the MCV Campus Graduate Committee, the approval of the dean of the School of Medicine is required prior to submission to University Graduate Council for review.

For comprehensive information on the School of Medicine departments, programs and faculty, please go to the school Web site at http://www.medschool.vcu.edu.

Professional programs

The School of Medicine offers the Undergraduate Medical Education, leading to the first-professional Doctor of Medicine degree; as well as Graduate Medical Education and Continuing Medical Education. Refer to each program's description for admission and program requirements.

Undergraduate Medical Education (M.D.)

The School of Medicine offers the first-professional Doctor of Medicine (M.D.) that develops students' clinical skills, professionalism and critical thinking. For more information about admission standards, curriculum requirements and other policies for the M.D. program, refer to the Medicine, Doctor of (M.D.) section of this bulletin.

Graduate Medical Education

Graduate Medical Education at Virginia Commonwealth University Health System provides diverse opportunities with very high academic and clinical standards for medical and dental graduates to pursue specialty training. Currently we offer over 70 medical and dental programs. The programs are accredited by either the Accreditation Council for Graduate Medical Education (ACGME) or the American Dental Association (ADA). Most of the programs use the ERAS application and the NRMP Matching program. We have over 700 residents training with the Health System and bring in approximately 200 new residents per year.

We encourage all qualified applicants to apply to our programs. For a detailed description of the qualifications and requirements please go to our Web page at www.medschool.vcu.edu/gme/residency.html.

Continuing Medical Education

The primary goal of the VCU Office of Medical Education is to provide continuing educational experiences specifically designed to enhance the delivery of high quality patient care by physicians and other health care professionals in Virginia and other states. The philosophy of continuing medical education is based on the belief that learning must be viewed as a lifelong process. In past generations, the graduating physician was able to look upon an acquired knowledge base as a reasonably stable resource for practicing medicine. However, today's rapidly expanding load of scientific information forces a continuing learning effort upon the physician. Undergraduate and graduate medical education alone can no longer offer reasonable assurance that practitioners are armed with the knowledge, attitudes and skills that will enable them to render optimal, achievable patient care throughout their careers. Continuing education is now linked with undergraduate and graduate education to complete the continuum of medical education.

The goal and philosophy stated herein undergird and lend direction to the effort of the Office of Medical Education as it engages in a diversity of educational and education-related activities. Specifically, the Office of Medical Education works in concert with the faculty of the School of Medicine, as well as other individuals and organizations as appropriate, to:

- coordinate a statewide continuing medical education program for several networks of affiliate hospitals,
- organize the Virginia Hospital Television Network and provide continuing education programs for physicians and other health professionals directly into hospitals statewide, using satellite and audio-conferencing,
- develop and deliver a series of short courses, clinical workshops, seminars, international medical study tours and conferences for physicians and other health professionals,
- provide clinical refresher courses and make readily available self-learning materials and methods, conduct research to improve the process of continuing medical education, and
- improve the education of the general public in the proper use of health care resources.

Fostering an appreciation for the concept of lifelong learning in undergraduate and graduate medical school programs is a challenge that is now being confronted by medical schools throughout the nation. During these critical years, the attitudes of medical students toward continuing pursuits of learning are molded and developed. In order to encourage undergraduate and graduate students at VCU to embrace the concept of lifelong learning, the Office of Medical Education actively seeks their involvement in its various programs and activities. Brochures, posters and a yearly catalog are utilized to announce pending events.

Further information may be obtained by writing the Assistant Dean for Continuing Education, School of Medicine, Virginia Commonwealth University, P.O. Box 980048, Richmond, VA 23298-0048.

Combined degree programs

The School of Medicine offers several combined degree programs:

- M.D./Ph.D. Program
- M.D./M.H.A.
- M.D./M.P.H. Program
- Combined M.S./Ph.D. and D.D.S. degree programs

All programs require review and acceptance by the professional degree program (M.D.) as a condition of entry into the combined degree program. Training for the graduate degree takes place following an initial phase of training in the professional program. Following completion of graduate degree requirements, the final phase of training in the professional degree program is concluded. Consult the appropriate listing for details of the admissions and program requirements.

Medicine, Doctor of (M.D.)

The program for the M.D. degree is divided into four phases, each of one year's duration. Medicine I, occupying the first year (mid-August to early June), emphasizes normal human structure, function, growth and development. Medicine II, occupying the second year (August to June), stresses the abnormal. Medicine III occupies the third year (July to July) and consists of clinical education and training. Medicine IV, lasting from August to mid-May, consists of approximately one-third required clinical education and training and approximately two-thirds electives at the VCU Health System's MCV Hospitals and at approved medical schools elsewhere in the United States and abroad. Elective opportunities also are offered in M-I and M-II.

School of Medicine students begin their clinical exposure in the first month of medical school in the Foundations of Clinical Medicine course. This longitudinal experience runs throughout the first two years and consists of sessions in a physician's office, small-group sessions, workshops and interacting with standardized patients and simulators. This course gives students the opportunity to learn the clinical relevance of basic science material and to work with a primary care role model. The course provides a fundamental understanding of the skills necessary for all clinical disciplines.

Admissions

Whitehurst-Cook, Dr. Michelle
Associate Dean of Admissions
www.medschool.vcu.edu/admissions

The School of Medicine participates in the American Medical College Application Service. The AMCAS application forms can be obtained from AMCAS, 2450 N. St., N.W., Washington, D.C. 20037-1126. The electronic application is available at www.aamc.org/students/amcas. Updated information is available at the School of Medicine Web site: www.medschool.vcu.edu. Application for the School of Medicine should be made during the first week of June of the year preceding intended matriculation. Letters of recommendation can now be submitted with the AMCAS application.

The closing date for filing applications for this institution is Oct. 15 of the year preceding the enrollment date. Priority for admissions is given to Virginia residents; however 45 percent of each class is from out of state. Members from disadvantaged populations are encouraged to apply to the School of Medicine. Students previously dismissed from a medical school will not be considered. All applicants must be U.S. citizens, permanent residents of the U.S. or Canadian citizens at the time of application. Permanent residents must submit their cards prior to file review.

A nonrefundable $80 application fee and supplemental information, including letters of recommendation, are required with all applications accepted for further consideration. The final date for returning supplemental information is Jan. 31 of the year of possible enrollment in the School of Medicine. Students are given individual deadlines which are 60 days from the date the Supplemental Application is granted.

The School of Medicine will not matriculate students from other health sciences schools at VCU or any other school until such students have completed the degree program for which they are enrolled.

The School of Medicine participates in the Early Decision Plan. This program permits an applicant to file a single application through AMCAS prior to Aug. 1. All applicants filing under the Early Decision Plan will receive consideration for admission and a response on or before Oct. 1. All applications for the Early Decision Plan must be supported by the results of the new MCAT test at the time the application is made.

The early notification date of this plan ensures that those who are unsuccessful have ample time to request further distribution of their applications to other medical schools. Further information on the Early Decision Plan is available with the AMCAS application.

Requirements for entrance

The MCAT is required as part of the application. It is necessary that the test be taken no later than September of the year of application. This test is produced by the American College Testing Program, P.O. Box 414, Iowa City, IA 52240, and is administered in colleges and universities throughout the country. Information about the MCAT is available through premedical advisers or directly from the American College Testing Program.

Applicants may be admitted on the basis of 90 semester hours of outstanding achievement. The majority of successful candidates have a college degree at the baccalaureate level or higher. The college major for premedical students should be selected in accordance with the individual student's aptitude and interest. The prerequisites for the School of Medicine have been reduced to a minimum in order to permit the widest possible latitude in preparation for medical education.

Prerequisites for admission include a minimum of 90 semester hours (or the equivalent) in a U.S. or Canadian college or university accredited by the regional accrediting agency. This program of study must include a minimum of:

1. English – two semesters (one semester to include grammar and composition);
2. College mathematics – two semesters;
3. Biological science – eight semester hours, including laboratory experience. This requirement may be satisfied by general biology, general zoology or botany. No more than half may be botany;
4. General or introductory chemistry – eight semester hours, including laboratory. An appropriate portion of this requirement may be met by courses in analytical chemistry or physical chemistry;
5. Organic chemistry – eight semester hours, including laboratory. This course should be equivalent to and acceptable for continued studies in a chemistry major;
6. General or introductory physics – eight semester hours, including laboratory experience.

Students are encouraged to pursue their own intellectual interests in college in order to obtain a broad education consistent with their major program. Courses in medically related science areas will not relieve the student of his/her responsibility for these subjects in the medical curriculum.

Selection factors

Demonstrated academic ability, as well as attributes of character and personality, are of significance to the admissions committee in the selection process. A review of academic achievement as represented by the standard academic record and summaries, MCAT scores, evaluations and interviews are all sources of information on which the comparative evaluation process is based. A review of the completed application file and interviews with members of the admissions committee are an integral part of the admissions process.

Noncognitive variables also are sought in all candidates. These qualities include, but are not limited to, health care experience, community service and social concern, communication skills both written and oral, leadership, ethical and moral behavior, creativity, compassion and empathy, altruism, personal maturity, self-confidence without arrogance, appropriate motivation, the ability to realistically self-appraise, and a demonstrated ability to work as a team member. These qualities and characteristics are judged by references within the letters of recommendation and from a careful review of the student's essays and extracurricular activities, as well as the interviewers' assessment during the interview. The School of Medicine hopes to create a learning environment where students will meet colleagues whose life experiences and views differ significantly from their own. A physician must be at home and at ease in a wide variety of environments and with a wide variety of people. Students frequently comment that the aspect of the school they appreciate most is the diversity of their class. The admissions process seeks to foster that diversity of perspective and background by admitting students from a wide range of backgrounds — socioeconomic, cultural, geographic and educational. Health care experience is also examined as a true evaluation of the motivation of the candidate for a career in medicine.

The interview is an opportunity for the applicant to become acquainted with the institution and it offers additional information for the selection process. Only on-campus interviews in Richmond are available. Each year more applicants are interviewed than can be accepted in the class. Therefore, an interview is not an indication of acceptance to the School of Medicine.

Offers for admission are made in the Early Decision Plan on Oct. 1 and on the uniform acceptance date after Oct. 15, with admissions occurring at several points thereafter until the class selections have been completed. The approximate dates for acceptance decisions are Oct. 16, Dec. 15, Feb. 1 and March 15. At the time the class is filled, an alternate list of applicants is compiled from which replacements are drawn for any vacancies that may occur in the selected class between notification and the third week of class attendance.

Since selections are made in advance of actual attendance, all acceptances are made on condition of satisfactory completion of courses planned or in progress. It is expected that candidates will maintain acceptable standards of deportment. Students offered acceptance into a class are expected to respond within two weeks of the offer. If such a response presents a problem, extension of the time for the response should be requested. After March 31, students are selected from a wait list of very good candidates until the first day of orientation in August.

The enrollment of accepted candidates is considered complete only after payment of the $100 deposit toward the first tuition payment. This deposit will be returned to the candidate should withdrawal occur prior to May 15 of the year of attendance. By the act of matriculation into the School of Medicine, the student accepts the responsibilities related to this opportunity and agrees that during the time that he/she is a registered student he/she will follow the rules and regulations established by the governing bodies of the School of Medicine and the university.

Transfer in advanced standing

Advanced standing admission is open only to students who previously have not been dismissed from any medical school and who are in good standing in LCME-accredited American or Canadian medical schools. Transfers are only at the third-year level and are limited in number each year. Interested students should request information between Jan. 1 and Jan. 15 of the year they wish to transfer. Applicants must pass Step 1 of the U.S. medical licensing examination prior to matriculation. Transfers are handled by the VCU School of Medicine curriculum office.

For additional information please see the Frequently Asked Questions About Transfer location on the VCU School of Medicine Web site at www.medschool.vcu.edu/curriculum/Transv.html.

Disability Support Services

Virginia Commonwealth University in agreement with Section 504 of the Rehabilitation Act of 1973 and The Americans with Disabilities Act of 1990 provides reasonable accommodation to any individual who advises us of a disability. We wish to provide new and current students who have a disability the opportunity to voluntarily identify themselves.

Early identification permits the Coordinator of Services for Students with Disabilities the opportunity to acquire verification of the disability, if required, and the opportunity to get appropriate accommodations in place as soon as possible. All accommodations request are handled on an individual basis. Examples of some accommodations are; extended test taking time, alternative testing format, note takers, readers, scribes, quiet testing area, sign language interpreters, assistive technology and computer software programs which are located in the library for student use.

If you are an individual with a disability and wish to identify yourself as such, please contact the Office of Disability Support Services. It is important to note that all disclosures are confidential and are released only with your permission. A comprehensive VCU Handbook for Students with Disabilities is available upon request. **Be sure to include your name, address and phone number if you write.** We also are available to answer questions about accommodations and services.

Director, VCU Office of Disability Support Services P.O. Box 980124 Richmond, VA 23298-0124 (804) 828-9782 VTDD (804) 828-4608 FAX (804) 828-4609 www.vcuhealth.org/vp/sassdss

Curriculum

Wood, Dr. Isaac K.
Senior Associate Dean for Medical Education and Student Affairs
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(804) 828-9791

The program for the M.D. degree is divided into four phases, each of one year's duration. Medicine I, occupying the first year (mid-August to early June), emphasizes normal human structure, function, growth and development. Medicine II, occupying the second year (August to May), stresses pathological conditions. Medicine III occupies the third year (July to July) and consists of clinical education and training. Medicine IV, lasting from August to mid-May, consists of approximately one-fourth required clinical education and training with the remainder open for electives at the Virginia Commonwealth University Medical Center and at approved medical schools elsewhere in the U.S. and abroad. Elective opportunities also are offered in M-I and M-II.

Registration in courses offered by the School of Medicine is restricted to students enrolled in the School of Medicine at Virginia Commonwealth University.

Medicine I and II

The curriculum is viewed as a dynamic and evolving entity and course titles, content or duration of emphasis may be subject to modification for the sake of improving the learning experience.

Each course in M-I and M-II is designed and implemented by a faculty committee and each phase of the curriculum is supervised by a faculty coordinator.

M-I Curriculum

The first year of medical school, from mid-August to early June, focuses on the normal human structure, function, growth and development.

1. Foundations of Clinical Medicine – www.medschool.vcu.edu/admissions/fcm.html
2. Medical Bioethics
3. Population Medicine
4. Medical Biochemistry
5. Human Genetics
6. Gross and Developmental Anatomy
7. Physiology
8. Histology
9. Behavioral Sciences
10. Immunology
11. Neurosciences

Total courses: 11

M-II Curriculum

The second year, from early August to late May, emphasizes the pathologic manifestations in the treatment of deseases. All students participate in the following courses:

1. Foundations of Clinical Medicine
2. Medical Bioethics
3. Pharmacology
4. Pathogenesis
5. Microbiology
6. Hematology-Oncology
7. Endocrine
8. Renal
9. Respiratory
10. Cardiovascular
11. Behavioral Sciences II
12. Central Nervous System
13. Women's Health
14. Gastrointestinal
15. Musculoskeletal

Total courses: 15

Medicine III

M-3 Clerkships

During the third year, students receive clinical training by rotating through the various hospitals and ambulatory services. This rich clinical experience is supplemented by didactic presentations on practice-related topics. All students participate in the following clerkships:

1. Internal Medicine (12 weeks)
2. Surgery (8 weeks)
3. Pediatrics (8 weeks)
4. Obstetrics/Gynecology (6 weeks)
5. Psychiatry (6 weeks)
6. Neurology (4 weeks)
7. Family Practice (4 weeks)
8. M-III Workshop (1 week)

Total required rotations: 8

Medicine IV

M-IV Curriculum

M-IV is an elective year, with more than 200 electives offered. Each elective is four weeks long.

The School of Medicine, in an effort to best serve the needs and goals of the individual student, offers M-IV students the option of choosing electives during the majority of their senior year. The elective curriculum has been arranged primarily to allow those students who have definite goals to pursue them logically without adherence to a required curriculum. At the same time, it allows those who have not yet defined their goals an adequate assortment of electives with which to explore career options. Where standard elective choices seem too limiting, students are encouraged to approach individual faculty members relative to the development of unique courses that more closely approach individual needs. A member of the M-IV Advisory Committee is available to advise each student and to approve each students program.

The year is divided into nine four-week periods. The required rotations, which must be served at the MCV Campus or an affiliated institution such as Inova-Fairfax Hospital or the McGuire Veterans Administration Medical Center, are an acting internship and an emergent care selective in Anesthesia, Emergency Medicine or one of the intensive care units. All students are required to take the year-end Update of Basic Sciences and Clinical Medicine course.

A description of the creation of the M IV schedule, including Electives Guidelines and the policy for Visiting Students is presented in the Senior Electives Catalog section of the School of Medicine website.

U.S. Medical Licensing Examination

All students are required to take the U.S. Medical Licensing Examination Step 1 prior to the start of the M-III year. Students are required to pass Step 1 for promotion to the M-IV year. If a student fails Step 1, he or she will be allowed to complete the current M-III clerkship and be required to take time off during the M-III year in an elective status to study for and retake the exam. The time off will be individualized for each student after discussion with the curriculum office and approval by the Promotions Committee. Failing to pass the exam after three attempts will result in dismissal.

All students are required to take U.S. Medical Licensing Examination Step 2 CK and CS for the first time after completion of their M-III year or by Dec. 1. Students are required to pass USMLE Step 2 CK and CS for graduation. Failure to pass either examination after three attempts will result in dismissal.

Grading and promotions

Each students progress toward his/her objectives is evaluated by examination in each area of subject matter and by national board examinations at appropriate times. Grades are assigned as honors, high-pass, pass, marginal or fail. Students receiving marginal or fail grades are counseled. All students are assigned a faculty adviser, available to the student throughout the four years of study.

Students who have attained satisfactory grades in M-I and M-II, but who do not pass U.S. Medical Licensing Examination Step 1, must take time off to study the basic medical sciences during the third school year, prior to their repeating the Step 1 examination. These students will use part of their fourth year to complete the segments omitted during the study time. Students must pass USMLE Step 1 to be promoted to the M-IV year.

At the close of each academic year, the Promotions Committee, composed of department chairs, recommends to the dean which students have achieved the objectives of the year and which students are qualified for either promotion or graduation. The Promotions Committee is charged to give careful individual attention to all aspects of student achievement, effectiveness, behavior and attitude. The Promotions Committee shall not recommend for promotion any student who has failed to meet the requirements of the preceding year or who appears unfit for the practice of medicine. In consideration of ones fitness for the practice of medicine and in recognition of the critical role of professionalism in being an effective physician, the Promotions Committee shall not recommend for promotion any student who has demonstrated a significant lack of either integrity or professionalism as those concepts are outlined in the School of Medicine Standards of Professional Behavior. When the committee determines by majority vote that a student will not be promoted, it then recommends to the dean remedial activities or dismissal in instances where no remedy is perceived. The dean reviews the recommendations and promptly notifies students that they have been promoted, have to repeat a year, require specific remediation or have been dismissed. A student repeating the year is expected to show significant improvement. The Promotions Committee also will meet each January to review the status of all senior students, all third-year students and M.D./Ph.D. candidates. At this meeting, the committee also will review any other students in serious academic difficulty and may choose to take final action, including dismissal, on such students.

An Appeals Committee of three senior faculty members will hear appeals of dismissals when such are filed in writing within 14 days of the student's notice of dismissal. A student also may appeal a decision to repeat a year, but such appeals will be reviewed by the Appeals Committee only when it is found that the student will present information not previously available to the Promotions Committee. A student appealing has the right to appear before the Appeals Committee and to have an adviser participate. The dean of the School of Medicine will act upon the recommendation of the Appeals Committee within 14 days of receipt of the committee's recommendation.

Withdrawal

Students may withdraw after meeting with the Senior Associate Dean for Medical Education and submitting a letter requesting withdrawal.

Requirements for graduation

The degree of Doctor of Medicine will be conferred by VCU upon candidates who, in the opinion of the medical faculty, have:

- Attained the schools educational objectives as evidenced by satisfactory completion of prescribed courses and examinations, by proven clinical skills and responsibilities, and by ethical standards.
- Passed Step 1, Step 2CK and Step 2CS of the U.S. Medical Licensing Examination before graduation (April of the M-IV year).
- Attended the School of Medicine for a minimum of two years, one of which must be an academic year of clinical rotations.
- Discharged all financial obligations to the university.

It is the policy of the School of Medicine that candidates must be present at commencement exercises unless excused by the dean.

School of Medicine core competencies and objectives

Professionalism: The ability to understand and demonstrate the nature of professional and ethical behavior in the act of medical care. This includes respect, responsibility, accountability, excellence, honor, integrity, altruism, leadership, cultural competency, compassion, maintenance of professional boundaries and confidentiality.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Provide compassionate care to patients with respect for their privacy and dignity
- Display honesty, integrity and responsibility in all educational settings and in interactions with patients, their families and colleagues
- Demonstrate altruism by consistently advocating for the patient's best interest
- Summarize and put into practice the principles of ethical decision-making
- Demonstrate accountability to the patient, society and the profession through a commitment to excellence and on-going professional development
- Appraise threats to the medical profession posed by the conflicts of interest inherent in the various financial and organizational arrangements within the practice of medicine
- Participate as an active member of the learning community and facilitate the learning of peers and other health care professionals
- Demonstrate knowledge of the psychological and physical risks and stressors of the practice of medicine
- Identify possible impairments in function and practice techniques for harm reduction

Patient engagement and communication (interpersonal and communication skills): The ability to engage and communicate with patients, their families and professional associates, using interpersonal skills to build relationships for information gathering, guidance, education, support and collaboration.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Create and sustain therapeutic and ethically sound relationships with patients and their families
- Employ effective oral and written communication skills to elicit and convey information while building rapport with patients, their families and professional associates
- Build collaborative relationships across both educational and clinical environments with patients, their families and professional associates
- Demonstrate the ability to engage in shared decision-making with patients and their families or individuals designated to fulfill this responsibility for the patient
- Demonstrate techniques of patient education and counseling in basic lifestyle changes and disease prevention

Application of scientific knowledge and method (medical knowledge): The ability to discuss the biomedical, epidemiological and social-behavioral aspects of clinical science and apply this knowledge to patient care.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Use the scientific method to analyze basic, translational and clinical research

- Delineate the molecular basis for the functions of organs and systems in health and disease
- Describe, apply and integrate the normal and pathologic structure and function of each organ system of the body
- Describe, apply and integrate the ways in which organ systems are affected by the various causative mechanisms of disease
- Recognize the clinical, laboratory, radiographic and pathologic manifestations of disease
- Describe, apply and integrate the scientific basis of disease prevention and treatment, including intended and unintended effects
- Apply evidence-based medicine to determine the causation of disease and the efficacy of traditional and non-traditional therapies
- Appraise the impact of social-behavioral factors on health maintenance, causation of disease and therapeutic outcomes

Patient care: The ability to provide patient care that is appropriate and effective for the treatment of health problems and the promotion of health.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Be able to obtain a complete history and perform a comprehensive physical/mental status examination
- Utilize a focused history and physical and mental status examination to obtain relevant clinical information in an efficient manner
- Recognize patients with immediate life-threatening or serious conditions that require critical care and outline an initial course of management
- Discuss with and provide to patients and their families information and counseling aimed at disease management, prevention and wellness
- Identify the epidemiology of common conditions within a defined population and apply systematic approaches to help reduce the incidence and prevalence of these conditions
- Describe the indications, risks, limitations, complications and interpretation of commonly used diagnostic tests
- Perform routine procedures competently and identify the indications, risks, limitations, justifications, complications and interpretations of these procedures
- Construct appropriate assessments, differential diagnoses and treatment plans for patients across the spectrum of medical presentations
- Gather, interpret and apply ongoing relevant clinical information in the care of patients
- Select appropriate tests for detecting patients at risk for specific diseases and determine strategies for responding appropriately
- Utilize information technology to gather patient data, support patient care decisions and educate patients and their families

Putting care in practical context (systems-based practice): The ability to provide clinical care within the practical context of a patient's age, gender, personal values, family, health literacy, culture, religion, and social and economic circumstances. This goal includes consideration of relevant ethical, moral and legal perspectives, patient advocacy, public health concerns, and resources and limitations of the health care system.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Obtain patient histories including information about patients' culture and other factors that may influence the appropriate course of care
- Perform culturally sensitive physical exams
- Identify cultural barriers that are perceived by patients as impacting health and health care
- Develop plans of care that take into account pertinent cultural attributes of patients and address barriers perceived by patients
- Compare and contrast various approaches to the organization, financing and delivery of health care
- Demonstrate understanding of the legal framework within which physicians function
- Describe the various roles and responsibilities of members of the health care team
- Interact effectively with all members of the health care team to provide the best possible care for patients
- Relate the effect of public policy actions to individual health and health care systems as a whole
- Define the methods used by individuals and systems to improve quality of care
- Practice a commitment to provide care to patients who are unable to pay and to advocate for access to health care for members of underserved populations
- Recognize and appropriately address gender and cultural biases in themselves and others and in the process of health care delivery

Self-directed learning and self-assessment (practice-based learning and improvement): The ability to assess and understand one's learning style, to self-identify areas of strength and weakness, to independently identify and evaluate resources to engage in lifelong learning, and to critically appraise the evolving body of medical knowledge.

Students who are graduated from Virginia Commonwealth University School of Medicine will:

- Demonstrate the understanding of the limitations of one's own knowledge and skills and seek to engage in lifelong learning and the advice and teaching of more experienced medical practitioners to address those limitations
- Demonstrate the understanding of the limitations of the role of a physician
- Demonstrate the understanding of the limitations of the evolving body of medical knowledge
- Retrieve, critically review and utilize biomedical and biopsychosocial information
- Identify means to maintain a healthy balance between professional and personal responsibilities to optimize mental, physical and emotional well-being

School of Medicine Registrar

The School of Medicine houses a Registrar's Office to meet the needs of physician trainees and alumni. Visit the School of Medicine Web site for more information at www.medschool.vcu.edu/registrar.

Criminal background checks

All applicants to the VCU School of Medicine who receive an acceptance will have a criminal background check performed by Certiphi Screening Inc. If there is a positive finding you will be notified by Certiphi first; this will allow you to make corrections to the report and verify the information. If there is no change in your status Certiphi will then notify VCU of their positive findings. VCU's Criminal Background Committee will meet to discuss your Certiphi report to determine if acceptance is to be withdrawn. We encourage full disclosure at all times on the AMCAS and supplemental applications, as dishonesty will impact the committee's decision. If you have a legal finding or institutional action against you after the supplemental is submitted please notify our admissions office immediately. Once an applicant is matriculated, full disclosure is also required throughout your time in medical school. Criminal background checks are repeated for all students at the end of the second year and for specific program participations throughout medical school.

Health policies

Virginia Commonwealth University School of Medicine requires that all medical students carry active health insurance. Health insurance benefits must be equal to or greater than those provided by the university health carrier. In addition, it is required that all students complete required immunizations within six months of matriculation and have repeat tuberculosis screening performed annually. For details related to these policies, please visit www.medschool.vcu.edu/studentactivities.

Student organizations

The School of Medicine, through the Office of Student Affairs, provides oversight to all of the organizations available to medical students. All student organization

are required to register with the Office of Student Affairs following established policy and the approved registration format.

For more information, visit the School of Medicine student organizations Web page at www.medschool.vcu.edu/studentactivities/studentorganizations.htm.

Combined Doctor of Medicine (M.D.) and Master of Public Health (M.P.H.)

Note: Students applying to the joint M.D./M.P.H. program should be accepted to the VCU School of Medicine prior to applying to the M.D./M.P.H. program. MCAT acceptable in lieu of GRE for combined professional/academic degree programs.

The Department of Epidemiology and Community Health in the School of Medicine offers a program for VCU medical students to obtain a Master of Public Health degree in conjunction with their medical training. The M.D./M.P.H. dual-degree program provides an opportunity for medical students who wish to pursue a public health or research career to graduate from medical school trained in both clinical and preventive, population-oriented medicine. Graduates from this program are prepared for positions in preventive medicine, primary care, research, community-based health centers and local health departments. Students may select a concentration in (1) epidemiology, which provides a foundation of epidemiological and biostatistical methods necessary to become a productive member of a research team in a public health setting, or (2) public health practice, which gives students a broad overview of public health issues and training in epidemiological, biostatistical and assessment/evaluative methods necessary to practice as a public health professional.

The objective of the dual-degree M.D./M.P.H. program is to provide high quality and in-depth training in public health to qualified medical students. The five-year program includes four years of medical school and one year of study in the M.P.H. program. During the M.P.H. year students take a minimum of 30 credits of didactic courses. Students may choose a concentration in epidemiology or in public health practice. To complete the M.P.H. requirements, students receive 12 credits for successful academic work during the first two years of medical school and take a minimum of one public health elective during the fourth year. Students may register for the M.P.H. year either prior to entering medical school or after the M-III year and prior to M-IV electives. Enrollment in the dual-degree program requires admission into both the School of Medicine and the Graduate School. Students must successfully complete all required course work to receive both degrees at the completion of the five years.

Epidemiology track

	Credits
Fall	15
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 602 Public Health Organization and Management (3)	
EPID 604 Principles of Environmental Health II (3)	
Elective (3)	
Spring	15
BIOS/STAT 544 Statistical Methods II (3)	
EPID 606 Epidemiology II: Epidemiological Methods (3)	
EPID 694 MPH Research Project (3)	
Topical epidemiology course (e.g. EPID 620 Cancer Epidemiology, PHAR 688 Applied Pharmacoepidemiology Research Methods) (3)	
Elective (3)	

Public health practice track

	Credits
Fall	15
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 602 Public Health Organization and Management (3)	
EPID 604 Principles of Environmental Health II (3)	
Elective (3)	
Spring	12
EPID 612 Community-based Program Planning and Evaluation (3) or SBHD 608 Health Communication (3)	
EPID 695 MPH Practice Project (3)	
Electives (9)	

Combined Doctor of Medicine (M.D.) and Doctor of Philosophy (Ph.D.)

The M.D./Ph.D. Program seeks to train physician-scientists for careers that bridge basic and clinical science. Physician-scientists will translate laboratory discoveries into better patient outcomes. The program begins two months prior to the first year of medical school. These students arrive on campus for orientation and complete two laboratory rotations before the start of medical school classes. They complete the first two years of medical school and, after taking the first part of the U.S. National Medical Licensing Examination, enter a Ph.D.-granting department or program as a graduate student. Graduate-level course work, examinations and research will be guided by the thesis adviser and the thesis committee, with oversight by members of the M.D./Ph.D. Steering Committee. The main undertaking at this phase is laboratory research that leads to the Ph.D. dissertation. After completion of doctoral degree requirements, students move to the clinical year of medical school. Students may begin their clinical year of medical school immediately after completion of doctoral (Ph.D.) requirements, regardless of the time in the calendar year, and, 14 to 16 months later, may complete their medical school requirements. These students are exempt from the major part of the fourth year of medical school.

Prospective students submit applications through the American Medical College Application Service. Upon review of the AMCAS documents, qualified applicants are sent supplemental admission materials, including an application for the M.D./Ph.D. Program. Those invited to Richmond for interviews will spend one day in the standard interview for the School of Medicine and will spend a second day interviewing with members of the M.D./Ph.D. Steering Committee, as well as touring labs of faculty scientists.

Admission of medical students to the Ph.D. phase of training takes place formally following completion of the M-II year of M.D. training. A copy of the student file is transferred to the Office of Graduate Education and the individual is formally accepted to Ph.D. training by the VCU Graduate School.

The requirements for a combined professional school/graduate school degree in the School of Medicine are equivalent to those required of students seeking a graduate degree alone and are determined by the individual program.

For additional information, please see the program Web site at www.vcu.edu/mdphd

Combined Doctor of Medicine (M.D.) and Master of Health Administration (M.H.A.)

Students may indicate their interest in the combined program prior to matriculation or during the first three years of the M.D. program.

Advanced study in health administration and medicine is available through a dual-degree program co-sponsored by the department of Health Administration and the VCU School of Medicine. The program leads to the awarding of the Doctor of Medicine and Master of Health Administration degrees. The objective of the M.D./M.H.A. program is to provide highly motivated medical students the expertise for management and leadership competency in complex health care organizations. The joint program may be completed in five years. Applicants for this program are required to meet the admission requirements of each program. For information regarding the dual-degree program, contact the director of the program.

For the combined degree program, course work for the M.H.A. is initiated following completion of the first two or three years of the M.D. program, occupies a full academic year (fall, spring and summer) and extends into a second year, and is taken during a hiatus from the third or fourth year of the M.D. program.

Students interested in the program may contact the School of Medicine Office of Curriculum or the Director of the M.H.A. Program, Department of Health Administration (School of Allied Health Professions).

For additional information refer to the School of Medicine handbook available on the school's Web site at www.medschool.vcu.edu.

Curriculum

Fall I	Credits
HADM 602 Health System Organization, Financing and Performance	3
HADM 606 Health Care Managerial Accounting	3
HADM 612 Information Systems for Health Care Management	3
HADM 615 Health Care Politics and Policy	3
HADM 646 Health Care Organization and Leadership	3
HADM 682 Executive Skills I	1
Spring I	
HADM 607 Financial Management in Health Organizations	3
HADM 610 Health Care Management Decision Support Systems	3
HADM/ECON 624 Health Economics	3
HADM 647 Management of Health Care Organizations	3
HADM 649 Human Resources Management in Health Care	3
Summer I	
HADM 693 Internship in Health Administration	3
Fall II	
No MHA course commitments; return to M.D. program	
Spring II	
HADM 611 Health Care Law and Bioethics	3
HADM 614 Health Care Marketing	3
HADM 648 Strategic Management in Health Care Organizations	3
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Combined Doctor of Medicine (M.D.) and Master of Science (M.S.)

Medical students seeking to expand their competency in the conduct of research may choose the basic science track in one of the master's-level programs within the School of Medicine. The track offers a research-intensive program that builds on the core of disciplinary material embedded in the medical school curriculum in the first two years of training — with additional exposure to specialized areas in basic science disciplines. The research experience leads to preparation of a report in the form of a manuscript suitable for publication. The program is designed to be completed within a period of 12-15 months.

Addiction Studies, Master of Science (M.S.)

Admission requirements summary

Addiction Studies, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall	Jul 1	TOEFL for non-native speakers (see below)
Special requirements: Applicant's must have qualified in a related discipline for an honors degree (level 2A or 1) or a bachelor's degree from a recognized tertiary institution in the U.S. Any applicant who does not meet this criterion should have (in addition to an honors or bachelor's degree) significant professional work experience and approval of the program committee. Additionally, applicants must have a high level of proficiency in English, demonstrated by completion of a university qualification studied in the English language, or by meeting one of the following English language requirements: an IELTS score of 7.0, a TOEFL score of 600 (paper-based) or 260 (computer-based), or Grade C or above in GCSE English.			

Through a collaborative program between VCU, King's College London and the University of Adelaide in Australia, students complete a program of study using distance-learning technologies to obtain a Master of Science in Addiction Studies (M.S.) degree. The program is designed to prepare students for local, national and international policy positions; prevention/treatment program management and other leadership positions in the addictions field.

Prospective students apply to the program electronically through the VCU IPAS website, www.vcu.edu/idas/IPAS. Once accepted, students are enrolled in all three universities and have access to the resources associated with all three schools. No on-campus classroom time is required to complete the degree.

Students are required to successfully complete 36 credit hours, which can be done either full time (12 months) or part time (24 months). Six of the required credits are assigned to a final research project examining a relevant addictions-related topic. VCU, King's College London and the University of Adelaide confer degrees jointly through a single diploma.

Anatomy and Neurobiology, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Anatomy and Neurobiology, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Jan 7 given priority consideration	GRE, MCAT or DAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

Advanced graduate study leading to a Doctor of Philosophy is offered in the Department of Anatomy and Neurobiology.

Curriculum

A typical course plan follows:

	Credits
Fall 1	
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research (laboratory rotations)	4
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
NEUS 609 Cellular and Molecular Neuroscience	4
Spring 1	
ANAT 610 Systems Neuroscience	4
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research (laboratory rotations)	3
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
Summer 1	
ANAT 697 Directed Research	6
Fall 2	
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research	variable
MICR 510 Scientific Integrity	1
Elective	
Spring 2	
ANAT 615 Techniques in Neuroscience and Cell Biology	2
ANAT 620 Scientific Writing and Grantsmanship	2
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research	variable
Elective	

Summer following second year

During the summer following the second year the student will take the required written and oral comprehensive exams. Students also register for ANAT 697

Directed Research (6 credits) and work in the research laboratory of their chosen thesis adviser.

Written comprehensive examination

The written exam consists of two parts. Part one is an open-book exam that is designed to: 1) assess the student's ability to integrate course material and 2) demonstrate critical thinking and evaluation of the literature in the basic health sciences related to the student's area of research. For part two, students will prepare an NIH-style grant proposal based on their research plan.

Oral comprehensive examination

After successful completion of both parts of the written comprehensive, the student's graduate advisory committee will administer the oral comprehensive examination, which entails an oral defense of the student's grant proposal as well as the topics covered in part one of the written comprehensive. The oral comprehensive covers: (1) course work (anatomy and other basic health sciences) related to the student's proposed research, (2) the literature cited in or related to the proposal, and (3) the hypotheses, research techniques and procedures presented in the proposal. Successful completion of the oral comprehensive exam advances the student to candidacy for the doctoral degree.

Third academic year and beyond

There is no expectation of the time required to complete the doctoral degree. Beginning with the fall semester of the third year in the graduate program students will devote their full time to conducting research in the laboratory of their advisers. Students also are required to register for 14 credits of ANAT 697 Directed Research, and one credit of ANAT 690 Anatomy and Neurobiology Seminar and one credit of ANAT 630 Research Presentations each semester. During the summer, students register for six credits of ANAT 697.

At the appropriate time in their research, the student will prepare a dissertation and schedule a final oral defense of the thesis. The final oral examination (defense of the dissertation) will be limited to the subject of the candidate's dissertation and related basic science.

Electives

Students are required to enroll in one elective, which will enhance their graduate training. Students must maintain a 3.0 overall cumulative grade point average to continue in the doctoral program. Suggested electives include:

	Credits
ANAT 617 Developmental Neurobiology	3
BIOS/STAT 543 Statistical Methods I	3
MICR 505 Immunobiology	3
MICR 607 Techniques in Molecular Biology and Genetics	2
PHIS 501 Mammalian Physiology	5
PHIS 604 Cell Physiology: From Molecules to Organisms	4
PHIS/PHTX 620 Ion Channels in Membranes	3
PHTX 536 Principles of Pharmacology and Toxicology	5
PHTX 632 Neurochemical Pharmacology	3

Students must achieve a grade of B or better in all courses, or they will be required to repeat that course.

Anatomy and Neurobiology, Master of Science (M.S.)

Admission requirements summary

Anatomy and Neurobiology, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	Applications received prior to Dec 17 given priority consideration	GRE, MCAT or DAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

Advanced graduate study leading to a Master of Science is offered in the Department of Anatomy and Neurobiology.

Curriculum

A typical course plan follows:

	credits
Fall 1	
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research (laboratory rotations)	4
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
NEUS 609 Cellular and Molecular Neuroscience	4
Spring 1	
ANAT 610 Systems Neuroscience	4
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research (laboratory rotations)	3
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
Summer 1	
ANAT 697 Directed Research	6
Fall 2	
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research	13
Spring 2	
ANAT 630 Research Presentations	1
ANAT 690 Anatomy and Neurobiology Seminar	1
ANAT 697 Directed Research	13

Students must pass all courses with a grade of B or better or they will be required to repeat the course. The student must maintain a 3.0 overall cumulative grade point average to continue in the master's program.

There is no expectation of the time required to complete the master's degree; usually two years of study are necessary to complete the requirements. At the appropriate time in their research, students will prepare a thesis and schedule a final oral defense of the thesis. The final oral examination (defense of the thesis) will cover the subject of the candidate's dissertation and related basic science course work.

Biochemistry, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Biochemistry, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Dec 17 given priority consideration	GRE, MCAT or DAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Ph.D. Program in Biochemistry prepares students for research-oriented careers as independent scientists in academia, government and biotechnology. The core of this degree program is an original independent research project under the supervision of a faculty adviser. The Department of Biochemistry and Molecular Biology has research efforts of international stature in several areas, including cellular and molecular signaling, tumor biology, structural biology, eukaryotic molecular biology, lipid and membrane biochemistry, and molecular genetics, using state-of-the-art approaches in enzymology, genomics, proteomics and lipidomics. While emphasizing independent research in biochemistry and molecular biology and training in the responsible conduct of research, the program also provides a background of courses designed to match the needs and interests of each student. An example of a schedule of courses is shown below. Ph.D. students are expected to enroll as full-time graduate students. During the first year, students pursue research rotations, take formal course work and become familiar with current research topics through seminars, discussion groups and lectures by distinguished scientists. By the end of the first year, students choose a faculty adviser and begin dissertation research. Following completion of the research project and defense of the doctoral dissertation, graduates are equipped to participate in virtually any area of current biomedical research in the most prestigious laboratories. For more detailed information on the program, please visit www.vcu.edu/biochem/students/phd.shtml.

Curriculum

A typical course plan for the full-time student is described below.

	Credits
First fall semester	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
BIOC 505 Experimental Biochemistry (laboratory rotation)	2
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Critical Scientific Thinking	1
MICR 512 Laboratory Safety	1
First spring semester	
ANAT 691 Special Topics in Anatomy: Scientific Writing	2
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
BIOC 506 Experimental Biochemistry (laboratory rotation)	2
BIOC 602 Physical Properties of Macromolecules	1-4
Students will select modules from 602 and 604 to get four credits (at least one from each)	
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Critical Scientific Thinking	1
Second fall semester	
BIOC 604 Enzymology	1-3
Students will select modules from 602 and 604 to get four credits (at least one from each)	
BIOC 605 Molecular Biology	3
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Student Seminar	1
BIOC 697 Directed Research in Biochemistry	variable
MICR 510 Scientific Integrity	1
MICR 607 Techniques in Molecular Biology and Genetics	2
Second spring semester	
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Student Seminar	1
BIOC 697 Directed Research in Biochemistry	variable

In addition to the core set of courses, Ph.D. students will take at least two of the optional courses listed below, at any time before graduation. Ph.D. students register for BIOC 690 and BIOC 691.901 for the duration of their tenure in the program. Students are encouraged to take additional courses that relate to their personal projects. Electives may include courses in techniques in molecular biology and genetics, bioinformatics, statistics, immunology, microbiology, molecular genetics, mammalian physiology, and advanced organic and physical chemistry, among others.

Optional courses	
ANAT 615 Techniques in Neuroscience and Cell Biology	2
BIOC 601 Membranes and Lipids	3
BIOC 606 Biochemical Control Processes	3
HGEN 501/BIOL 530 Human Genetics	3
MICR 505 Immunobiology	3
MICR 605 Prokaryotic Molecular Genetics	3
MICR 653/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
PHTX 691 Special Topics in Pharmacology: Research Design Analysis (A. Lichtman – statistics)	2

Biochemistry, Master of Science (M.S.)

Admission requirements summary

Biochemistry, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	None. Applications accepted through June for admission the following fall. Priority given to early applicants.	GRE, MCAT or DAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The M.S. Program in Biochemistry prepares students for research-oriented careers in academia, government and biotechnology. The core of this degree program is an original independent research project under the supervision of a faculty adviser. The Department of Biochemistry and Molecular Biology has research efforts of international stature in several areas, including cellular and molecular signaling, tumor biology, structural biology, eukaryotic molecular biology, lipid and membrane biochemistry, and molecular genetics, using state-of-the-art approaches in enzymology, genomics, proteomics and lipidomics. While emphasizing independent research in biochemistry and molecular biology and training in the responsible conduct of research, the program also provides a background of courses designed to match the needs and interests of each student. An example of a schedule of courses is shown below. During the first year, students pursue research rotations, take formal course work and become familiar with current research topics through seminars, discussion groups and lectures by distinguished scientists. By the end of the first year, students choose a faculty adviser and begin thesis research. Following completion of the research project and defense of the masters thesis, graduates are equipped to participate in virtually any area of current biomedical research in the most prestigious laboratories. For more detailed information on the program, please visit www.vcu.edu/biochem/students/ms.shtml.

Curriculum

A typical course plan for the full-time student is described below.

	Credits
First fall semester	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
BIOC 505 Experimental Biochemistry (laboratory rotation)	2
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Critical Scientific Thinking	1
MICR 512 Laboratory Safety	1
First spring semester	
ANAT 691 Special Topics in Anatomy: Scientific Writing	2
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
BIOC 506 Experimental Biochemistry (laboratory rotation)	2
BIOC 602 Physical Properties of Macromolecules	1-4
Students will select modules from 602 and 604 to get four credits (at least one from each)	
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Critical Scientific Thinking	1
Second fall semester	
BIOC 604 Enzymology	1-3
Students will select modules from 602 and 604 to get four credits (at least one from each)	

BIOC 605 Molecular Biology	3
BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Student Seminar	1
BIOC 697 Directed Research in Biochemistry	variable
MICR 510 Scientific Integrity	1
MICR 607 Techniques in Molecular Biology and Genetics	2

Second spring semester

BIOC 690 Biochemistry Seminar	1
BIOC 691 Special Topics in Biochemistry: Student Seminar	1
BIOC 697 Directed Research in Biochemistry	variable

M.S. students register for BIOC 690 and BIOC 691.901 for the duration of their tenure in the program. The core set of courses can be supplemented with elective courses offered by the Department of Biochemistry and Molecular Biology or other departments. Students are encouraged to take additional courses that relate to their personal projects. Electives may include courses in techniques in molecular biology and genetics, bioinformatics, statistics, immunology, microbiology, molecular genetics, mammalian physiology, and advanced organic and physical chemistry, among others.

Optional courses

ANAT 615 Techniques in Neuroscience and Cell Biology	2
BIOC 601 Membranes and Lipids	3
BIOC 606 Biochemical Control Processes	3
HGEN 501/BIOL 530 Human Genetics	3
MICR 505 Immunobiology	3
MICR 605 Prokaryotic Molecular Genetics	3
MICR 653/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
PHTX 691 Special Topics in Pharmacology: Research Design Analysis (A. Lichtman – statistics)	2

Biostatistics, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Biostatistics, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Jan 7 given priority consideration	GRE
Special requirements: Applicants must complete the verbal, quantitative and analytical writing sections of the Graduate Record Exam. The following mathematics courses or their equivalents are required for admission: MATH 307 Multivariate Calculus, MATH 309 Introduction to Probability Theory, MATH 310 Linear Algebra, STAT 213 Introductory Statistics.			

The Department of Biostatistics at Virginia Commonwealth University offers the M.S. and Ph.D. degrees in Biostatistics. It is part of the School of Medicine on the university's MCV Campus.

While committed to excellence in biostatistical research and in its graduate program, the department also collaborates in biomedical research with other departments on the MCV Campus. Its faculty members are nationally recognized for their biostatistical work in the areas of clinical trials, pharmacology and toxicology. The department continues to emphasize scholarship and graduate education, and its graduates are in demand for jobs throughout the country in government, academia and the private sector.

The program is committed to diversifying the racial and ethnic composition of people who become biostatisticians. Individuals from all racial or cultural backgrounds are encouraged to apply.

Complete program requirements and other information are found at www.biostatistics.vcu.edu.

Biostatistics, Master of Science (M.S.)

Admission requirements summary

Biostatistics, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	Applications received prior to Jan 7 given priority consideration	GRE, MCAT or DAT
Special requirements: Program requirements and other information are found at www.biostatistics.vcu.edu.			

The Department of Biostatistics at Virginia Commonwealth University offers the M.S. and Ph.D. degrees in Biostatistics. It is part of the School of Medicine on the university's MCV Campus.

While committed to excellence in biostatistical research and in its graduate program, the department also collaborates in biomedical research with other departments on the MCV Campus. Its faculty members are nationally recognized for their biostatistical work in the areas of clinical trials, pharmacology and toxicology. The department continues to emphasize scholarship and graduate education, and its graduates are in demand for jobs throughout the country in government, academia and the private sector.

The program is committed to diversifying the racial and ethnic composition of people who become biostatisticians. Individuals from all racial or cultural backgrounds are encouraged to apply.

Complete program requirements and other information are found at www.biostatistics.vcu.edu.

Epidemiology, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Epidemiology, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall	Application strongly encouraged by Jan 15	GRE
Special requirements: M.P.H. or equivalent M.S. degree			

The Ph.D. program in epidemiology, the only one of its kind in Virginia, prepares students for research-oriented careers in the areas of clinical and population-based research. The program includes a foundation of 41 credits of epidemiology and biostatistics course work whereby students learn methods for studying disease etiology and prevention in populations. Students then implement such methods in an original research project under the supervision of an experienced faculty adviser.

For additional information, see www.epidemiology.vcu.edu/education/phd.

Sample curriculum

	credits
Fall 1	
BIOS 553 Applied Statistics	3
EPID 690 Journal Club	1
Electives	6
Total	10
Spring 1	
BIOS 554 Applied Statistics	3
EPID 690 Journal Club	1
PPAD 723 Survey Research Methods	3
Elective	3
Total	10
Summer 1	
STAT 623 Discrete Multivariate Analysis*	3
EPID/BIOS elective	3

Total	6
Fall 2	
BIOS 631 Multivariate Analysis I	4
Electives	6
Total	10
Spring 2	
EPID 642 Advanced Epidemiological Protocol Design	3
EPID 697 Directed Research in Epidemiology	variable
Elective	variable
Total	5
Summer 2	
EPID 697 -- Research	variable

* Offered every other year

Genetic Counseling, Master of Science (M.S.)

Admission requirements summary

Genetic Counseling, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall	Applications received prior to Feb 2 given priority consideration	GRE

The Master of Science in Genetic Counseling program is accredited by the American Board of Genetic Counseling. The master's degree requires four semesters of study for students entering with a bachelor's degree, and it must be completed within five years. The student working toward the Master of Science has an integrated and progressively complex classroom and supervised clinical experience. The program requires an original research project under the supervision of a faculty adviser.

The straddling of the student and professional roles is a lifelong process in the changing field of human genetics and genetic counseling. Graduates of this program will be contributing members of the clinical genetics team of counselors, physicians and basic scientists.

Admission requirements

Applicants should have successfully completed undergraduate training and hold a baccalaureate degree. Training in chemistry through completion of course work in biochemistry is required. Admissions to the program are generally drawn from applicants with an undergraduate grade-point average minimum of 3.0 (on a 4.0 scale or equivalent), a performance on the Graduate Record Examination above a combined score of 1000 (V+Q) and a performance above a score of 3.5 on the analytical section. Applicants holding an undergraduate degree from foreign institutions must display an acceptable level of English proficiency by achieving a score of 250 on the computer-based TOEFL examination or 600 on the written version.

Curriculum

Sample typical course plan for the full-time student

	credits
Fall 1	
CLED 601 Theories of Counseling	3
HGEN 501/BIOL 530 Human Genetics	3
HGEN 525 Practice of Genetic Counseling	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics: Classic Papers	1
IDDS 691 Special Topics in Developmental Disabilities: Leadership	2
MICR 510 Scientific Integrity	1
Total	14
Spring 1	
HGEN 502 Advanced Human Genetics	3
HGEN 526 Practice of Genetic Counseling	3
HGEN 600 Clinical Genetics (rotation)	3
HGEN 690 Genetics Research Seminar	1
SLWK 609 Foundations of Research in Social Work Practice	3
Elective	3
Total	16
Summer	
HGEN 605 Experimental Methods in Human Genetics	3
HGEN 697 Directed Research in Genetics (rotation)	1
Total	4
Fall 2	
HGEN 527 Medical Genetics	3
HGEN 600 Clinical Genetics (rotation)	3
HGEN 690 Genetics Research Seminar	1
HGEN 697 Directed Research in Genetics	3
Elective	3
Total	13
Spring 2	
ANAT 691 Special Topics in Anatomy: Embryology	2
HGEN 528 Medical Genetics	3
HGEN 600 Clinical Genetics (rotation)	3
HGEN 622 Cancer Genetic Counseling	3
HGEN 690 Genetics Research Seminar	1
HGEN 697 Directed Research in Genetics	3
Total	15

For additional information on the program and required prerequisites, please visit www.gen.vcu.edu.

Combined Master of Science in Genetic Counseling (M.S.) and Doctor of Philosophy in Human Genetics (Ph.D.)

Human Genetics, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall	Applications received prior to Dec 17 given priority consideration	GRE
Special requirements: International applicants must score 600 or greater on the TOEFL.			

Genetic Counseling, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall	Applications received prior to Feb 2 given priority consideration	GRE

The Department of Human and Molecular Genetics offers training that combines preparation for a career as a genetic counselor with research-based doctoral

training in a coordinated program that integrates the complementary aspects of these two degree categories. In order to be admitted to this dual-degree program, an applicant must be accepted into both the M.S. and Ph.D. programs.

The Master of Science in Genetic Counseling program is accredited by the American Board of Genetic Counseling. The master's degree requires four semesters of study for students entering with a bachelor's degree, and it must be completed within five years. The student working toward the Master of Science has an integrated and progressively complex classroom and supervised clinical experience. The program requires an original research project under the supervision of a faculty adviser. In this dual degree program, clinical exposure/ experience will begin in the third year.

The straddling of the student and professional roles is a lifelong process in the changing field of human genetics and genetic counseling. Graduates of this program will be contributing members of the clinical genetics team of counselors, physicians and basic scientists.

Human Genetics, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Human Genetics, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall	Applications received prior to Dec 17 given priority consideration	GRE
Special requirements: International applicants must score 600 or greater on the TOEFL. MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs, but not for dual degree academic programs.			

The Department of Human and Molecular Genetics offers a comprehensive program in graduate study leading to a Doctor of Philosophy (Ph.D.) in Human Genetics. The program includes the completion of an original research project under the supervision of a faculty adviser and a background/foundation of courses that prepare students for research-oriented careers in the rapidly expanding field of human genetics. Major areas of study available to Ph.D. students in the program include clinical and molecular cytogenetics, molecular genetics, developmental genetics, cancer genetics, behavior genetics, population and quantitative genetics, genetic epidemiology, clinical genetics, and genetic counseling. Once core course work requirements have been completed, the students course plan is tailored to meet individual needs with regard to the area of research focus. A track in genetic epidemiology is available for those planning a career in this area. For more detailed information on the program please visit www.gen.vcu.edu/phd.

Curriculum

Typical course plan for the full-time student

	credits
Fall 1	
BIOC/MICR 503 Biochemistry	5
BIOS/STAT 543 Biostatistics	3
HGEN 501/BIOL 530 Human Genetics	3
HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Classic Papers in Human Genetics	1
Total	16

*For HGEN 605, the student and faculty member will design a project that can reasonably be completed in 12 weeks. The student will spend approximately 12 weeks in that lab for a minimum of eight hours/week. The student's performance in the laboratory will serve as the basis for the grade that is received for this course.

Spring 1	
BIOC/MICR 504 Biochemistry	5
HGEN 603 Introduction to Mathematical/Statistical Genetics	3
HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Clinical Genetics Overview	1
HGEN 691 Special Topics in Genetics – Journal Club	1
Elective	3
Total	17

Summer 1	
HGEN 600 Clinical Genetics (optional)	3
HGEN 697 Directed Research in Genetics (lab rotation)	3
Total	3-6

Fall 2	
HGEN 511 Human Cytogenetics or HGEN 614 Pathogenesis of Human Genetic Disease	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Journal Club	1
HGEN 697 Directed Research in Genetics	3
MICR 510 Scientific Integrity	1
Electives	6
Total	15

Spring 2	
HGEN 697 Directed Research in Genetics	9-15
Elective	0-6
Total	15

Fifteen additional credit hours will be taken in HGEN 697 after the second spring semester.

Additional information on the program can be found online at www.gen.vcu.edu/phd.

Genetic epidemiology track

Curriculum

Typical course plan for the full-time student in the genetic epidemiology track

	credits
Fall 1	
BIOC/MICR 503 Biochemistry	5
BIOS/STAT 543 Biostatistics	3
HGEN 501/BIOL 530 Human Genetics	3
HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 614 Pathogenesis of Human Genetic Disease (or elective)	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Classic Papers in Human Genetics	1
Total	19

*For HGEN 605, the student and faculty member will design a project that can reasonably be completed in 12 weeks. The student will spend approximately 12 weeks in that lab for a minimum of eight hours/week. The student's performance

in the laboratory will serve as the basis for the grade that is received for this course.

Spring 1	
BIOS/STAT 544 Biostatistics	3
HGEN 502 Advanced Human Genetics	3
HGEN 603 Mathematical/Statistical Genetics	3
HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Clinical Genetics Overview	1
HGEN 691 Special Topics in Genetics – Journal Club	1
HGEN 697 Directed Research in Genetics	2
Elective	3
Total	20
Summer 1	
HGEN 697 Directed Research in Genetics (lab rotation)	6
Total	6
Fall 2	
HGEN 603 Mathematical/Statistical Genetics	3
HGEN 619 Quantitative Genetics	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Journal Club	1
HGEN 697 Directed Research in Genetics	3
MICR 510 Scientific Integrity	1
Elective	3
Total	15
Spring 2	
HGEN 697 Directed Research in Genetics	9-15
Elective	0-6
Total	15

Fifteen additional credit hours will be taken in HGEN 697 after the second spring semester.

Additional information on the program can be found online at www.gen.vcu.edu/phd.

Combined Master of Science in Genetic Counseling (M.S.) and Doctor of Philosophy in Human Genetics (Ph.D.)

Human Genetics, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall	Applications received prior to Dec 17 given priority consideration	GRE
Special requirements: International applicants must score 600 or greater on the TOEFL.			

Genetic Counseling, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall	Applications received prior to Feb 2 given priority consideration	GRE

The Department of Human and Molecular Genetics offers training that combines preparation for a career as a genetic counselor with research-based doctoral training in a coordinated program that integrates the complementary aspects of these two degree categories. In order to be admitted to this dual-degree program, an applicant must be accepted into both the M.S. and Ph.D. programs.

The Master of Science in Genetic Counseling program is accredited by the American Board of Genetic Counseling. The master's degree requires four semesters of study for students entering with a bachelor's degree, and it must be completed within five years. The student working toward the Master of Science has an integrated and progressively complex classroom and supervised clinical experience. The program requires an original research project under the supervision of a faculty adviser. In this dual degree program, clinical exposure/experience will begin in the third year.

The straddling of the student and professional roles is a lifelong process in the changing field of human genetics and genetic counseling. Graduates of this program will be contributing members of the clinical genetics team of counselors, physicians and basic scientists.

Human Genetics, Master of Science (M.S.)

Admission requirements summary

Human Genetics, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall	Applications received prior to Jan 7 given priority consideration	GRE
Special requirements: International applicants must score 600 or greater on the TOEFL MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Department of Human and Molecular Genetics offers a comprehensive program in graduate study leading to a Master of Science in Human Genetics. The program includes the completion of an original research project under the supervision of a faculty adviser and a background/foundation of courses that prepare students for research-oriented careers in the rapidly expanding field of human genetics. Major areas of study available to master's students in the program include clinical and molecular cytogenetics, molecular genetics, developmental genetics, cancer genetics, behavior genetics, population and quantitative genetics, genetic epidemiology, clinical genetics, and genetic counseling.

Curriculum

Typical course plan for the full-time student

	credits
Fall 1	
BIOC/MICR 503 Biochemistry	5
BIOS/STAT 543 Biostatistics	3
HGEN 501/BIOL 530 Human Genetics	3
HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Classic Papers in Human Genetics	1
Total	16

*For HGEN 605, the student and faculty member will design a project that can reasonably be completed in 12 weeks. The student will spend approximately 12 weeks in that lab for a minimum of eight hours/week. The student's performance in the laboratory will serve as the basis for the grade that is received for this course.

Spring 1	
BIOC/MICR 504 Biochemistry	5
BIOS/STAT 544 Biostatistics	3

HGEN 605 Experimental Methods in Human Genetics*	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Clinical Genetics Overview	1
HGEN 691 Special Topics in Genetics – Journal Club	1
Elective	3
Total	17

Summer 1

HGEN 697 Directed Research in Genetics (lab rotation)	3-6
Total	3-6

Fall 2

HGEN 511 Human Cytogenetics or HGEN 603 Mathematical and Statistical Genetics or HGEN 614 Pathogenesis of Human Genetic Disease	3
HGEN 690 Genetics Research Seminar	1
HGEN 691 Special Topics in Genetics – Journal Club	1
HGEN 697 Directed Research in Genetics	6
MICR 510 Scientific Integrity	1
Elective	3
Total	15

Spring 2

HGEN 697 Directed Research in Genetics	15
Total	15

If needed, six additional credit hours may be taken in HGEN 697 after the second spring semester.

Additional information on the program can be found online at www.gen.vcu.edu.

Medical Physics, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Medical Physics, Doctor of Philosophy (Ph.D.)			
Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
Ph.D.	Fall	Mar 1	GRE

The Ph.D. in Medical Physics offers students course work and research training in physics as it is applied to the diagnosis and treatment of human diseases. Research interests include functional imaging using PET and NMR, CT image artifact removal and deformation, intenstiy-modulated radiation therapy, radiation therapy dose calculations, 4D radiation therapy, and brachytherapy dose calculations.

Admission requirements

In addition to the general requirements for admission to graduate programs in the Graduate School and the School of Medicine, students are expected to satisfy the following minimum standards for admission:

- Students must have a minimum of 30 semester credits in undergraduate physics, physical science or engineering, of which at least 18 credits must be at the upper level.
- Students must submit satisfactory GRE scores.
- Provisional admission may be granted where deficiencies exist. These deficiencies must be removed by the end of the first year of residence or its part-time equivalent, when the student's application will be re-examined. Courses that are designed to remove deficiencies will not be accepted for credit toward the graduate degree.

Degree requirements

Students entering the program with an undergraduate degree are required to earn a minimum of 30 credits in didactic or laboratory course work. Students entering with a master's degree in medical physics, physics or an appropriate related field are required to earn a minimum of 18 course credits. In addition to course work, the Ph.D. requires a minimum of 12 credits in MEDP 697 (directed research). At least half of the course work must be earned at the 600 level or higher. Detailed degree requirements are listed in the medical physics graduate handbook.

All new students entering the program initially will be advised by the Medical Physics Graduate Advisory Committee until they have selected a research adviser and formed a graduate dissertation committee. Each student should select a research adviser and area of research before the end of his/her third semester. A graduate dissertation committee will direct the student in his/her research and subsequent course selection, will report annually to the program director on the academic progress of the student and will administer the oral candidacy and dissertation defense examinations.

The student is required to complete written and oral examinations to be admitted as a Ph.D. candidate. The comprehensive written examination covers core knowledge and applications in medical physics course work, as well as basic concepts in physics, chemistry and biology. The oral examination, administered by the student's graduate dissertation committee, is based upon a written prospectus describing the proposed dissertation research project. Examiners evaluate the adequacy of the proposed project, the student's level of understanding of the project and the liklihood that the dissertation can be completed successfully.

After becoming a Ph.D. candidate, the student must conduct a substantial original investigation under the supervision of his/her adviser and must prepare a dissertation reporting the results of the research in the context of existing scientific knowledge. After the dissertation has been completed and unanimously accepted for defense by the student's graduate dissertation committee, the candidate will appear before the committee for an oral defense. The oral dissertation defense examines the candidate's research, dissertation documentation, and underlying fundamental knowledge. Upon successful completion of the defense and dissertation, the student may apply for graduation with a Ph.D. in Medical Physics.

Medical Physics, Master of Science (M.S.)

Admission requirements summary

Medical Physics, Master of Science (M.S.)			
Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.S.	Fall	Mar 1	GRE

The Master of Science in Medical Physics offers students course work and practical clinical training in physics as it is applied to the diagnosis and treatment of human diseases. Required course work provides theoretical and practical training in radiation dosimetry, radiation biology, radiation therapy, imaging and health physics.

Admission requirements

In addition to the general requirements for admission to graduate programs in the Graduate School and the School of Medicine, students are expected to satisfy the following minimum standards for admission:

- Students must have a minimum of 30 semester credits in undergraduate physics, physical science or engineering, of which at least 18 credits must be at the upper level.
- Students must submit satisfactory GRE scores.

Provisional admission may be granted where deficiencies exist. These deficiencies must be removed by the end of the first year of residence or its part-time equivalent, when the student's application will be re-examined. Courses that are designed to remove deficiencies will not be accepted for credit toward the graduate degree.

Degree requirements

Students entering the program with an undergraduate degree are required to earn a minimum of 30 credits in didactic or laboratory course work. At least 15 credits must be earned at the 600 level or higher. Detailed degree requirements are listed in the medical physics graduate handbook.

Students are required to complete the 20 credits of the core graduate medical physics course work (MEDP 563, 567, 601, 630, 635, 636), one credit of MEDP 689 and six credits of MEDP 682. Additionally, students also must demonstrate competence in anatomy through completion of an undergraduate or graduate anatomy course approved by the graduate curriculum committee.

Following completion of course work, students will be required to pass a comprehensive examination administered by the Medical Physics Comprehensive Examination Committee. The comprehensive examination will cover materials from the core medical physics courses and clinical rotations.

Microbiology and Immunology, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Microbiology and Immunology, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Dec 17 given priority consideration	GRE or MCAT
Special requirements: Combined GRE Verbal and Quantitative Score of 1200 or greater, MCAT score of 26 or greater International applicants must score great than 600 (paper), greater than 250 (computer) on TOEFL MCAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Department of Microbiology and Immunology has an outstanding faculty with diverse research interests that include cell and molecular biology, molecular genetics, molecular pathogenesis, bacteriology, immunology, immunotoxicology, virology, parasitology, mycology, and oncology. The goal of the graduate program is to prepare students to become creative problem solvers and leaders in scientific research. The Ph.D. degree is offered, as well as an M.D./Ph.D. degree for medical students interested in academic or research careers.

The research experience is complemented with excellent course offerings, seminar programs, teaching opportunities, presentations at scientific meetings and writing of grant applications and scientific papers. Graduate students acquire a wide range of research experience in the first year through exposure to a variety of research laboratories and investigators. The student chooses a research adviser and then carries out an original, independent research project under the direction of the adviser. The project falls under the review of an advisory committee, and a written dissertation is defended in a final oral examination. For more detailed information on the program please visit www.vcu.edu/micro.

Curriculum

	credits
Semester 1 – fall (taken by all first-year students)	
Temporary adviser appointed	
MICR/BIOC 503 Biochemistry, Cell and Molecular Biology	5
MICR 505 Immunobiology	3
MICR 512 Laboratory Safety	1
MICR 515 Principles of Molecular Microbiology	3
MICR 608 Introduction to Microbiology and Immunology Research (one rotation/principle investigator lectures)	3
MICR 690 Microbiology Research Seminar (attendance required)	1
Semester 2 – spring	
MICR/BIOC 504 Biochemistry, Cell and Molecular Biology	5
MICR 609 Introduction to Microbiology and Immunology Research (two rotations)	3
MICR 616 Mechanisms of Viral and Parasite Pathogenesis*	3
MICR 618 Molecular Mechanisms of Bacterial Pathogenesis*	3
MICR 686 Advanced Immunobiology*	2
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
* students take two of three classes	
Cumulative GPA of 3.0 required to continue; permanent adviser chosen after three rotations completed.	
Summer 1	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 3 and 4 – fall/spring	
MICR 510 Scientific Integrity	1
MICR 607 Techniques in Molecular Biology and Genetics	2
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Optional electives	
MICR 605 Prokaryotic Molecular Genetics	3
MICR/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
Student's GAC formed, first meeting held in the fall; written examination in the spring.	
Summer 2	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 5 and 6 – fall/spring	
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Oral examination	
Summer 3	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 7 and 8 – fall/spring	
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Summer 4	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 9 and 10 – fall/spring	
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Thesis defense	

Microbiology and Immunology, Master of Science (M.S.)

Admission requirements summary

Microbiology and Immunology, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	Applications received prior to Jan 7 given priority consideration	GRE or MCAT
Special requirements: Combined GRE Verbal and Quantitative Score of 1200 or greater, MCAT score of 26 or greater International applicants must score great than 600 (paper), greater than 250 (computer) on TOEFL MCAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Department of Microbiology and Immunology has an outstanding faculty with diverse research interests that include cell and molecular biology, molecular genetics, molecular pathogenesis, bacteriology, immunology, immunotoxicology, virology, parasitology, mycology, and oncology. The goal of the graduate program is to prepare students to become creative problem solvers and leaders in scientific research. The Master of Science degree is offered, as well as a Ph.D., and an M.D./Ph.D. degree for medical students interested in academic or research careers.

The research experience is complemented with excellent course offerings, seminar programs, teaching opportunities, presentations at scientific meetings and writing of grant applications and scientific papers. Graduate students acquire a wide range of research experience in the first year through exposure to a variety of research laboratories and investigators. The student chooses a research adviser and then carries out an original, independent research project under the direction of the adviser. The project falls under the review of an advisory committee, and a written dissertation is defended in a final oral examination. For more detailed information on the program please visit www.vcu.edu/micro.

Curriculum

	credits
Semester 1 – fall (taken by all first-year students)	
Temporary adviser appointed	
MICR/BIOC 503 Biochemistry, Cell and Molecular Biology	5
MICR 505 Immunobiology	3
MICR 512 Laboratory Safety	1
MICR 515 Principles of Molecular Microbiology	3
MICR 608 Introduction to Microbiology and Immunology Research (one rotation/principle investigator lectures)	3
MICR 690 Microbiology Research Seminar (attendance required)	1
Semester 2 – spring	
MICR/BIOC 504 Biochemistry, Cell and Molecular Biology	5
MICR 509 Introduction to Microbiology and Immunology Research (two rotations)	3
MICR 616 Mechanisms of Viral and Parasite Pathogenesis*	3
MICR 618 Molecular Mechanisms of Bacterial Pathogenesis*	3
MICR 686 Advanced Immunobiology*	2
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
* students take two of three classes	
Cumulative GPA of 3.0 required to continue; permanent adviser chosen after three rotations completed.	
Summer 1	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 3 and 4 – fall/spring	
MICR 510 Scientific Integrity	1
MICR 602 Techniques in Molecular Biology and Genetics	2
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Optional electives	
MICR 606 Molecular Biology and Genetics	3
MICR/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
Student's GAC formed, first meeting held in the fall; written examination in the spring.	
Summer 2	
MICR 697 Directed Research in Microbiology	variable (1-6)
Semesters 5 and 6 – fall/spring	
MICR 690 Microbiology Research Seminar – Departmental (attendance required)	1
MICR 691 Special Topics in Microbiology – Journal Club (graded Pass/Fail)	1
MICR 697 Directed Research in Microbiology	variable
Oral examination/thesis defense	

Molecular biology and genetics, interdisciplinary doctoral curricula with Anatomy and Neurobiology, Biochemistry and Molecular Biology, Human Genetics, Microbiology and Immunology, Pathology, Pharmacology and Toxicology, and Physiology Ph.D. programs

The molecular biology and genetics curriculum is an integrated interdisciplinary program of study that builds on the graduate programs of participating departments in the School of Medicine. The core curriculum is specifically designed to provide a strong foundation in biochemistry, cell biology and molecular genetics, culminating in the conduct of an original research project under the supervision of a faculty adviser. Electives drawn from various departments allow individual specialization. The departments through which a Ph.D. with a concentration in molecular biology and genetics can be pursued include Anatomy and Neurobiology, Biochemistry and Molecular Biology, Human and Molecular Genetics, Microbiology and Immunology, Pathology, Pharmacology and Toxicology, and Physiology and Biophysics. Participating faculty are associated not only with programs and departments within the School of Medicine, but also VCU Massey Cancer Center, Philips Institute for Oral and Craniofacial Molecular Biology (School of Dentistry), Institute of Structural Biology and Drug Discovery (School of Pharmacy) and the VCU Center for the Study of Biological Complexity (VCU Life Sciences) and VCU's School of Engineering. The interdisciplinary approach to the solution of biological problems provided by this training is designed to teach students the flexibility and problem-solving skills necessary for success in a variety of scientific research-oriented career opportunities.

All students are required to satisfy the core curriculum requirements, which are supplemented with electives appropriate to the individual research program area and with directed research under the supervision of the thesis adviser. Some departments may require specific electives. The core curriculum consists of the following courses, most of which are taken during the first two years of graduate study.

Core curriculum

credits

BIOC/MICR 503-504 Biochemistry, Cell and Molecular Biology	10
BIOC 602 Physical Properties of Macromolecules	2
BIOC 605 Molecular Biology or HGEN 614 Pathogenesis of Human Genetic Disease or PATH 670 Experimental Approaches to Tumor Biology or PHTX 625 Cell Signaling and Growth Control	3
MICR 607 Techniques in Molecular Biology and Genetics	2
MICR 608-609 Introduction to Microbiology and Immunology Research	6
MICR 510 Scientific Integrity	1
MICR 512 Laboratory Safety	1
MICR 605 Prokaryotic Molecular Genetics	3
MICR 690 Microbiology Research Seminar (every semester)	1
MICR 691 Special Topics in Microbiology – MBG Journal Club (must take at least twice)	1

For additional information, visit www.vcu.edu/mbg/.

Molecular biology and genetics, interdisciplinary master's curricula with Anatomy and Neurobiology, Biochemistry and Molecular Biology, Human Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology M.S. programs

The molecular biology and genetics curriculum is an integrated interdisciplinary program of study that builds on the graduate programs of participating departments in the School of Medicine. The master's program is designed to be an intensive course of study that will prepare students for research-oriented careers in biotechnology or provide the foundation for further graduate study toward a Ph.D. It is expected that the program should be completed in approximately two to two-and-one-half years. The curriculum includes core, specialization and elective courses. Electives drawn from various departments allow individual specialization. The final three semesters include a research project conducted under the guidance of a selected faculty mentor and culminates in the presentation and defense of a masters thesis.

The departments through which an M.S. with a concentration in molecular biology and genetics can be pursued include Anatomy and Neurobiology, Biochemistry and Molecular Biology, Human and Molecular Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics. Participating faculty are associated not only with programs and departments within the School of Medicine, but also VCU Massey Cancer Center, Philips Institute for Oral and Craniofacial Molecular Biology (School of Dentistry), Institute of Structural Biology and Drug Discovery (School of Pharmacy) and the VCU Center for the Study of Biological Complexity (VCU Life Sciences). The interdisciplinary approach to the solution of biological problems provided by this training is designed to teach students the flexibility and problem-solving skills necessary for success in a variety of scientific career opportunities or further graduate study.

Curriculum

Course plan for the full-time student. Some departments may require specific electives.

	credits
Fall 1	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
MICR 512 Laboratory Safety	1
MICR 608 Introduction to Microbiology and Immunology Research	3
MICR 690 Microbiology Research Seminar	1
Elective	3
Spring 1	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
MICR 690 Microbiology Research Seminar	1
Directed research	3
Electives	6
Summer 1	
Directed research	1-6
Fall 2	
MICR 510 Scientific Integrity	1
MICR 607 Techniques in Molecular Biology and Genetics	2
MICR 690 Microbiology Research Seminar	1
Directed research	11
Spring 2	
MICR 690 Microbiology Research Seminar	1
MICR 691 Special Topics in Microbiology – MBG Journal Club (must take at least once)	
Directed research	13

For additional information visit www.vcu.edu/mbg/.

Neuroscience, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Neuroscience, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Apr 15 Applications received prior to Dec 17 given priority consideration	GRE or MCAT

The doctoral program in neuroscience at VCU is an interdepartmental, integrated curriculum for graduate study leading to the Ph.D. degree in neuroscience. The program offers flexibility for students to train in a laboratory chosen among neuroscience faculty members in multiple departments who are exploring the fields of molecular, cellular, developmental, systems, behavioral and clinical neuroscience. The curriculum consists of a set of core courses and electives that are customized for each student to best complement their individual research interests. The program provides students with a core of knowledge of the basic structure and function of the central nervous system, while allowing maximum flexibility in the choice of advisers, electives and areas of research specialization. The neuroscience Ph.D. program prepares students to teach in the neuroscience disciplines at a university or academic health center, and is distinguished by its objective to prepare the student to function as an independent scientific research investigator.

Curriculum Course plan for full-time student	Credits
Fall 1	
ANAT 630 Research Presentations	1
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
NEUS 609 Cellular and Molecular Neuroscience	4
NEUS 690 Neuroscience Research Seminar	1
NEUS 697 Directed Research (laboratory rotations)	4
Spring 1	
ANAT 610 Systems Neuroscience	4

ANAT 630 Research Presentations	1
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
NEUS 690 Neuroscience Research Seminar	1
NEUS 697 Directed Research (laboratory rotations)	3

Summer 1

Directed research with thesis adviser	6

Fall 2

ANAT 630 Research Presentations	1
MICR 510 Scientific Integrity	1
NEUS 690 Neuroscience Research Seminar	1
Advanced electives	
Research credits	

Spring 2

ANAT 615 Techniques in Neuroscience and Cell Biology	2
ANAT 620 Scientific Writing and Grantsmanship	2
ANAT 630 Research Presentations	1
NEUS 690 Neuroscience Research Seminar	1
Advanced elective	
Research credits	

Years 3-5 Completion of dissertation research; each semester student registers for:

ANAT 630 Research Presentations	1
NEUS 690 Neuroscience Research Seminar	1
Directed research	

Pharmacology and Toxicology, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Pharmacology and Toxicology, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Apr 15 Applications received prior to Dec 17 given priority consideration	GRE or MCAT
Special requirements: See Web site for more information MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Department of Pharmacology and Toxicology offers a program of graduate study leading to the Doctor of Philosophy. The broad base offered in pharmacology and toxicology, together with basic training in physiology and biochemistry, provides the background for a successful career in academic institutions, industry or government. Students customarily complete formal course work in physiology and biochemistry during the first year of study. Participation in research also is begun early in the first year. Students and faculty members join together in a seminar program, which includes distinguished visiting scientists from the U.S. and abroad. Following completion of a qualifying examination, a degree candidate is required to submit and defend a thesis embracing an original research project conducted under the guidance and supervision of an adviser. There is no foreign language requirement. The research program of the department is sufficiently broad to provide an adequate basis for entry into a wide variety of interesting areas of modern biology and medicine.

Curriculum

A typical course plan for the full-time doctoral student is described below.

	credits
Fall 1	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology*	5
PHIS 501 Mammalian Physiology* or PHTX 691 Special Topics in Pharmacology	5 or 3
PHTX 597 Introduction to Pharmacological Research	4 or 6
PHTX 690 Pharmacology Research Seminar**	1
Spring 1	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
PHTX 536 Principles of Pharmacology and Toxicology	5
PHTX 597 Introduction to Pharmacological Research	4
PHTX 690 Pharmacology Research Seminar	1
Summer 1	
PHTX 697 Directed Research in Pharmacology	6
Fall 2	
PHTX 537 Principles of Pharmacology and Toxicology	5
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	3
Advanced PHTX elective	3
Advanced elective	3
Spring 2	
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	variable
Advanced elective (if desired)	3
Summer 2	
PHTX 697 Directed Research in Pharmacology	6

* Note: Students normally take the comprehensive exam in June of their second year.

In the third and subsequent years, the majority of the course load is taken as PHTX 697. Advanced electives also may be taken as desired. Students also participate in PHTX 690 seminars through their fourth years. The average time necessary to complete the doctoral program in pharmacology and toxicology is four to five years.

General course requirements

Students in the doctoral program in pharmacology and toxicology rarely take courses designed for students in the professional programs offered by the schools of Allied Health Professions, Medicine, Nursing and Pharmacy, and they are rarely allowed to apply PHTX courses designed for these students toward their degrees. A full-time course load is 15 credits in the fall and spring semesters and six credits in the summer. Students in the program must achieve a 3.0 or higher GPA overall in graduate courses and at least a 3.0 GPA in PHTX courses in order to graduate.

The following courses are generally taken before administration of the comprehensive examination:

BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
PHIS 501 Mammalian Physiology or PHTX 691 Special Topics in Pharmacology	5 or 3
PHTX 536 Principles of Pharmacology and Toxicology	5

PHTX 537 Principles of Pharmacology and Toxicology	5
PHTX 597 Introduction to Pharmacological Research	variable
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	4

Two additional advanced graduate courses also must be taken prior to eligibility for the comprehensive examination. One of the courses must be chosen from the following list. The second advanced course must be taken from this list or from the additional advanced courses in the table below, as deemed appropriate by the students advisory committee.

Advanced PHTX courses	
PHTX/ANAT/PHIS/NEUS 509 Cellular and Molecular Neuroscience	3
PHTX 614 Foundation of Psychoneuroimmunology	3
PHTX/PHIS 620 Ion Channels in Membranes	3
PHTX 625 Cell Signaling and Growth Control	3
PHTX 632 Neurochemical Pharmacology	3
PHTX 633 Behavioral Pharmacology	3
PHTX 637 Cellular Pharmacology	3
PHTX 638 Cellular Mechanisms of Toxicology	3
PHTX 644 Forensic Toxicology	3

Advanced courses in other disciplines may include, but are not limited to:	
ANAT 610 Systems Neuroscience	4
BIOC 601 Membranes and Lipids	3
BIOC 602 Physical Properties of Macromolecules	3
BIOC 605 Molecular Biology	3
EGRB 603 Biomedical Signal Processing	3
EGRB 610 Microprocessor Interfacing for Biomedical Instrumentation	3
CHEM 504 Advanced Organic Chemistry I	3
MEDC 541 Survey of Molecular Modeling Methods	3
MEDC 601 Advanced Medicinal Chemistry I	1
MEDC 630 Theoretical Methods in Drug Design	2
MICR 505 Immunobiology	3
MICR/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
PHIS 604 Cell Physiology: From Molecules to Organisms	4
PHIS 615 Signal Detection in Sensory Systems	3
PHIS 617 Cellular Signaling	3

Pharmacology and Toxicology, Master of Science (M.S.)

Admission requirements summary

Pharmacology and Toxicology, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	Apr 15	GRE or MCAT
Special requirements: See Web site for more information MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The Department of Pharmacology and Toxicology offers a graduate program leading to the Master of Science degree. This is a research-oriented degree program comprised of graduate course work and supervised research leading to a master's thesis. The M.S. program will be of interest to individuals planning on technical positions in pharmacology or toxicology research or testing; students interested in the health professions, such as medicine or dentistry, who desire additional research training; and for those interested in a government position, such as those offered with regulatory agencies, who seek training in pharmacology and toxicology.

Curriculum

A typical course plan for the full-time master's student is described below.

	credits
Fall 1	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology*	5
PHIS 501 Mammalian Physiology* or PHTX 691 Special Topics in Pharmacology	5 or 3
PHTX 690 Pharmacology Research Seminar**	1
PHTX 697 Directed Research in Pharmacology	4 or 6
Spring 1	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
PHTX 536 Principles of Pharmacology and Toxicology	5
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	4
Summer 1	
PHTX 697 Directed Research in Pharmacology	6
Fall 2	
PHTX 537 Principles of Pharmacology and Toxicology	5
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	3
Advanced PHTX elective	3
Advanced elective	3
Spring 2	
PHTX 690 Pharmacology Research Seminar	1
PHTX 697 Directed Research in Pharmacology	variable
Advanced elective (if desired)	3
Summer 2	
PHTX 697 Directed Research in Pharmacology	6

* These are typical requirements. Less advanced courses may be substituted depending on situation.
** M.S. students are required to give a seminar. A student must take an advanced graduate course in their specialty.

Advanced PHTX courses	
PHTX/ANAT/PHIS/NEUS 509 Cellular and Molecular Neuroscience	3
PHTX/PHIS 620 Ion Channels in Membranes	3
PHTX 625 Cell Signaling and Growth Control	3
PHTX 632 Neurochemical Pharmacology	3
PHTX 633 Behavioral Pharmacology	3
PHTX 637 Cellular Pharmacology	3
PHTX 638 Cellular Mechanisms of Toxicology	3
PHTX 644 Forensic Toxicology	3

Advanced courses in other disciplines may include, but are not limited to:	
ANAT 610 Systems Neuroscience	4
BIOC 601 Membranes and Lipids	3

BIOC 602 Physical Properties of Macromolecules	3
BIOC 605 Molecular Biology	3
EGRB 603 Biomedical Signal Processing	3
EGRB 610 Microprocessor Interfacing for Biomedical Instrumentation	3
CHEM 504 Advanced Organic Chemistry I	3
MEDC 541 Survey of Molecular Modeling Methods	3
MEDC 601 Advanced Medicinal Chemistry I	1
MEDC 630 Theoretical Methods in Drug Design	2
MICR 505 Immunobiology	3
MICR/BNFO 653 Advanced Molecular Genetics: Bioinformatics	3
PHIS 604 Cell Physiology: From Molecules to Organisms	4
PHIS 615 Signal Detection in Sensory Systems	3
PHIS 617 Cellular Signaling	3

Physiology, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Physiology, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Dec 17 given priority consideration	GRE, MCAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

Graduate study in the Department of Physiology and Biophysics of the School of Medicine is a highly individualized undertaking, of which required course work is only one component. Each student's program is tailored to meet his or her particular interests, with the primary emphasis on developing research skills and the capacity for scholarship.

Opportunities for research experience begin in the first year, when students spend time working in several faculty laboratories of their choice. These lab rotations enable students to examine current faculty research projects and choose their areas of specialization. In the second and subsequent years, increasingly more time is devoted to independent research under the guidance of a faculty adviser. Department-sponsored seminars give students opportunities to discuss their research interests with visiting scientists, and many students present their work at national professional meetings.

The Ph.D. program in physiology normally takes at least four years to complete. The first two years are devoted mainly to course work: the first year consists primarily of required courses, while the second is geared toward electives and research. On satisfactory completion of two years of course work, students must pass written and oral comprehensive examinations to qualify for degree candidacy. Following admission to candidacy, each student must conduct a substantial original research project, prepare a written dissertation and defend it successfully in an oral examination.

Curriculum

Typical course plan for the full-time student

	credits
Fall 1	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
PHIS 501 Mammalian Physiology	5
PHIS 690 Physiology Research Seminar	1
Elective – suggestions include: ANAT 611 Histology (5) or BIOS 543 Biostatistics (3)	variable
Spring 1	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
PHIS 604 Cell Physiology: From Molecules to Oragnisms	4
PHIS 690 Physiology Research Seminar	1
Elective – suggestions include: ANAT 610 Systems Neuroscience (4) or PHTX 536 Pharmacology (5)	variable
Fall 2	
MICR 510 Scientific Integrity	1
PHIS 690 Physiology Research Seminar	1
PHIS 691 Student Seminar	1
PHIS 697 Assigned Research	variable
One advanced PHIS course	variable
Spring 2	
PHIS 690 Physiology Research Seminar	1
PHIS 691 Student Seminar	1
PHIS 697 Assigned Research	variable
One advanced PHIS course	variable

The student would be expected to stand for his qualifying exam at the completion of the second year.

Years 3 and 4	
PHIS 690 Physiology Research Seminar	1
PHIS 697 Directed Research	variable

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For additional information see the departmental Web site at www.vcu.edu/physio.

Physical therapy track in Physiology Ph.D. program

Admission requirements summary

Physical therapy track in Physiology Ph.D. program			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall	Applications received prior to Jan 7 given priority consideration	B.S., M.S. or D.P.T. in Physical Therapy Contact Physical Therapy or Physiology and Biophysics for specific admission requirements

The Department of Anatomy and Neurobiology and the Department of Physiology and Biophysics of the School of Medicine, together with the Department of Physical Therapy of the School of Allied Health Professions offers Ph.D. programs in anatomy and neurobiology and physiology with physical therapy tracks. The goals of the doctoral programs are to train students in research and educational skills in preparation for students to function as physical therapy faculty members. Application is made to either the Department of Anatomy and Neurobiology or the Department of Physiology and Biophysics. Acceptance into either of the programs requires approval by the admission committees of the cooperating departments. **Graduates receive either the Ph.D. in Anatomy and Neurobiology or the Ph.D. in Physiology.**

Students in the physical therapy track of the anatomy and neurobiology doctoral program take required courses within the departments of Anatomy and Neurobiology and Physical Therapy. Students in the physical therapy track of the physiology program take required courses within the departments of Physiology and Biophysics and Physical Therapy. (Other courses may be required by the students dissertation committee.) In both programs, the student plans and conducts a research study generally under the direction of a faculty member of the Department of Physical Therapy; however, the dissertation adviser may be from either of the two primary departments. In addition, the student is required to assist in teaching three courses.

In addition to the requirements listed above, admission to either of the programs requires:

- A minimum of a bachelor's degree.
- Graduation from an accredited program in physical therapy (or equivalent, if trained outside the United States).
- Demonstrated clinical experience in physical therapy.

Applicants to the physical therapy track of the physiology program also are encouraged to have completed at least one course in organic chemistry. Applicants should refer to the departmental Web site for more information or contact:

Dr. Sheryl Finucane, Director of Graduate Studies
Department of Physical Therapy
School of Allied Health Professions
Virginia Commonwealth University
P.O. Box 980224
Richmond, VA 23298-0224
Phone: (804) 828-0234

For additional information about the collaborating departments, refer to their Web sites:

- Department of Physical Therapy
- Department of Anatomy and Neurobiology
- Department of Physiology and Biophysics

Physiology, Master of Science (M.S.)

Admission requirements summary

Physiology, Master of Science (M.S.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
M.S.	Fall preferred	None. Generally applications accepted through June for admission the following fall.	GRE, MCAT or DAT
Special requirements: MCAT or DAT acceptable in lieu of GRE for combined professional/academic degree programs			

The department offers courses of study leading to two graduate degrees in physiology, the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.). A combined M.D./Ph.D. degree program also is available through this department and the School of Medicine. It is generally recommended that students intending to pursue careers as professional physiologists should attempt to earn the Ph.D. Work done in partial or complete fulfillment of the requirements for the master's degree may be applied toward the Ph.D. provided that it is of adequate quality.

Graduate education in physiology is a highly individualized enterprise, of which the formal course requirements comprise only a portion. The degree program described here provides an opportunity for apprenticeship in research and, through this, the development of a capacity for scholarship. The essence of this type of education lies in the development of a close relationship between the student and the faculty adviser. The adviser and the student, jointly and with the approval of the department chair and the associate dean of medicine for graduate education, select the student's graduate advisory committee.

The Master of Science includes a year of course work and a second year largely devoted to completion of an independent research project, writing a thesis based on this work and a successful oral defense of this thesis and completed course work.

Curriculum

Typical course plan for the full-time student

	credits
Fall 1	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
PHIS 501 Mammalian Physiology	5
PHIS 690 Physiology Research Seminar	1
Elective – suggestions include: ANAT 611 Histology (5) BIOS/STAT 543 Biostatistics (3) MICR 505 Immunobioloby (3) PHTX 548 Drug Dependence (3)	variable
Spring 1	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
PHIS 604 Cell Physiology: From Molecules to Organisms	4
PHIS 690 Physiology Research Seminar	1
Elective – suggestions include: ANAT 610 Systems Neuroscience (4) PHIS 512 Cardiovascular and Exercise Physiology (3) PHIS 691 Special Topics: Cardiac Auscultation and Hemodynamics (2) PHTX 535 Introduction to Toxicology (4) PHTX 536 Principles of Pharmacology and Toxicology (5) PHTX 691 Special Topics in Pharmacology: Neuroimmunology (3) PHTX 691 Special Topics in Pharmacology: Psychobioneuroimmunology (3)	variable
Fall 2	
MICR 510 Scientific Integrity	1
PHIS 690 Physiology Research Seminar	1
PHIS 691 Special Topics: Student Seminar	1
PHIS 697 Directed Research in Physiology	variable
One advanced PHIS course	variable
Spring 2	
PHIS 690 Physiology Research Seminar	1
PHIS 691 Special Topics: Student Seminar	1
PHIS 697 Directed Research in Physiology	variable

For additional information see the departmental Web site at www.vcu.edu/physio.

Pre-medical Graduate Health Sciences (Post-baccalaureate graduate certificate)

Admission requirements summary

Pre-medical Graduate Health Sciences (Post-baccalaureate graduate certificate)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Certificate	Fall	No deadline. Generally applications accepted through June for admission the following fall. Priority given to early applicants.	GRE, MCAT or DAT

The pre-professional (pre-dental, pre-veterinary, pre-physician assistant) health sciences certificate program of the Virginia Commonwealth University School of Medicine, offers a one-year graduate-level training program for individuals seeking to enhance their credentials for admission into professional schools. Students who complete the highly successful certificate program also have a strong foundation to pursue a Master of Science or Ph.D. in one of the health sciences departments in the School of Medicine.

Admission to the certificate program and its administration and benefits are centralized in the School of Medicine, with required and elective courses based in specific departments: Anatomy and Neurobiology, Biochemistry and Molecular Biology, Human and Molecular Genetics, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics.

Admission requirements

Applicants should hold a baccalaureate degree from an accredited university. Training in chemistry through organic chemistry is required. Admissions are generally drawn from applicants with a GPA greater than 3.0, MCAT more than 24, DAT more than 15, or GRE more than 1100 (verbal plus quantitative) and 4.0 Analytic. International students must display an acceptable level of English proficiency, e.g., more than 250 on the computer-based TOEFL examination (or the equivalent in other TOEFL formats) or more than 600 on the GRE verbal section.

Degree requirements

Students must complete a minimum of 27 credit hours of course work with a minimum grade point average of 3.2 (on a 4.0 scale) or better. The curriculum is composed of three required courses (15 credits) and 12 elective credits (including for-credit research options) spread over two semesters.

Curriculum

	Credits
Fall – required courses	
BIOC/MICR 503 Biochemistry, Cell and Molecular Biology	5
PHIS 501 Mammalian Physiology	5
Electives (minimum 5 credit hours)	
ANAT 611 Histology	5
BIOS/STAT 543 Statistical Methods I	3
MICR 505 Immunobiology	3
NEUS 609 Cellular and Molecular Neuroscience	4
NEUS or PHTX or PHIS 690 research seminar	1
PHIS 691 Special Topics in Physiology (current research)	1
Spring – required course	
BIOC/MICR 504 Biochemistry, Cell and Molecular Biology	5
Electives (minimum 7 credit hours)	
ANAT 610 Systems Neuroscience	4
HGEN 502 Advanced Human Genetics	3
MICR 515 Principles of Molecular Microbiology	3
NEUS or PHTX or PHIS 690 research seminar	1
PATH 601 General Pathology (Dentistry)	6
PHIS 604 Cell Physiology: From Molecules to Oragnisms	4
PHIS 691 Special Topics in Physiology (basic research)	3
PHIS 691 Special Topics in Physiology (current research)	1
PHTX 536 Principles of Pharmacology and Toxicology	5

Public Health, Master of (M.P.H.)

Admission requirements summary

Public Health, Master of (M.P.H.)
Indicate track: epidemiology, public health practice or social and behavioral science

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.P.H.	Fall	Applications strongly encouraged by Jan 1	GRE

For additional information:

See program admission requirements in this Bulletin. Also see www.epidemiology.vcu.edu/education/mph for more program details.

The Master of Public Health program is a 45-credit hour, five-semester course of study that leads to a Master of Public Health (M.P.H.) degree. The first M.P.H. program in Virginia, it is fully accredited by the Council on Education for Public Health. There are currently three tracks within the M.P.H. program: epidemiology, public health practice and social and behavioral science.

The program is closely linked with local, state and national public health agencies, organizations and professionals in order to enhance the student's appreciation and understanding of the application of public health principles to practice. Under the guidance of a faculty adviser, each student must complete a culminating experience that synthesizes knowledge and skills gained in the program. Depending on the track chosen, this may be a scientific investigation on a topic relevant to public health using intensive data analysis and resulting in a scholarly report on research results, or it may be a comprehensive project for a state or local public health organization that serves the organization's needs, such as a target population needs assessment or a comprehensive disease surveillance project.

Students in the public health practice track are prepared for employment in a broad range of positions in local, state and national public health agencies. Students in the epidemiology track are prepared to work on research teams in private, public or academic settings or to go on for further academic study. Students in the social and behavioral sciences track develop an understanding of behavioral and social factors associated with mortality and morbidity and are prepared to participate in the design, implementation and evaluation of interventions, programs and policies that address these factors in professional public and private organizations. Students in the epidemiology and public health practice tracks must complete 20 hours of community-based service-learning.

Admission requirements

To be considered for admission, applicants must meet the following requirements.

- Students must hold a bachelor's degree from an accredited institution, with a minimum GPA of 3.0 on a 4.0 scale in all undergraduate and any other graduate study.
- GRE scores must be current (taken within the past five years), with minimum scores of 500 verbal, 500 quantitative and 4.5 analytical writing.
- International students must submit TOEFL or IELTS scores. Minimum TOEFL score is 600 (paper-based), 250 (computer-based) or 100 (Internet-based); IELTS minimum score is 7.0. Test score requirements may be waived for international students who have received a medical degree (M.D.) in the U.S. Contact the program coordinator for more information.

Students must also submit the following materials with their application:

- Letters of recommendation from three individuals who can assess applicant qualifications for graduate school; at least one academic reference required. Most appropriate are letters from past professors or work supervisors.
- Current version of curriculum vitae or resume. Include experience and/or education relevant to study in public health.
- Personal statement following these guidelines:
  - The document should be 1.5 or double-spaced with one-inch margins, in a font no smaller than 11 points. The document should cover the following issues in two to five pages:
    1. Description of the applicant's career goals
    2. Why the applicant wishes to pursue an MPH degree
    3. How an MPH degree will help the applicant achieve her/his career goals
    4. Description of applicant's particular areas of interest in public health (e.g., maternal and child health, cancer epidemiology)
    5. Why VCU's MPH program best fits the student's public health interests
    6. For epidemiology track applicants only: the specific public health area in which you would like to do research
    7. What applicant plans to do in the first few years after graduation

Epidemiology track

Admission requirements summary

Public Health, Master of (M.P.H.)
Indicate track: epidemiology, public health practice or social and behavioral science

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.P.H.	Fall	Applications strongly encouraged by Jan 1	GRE

For additional information:

See program admission requirements in this Bulletin. Also see www.epidemiology.vcu.edu/education/mph for more program details.

The epidemiology track of the Master of Public Health program provides a didactic foundation and builds applied biostatistical and epidemiological skills students need to become productive members of research teams in public health settings. The track also provides a general foundation in public health as well as a basic background in epidemiological and biostatistical methods commonly used

by public health professionals. Additional course work provides knowledge in selected, topic-specific epidemiological applications.

This track is designed to train students who want to specialize in research methods, analysis and interpretation of public health data or to pursue further graduate study in epidemiology or a related field. The track requires a minimum of 45 credits. Students also must complete 20 hours of community-based service-learning.

As the culminating experience of the degree program, students work with a faculty adviser to conduct a scholarly epidemiologic scientific investigation on a topic relevant to public health and related the adviser's existing research program. This work is based on two to three semesters of practical experience working in the faculty member's research program, culminating in pursuit of a specific research topic for the final program project. The student must prepare a report of the results of this research and present the research in an organized, refereed forum in poster format. The student's adviser will submit a final grade to the program based on the work completed.

	Credits
Fall 1	10
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 571 Epidemiology I: Principles of Epidemiology (3)	
EPID 593 MPH Practicum (1)	
Spring 1	10
BIOS/STAT 544 Statistical Methods II (3)	
EPID 593 MPH Practicum (1)	
EPID 606 Epidemiology II: Epidemiologic Methods (3)	
SBHD 605 Introduction to Social and Behavioral Health (3)	
Summer	6
EPID 693 Public Health Internship (3)	
Elective (3)	
Fall 2	10
EPID 602 Public Health Organization and Management (3)	
Choose one: EPID 604 Principles of Occupational and Environmental Health **or** EPID 610 Environmental and Occupational Health Epidemiology (3)	
EPID 694 MPH Research Project (1)	
Choose one topic-specific epidemiology course (e.g., EPID 622 Maternal and Child Health Epidemiology) (3)	
Spring 2	9
EPID 694, MPH Research Project (3)	
Choose one topic-specific epidemiology course (e.g., EPID 620 Cancer Epidemiology, PHAR 688 Applied Pharmacoepidemiology Research Methods) (3)	
Elective (3)	

Public health practice track

Admission requirements summary

Public Health, Master of (M.P.H.)
Indicate track: epidemiology, public health practice or social and behavioral science

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.P.H.	Fall	Applications strongly encouraged by Jan 1	GRE

For additional information:

See program admission requirements in this Bulletin. Also see www.epidemiology.vcu.edu/education/mph for more program details.

The public health practice track of the Master of Public Health program provides a didactic foundation and builds skills that students need to be public health practitioners. The track provides a broad overview of public health issues and a foundation in skills such as program assessment and evaluation and epidemiological and biostatistical methods commonly used by public health professionals. A choice of several electives gives students the opportunity to focus on an area of interest, and required practical experience provides opportunities for community-based learning.

The track gives students a broad overview of public health issues and training in epidemiologic, biostatistical and assessment/evaluative methods necessary to practice successfully as a public health professional. The M.P.H. public health practice track requires a minimum of 45 credits. Students also must complete 20 hours of community-based service-learning.

Students work in a professional public health setting through required practica and an internship. As the culminating experience of the degree program, students work with a public health preceptor and faculty adviser to complete a capstone public health project that serves the need of a professional public health agency or organization. The project will be based on practical work that the student completes in the public health agency/organization and will result in a professional end product that will further the mission of the public health agency/organization. The student's adviser will submit a final grade to the department based on the quality of the work performed.

Curriculum	Credits
Fall 1	10
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 571 Epidemiology I: Principles of Epidemiology (3)	
EPID 593 MPH Practicum (1)	
Spring 1	10
EPID 593 MPH Practicum (1)	
SBHD 605 Introduction to Social and Behavioral Health (3)	
Program planning course (SBHD 608 Health Communication) or elective (3)	
Elective (3)	
Summer	3-6
EPID 693 Public Health Internship (3)	
Program planning course (EPID 612 Community-based Program Planning and Evaluation, if selected) or elective (3)	
Fall 2	10-13
EPID 602 Public Health Organization and Management (3)	
EPID 604 Principles of Occupational and Environmental Health (3)	
EPID 695 Public Health Practice Project (1)	
Elective (3)	
Spring 2	9
EPID 695 Public Health Practice Project (3)	

Electives (6)

Social and behavioral science track

Admission requirements summary

Public Health, Master of (M.P.H.) Indicate track: epidemiology, public health practice or social and behavioral science			
Degree: M.P.H.	**Semester(s) of entry:** Fall	**Deadline dates:** Applications strongly encouraged by Jan 1	**Test requirements:** GRE
For additional information: See www.behavioralhealth.vcu.edu.			

The M.P.H. track specializing in social and behavioral science is designed for persons who wish to learn about social and behavioral factors that affect public health and disease outcomes. Students will also discover how new knowledge about these factors is gained and addressed. The track emphasizes the collection and use of data to inform public health policy, program planning and clinical practice, with additional emphasis on health communication.

The program requires 45 semester credits, including a scientific investigation of a topic relevant to social and/or behavioral factors that impact health. As part of the program, students complete an internship to learn more about public health or clinical applications of social and behavioral science.

Combined Doctor of Medicine (M.D.) and Master of Public Health (M.P.H.)

Note: Students applying to the joint M.D./M.P.H. program should be accepted to the VCU School of Medicine prior to applying to the M.D./M.P.H. program. MCAT acceptable in lieu of GRE for combined professional/academic degree programs.

The Department of Epidemiology and Community Health in the School of Medicine offers a program for VCU medical students to obtain a Master of Public Health degree in conjunction with their medical training. The M.D./M.P.H. dual-degree program provides an opportunity for medical students who wish to pursue a public health or research career to graduate from medical school trained in both clinical and preventive, population-oriented medicine. Graduates from this program are prepared for positions in preventive medicine, primary care, research, community-based health centers and local health departments. Students may select a concentration in (1) epidemiology, which provides a foundation of epidemiological and biostatistical methods necessary to become a productive member of a research team in a public health setting, or (2) public health practice, which gives students a broad overview of public health issues and training in epidemiological, biostatistical and assessment/evaluative methods necessary to practice as a public health professional.

The objective of the dual-degree M.D./M.P.H. program is to provide high quality and in-depth training in public health to qualified medical students. The five-year program includes four years of medical school and one year of study in the M.P.H. program. During the M.P.H. year students take a minimum of 30 credits of didactic courses. Students may choose a concentration in epidemiology or in public health practice. To complete the M.P.H. requirements, students receive 12 credits for successful academic work during the first two years of medical school and take a minimum of one public health elective during the fourth year. Students may register for the M.P.H. year either prior to entering medical school or after the M-III year and prior to M-IV electives. Enrollment in the dual-degree program requires admission into both the School of Medicine and the Graduate School. Students must successfully complete all required course work to receive both degrees at the completion of the five years.

Epidemiology track

	Credits
Fall	15
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 602 Public Health Organization and Management (3)	
EPID 604 Principles of Environmental Health II (3)	
Elective (3)	
Spring	15
BIOS/STAT 544 Statistical Methods II (3)	
EPID 606 Epidemiology II: Epidemiological Methods (3)	
EPID 694 MPH Research Project (3)	
Topical epidemiology course (e.g. EPID 620 Cancer Epidemiology, PHAR 688 Applied Pharmacoepidemiology Research Methods) (3)	
Elective (3)	

Public health practice track

	Credits
Fall	15
BIOS/STAT 543 Statistical Methods I (3)	
EPID 560 SAS Programming for Public Health (3)	
EPID 602 Public Health Organization and Management (3)	
EPID 604 Principles of Environmental Health II (3)	
Elective (3)	
Spring	12
EPID 612 Community-based Program Planning and Evaluation (3) or SBHD 608 Health Communication (3)	
EPID 695 MPH Practice Project (3)	
Electives (9)	

Combined Doctor of Pharmacy (Pharm.D.) and Master of Public Health (M.P.H.)

The School of Pharmacy and the Department of Epidemiology and Community Health in the School of Medicine offer a dual degree program that results in a Pharm.D. and M.P.H. This dual degree program offers students the opportunity to achieve a doctorate in pharmacy while also learning about research and the importance of population health. This five-year program requires students to spend their fourth year pursuing the M.P.H. degree and transition back to pharmacy for advanced practice experiences. The students will be required to take 36 of the 45 credits required for the M.P.H. The field study requirement will be satisfied by Pharm.D. special advanced practice experiences in community health during the fifth year of the program.

Curriculum

Typical course plan for dual degree:

	credit
P1 fall semester	
ANAT 505 Anatomy	3
BIOC 523 Biochemistry I	3
MEDC 501 Medicinal Chemistry I	2
PCEU 503 Principles of Pharmacy	3
PCEU 517 Pharmacy Skills Laboratory I	1
PHAR 521 Pharmacy and Health Care Systems	2
PHAR 525 Pharmacy Communications	2
PHAR 556 Introduction to Pharmacy Practice	1
	17
P1 spring semester	
BIOC 524 Biochemistry II	2
PHIS 506 Physiology and Pathophysiology	5
MICR 501 Microbiology	4
PCEU 504 Biopharmaceutics and Dosage Forms	2.5
PCEU 506 Biopharmaceutics and Pharmacokinetics	2

PCEU 518 Pharmacy Skills Laboratory II	1
PHAR 558 Pharmacy Practicum II	0.5
	17
P2 fall semester	
MEDC 602 Principles of Pharmaceutical Analysis	2.0
MEDC 603 Medicinal Chemistry II	2.5
PCEU 617 Pharmacy Skills Laboratory III	1.0
PHAR 627 Principles of Pharmacy Practice Management	4.5
PHAR 643 Pharmacotherapy I	3.5
PHAR 657 Pharmacy Practicum III	0.5
PHTX 603 Pharmacology I	3.0
	17.0
P2 spring semester	
MEDC 604 Medicinal Chemistry III	2.5
PCEU 606 Applied Pharmacokinetics	2.5
PHAR 644 Pharmacotherapy II	4.5
PHAR 658 Pharmacy Practicum IV	0.5
PHTX 604 Pharmacology II	4
Elective(s)	2-3
	16-17
P3 fall semester	
EPID 600 Introduction to Public Health	3
PHAR 701 Ethics in Pharmacy Practice	2
PHAR 743 Pharmacotherapy III	3
PHAR 745 Drug Literature Evaluation	4
PHAR 747 Physical Assessment	1
PHAR 757 Pharmacy Practicum V	.5
Pharmacy elective(s)	2-3
	15.5-16.5
P3 spring semester	
EPID 603 Public Health Policy and Politics	3
PHAR 718 Pharmacy Skills Laboratory IV	1
PHAR 724 Pharmacy Law	3
PHAR 744 Integrated Therapeutics	3
PHAR 748 Self-Medication Awareness and Community Health	3
PHAR 758 Pharmacy Practicum VI	.5
Elective(s)	2-3
	15.5-16.5
P4 fall semester	
BIOS 543 Statistical Methods I	3
EPID 571 Epidemiology I: Principles of Epidemiology	3
EPID 602 Public Health Organization and Management	3
EPID 604 Principles of Occupational and Environmental Health	3
EPID 693 Fundamentals of Public Health Data Management	3
	15
P4 spring semester	
EPID 606 Epidemiology Methods II	3
EPID 694 Research Project	3
SBHD 605 Introduction to Social and Behavioral Health	3
Epidemiology elective	3
	12
P5 year	
PHAR 760 Acute Care Pharmacy Practice	5
PHAR 761 Institutional Practice Rotation	5
PHAR 762 Geriatrics Practice Rotation	5
PHAR 763 Ambulatory Care Rotation	5
PHAR 764 Community Practice Rotation	5
PHAR 765 Elective I (in public health)	5
PHAR 766 Elective II (in public health)	5
PHAR 767 Elective III	5
PHAR 768 Advanced Community Pharmacy Practice	5
Total	42-45

Combined Master of Social Work (M.S.W.) and Master of Public Health (M.P.H.)

See the individual program pages for admission requirements specific to the separate degrees.

Through a collaborative program between the VCU School of Social Work and the Department of Epidemiology and Community Health in the School of Medicine, students complete a three-year full-time program of study, including summer course work, to obtain the Master of Social Work and Master of Public Health degrees. The purpose of this dual-degree program is to prepare graduates to work with individuals, families, groups, communities and/or organizations; advocate for social, health care and economic justice in a diverse and multicultural society; and promote physical and mental health across the life course.

Prospective students are required to apply separately to both programs through the Graduate School and must meet both sets of admission requirements. (See www.pubapps.vcu.edu/bulletins/prog_search/?did=20039&iid=31083 for M.P.H. program requirements; www.pubapps.vcu.edu/Bulletins/prog_search/?did=20077&iid=30474 for M.S.W. program requirements.) Once admitted to both programs, the student is assigned an adviser from each to develop a plan of study, typically starting with the M.S.W. course work. It is preferable that students apply to both programs at the same time so that the structured dual-degree curriculum can be optimally planned. Students in one program may also apply to the second program during the first year of study. After admission to both programs, students are assigned an adviser from each to develop a plan of study.

Students are required to complete a minimum of 45 M.S.W. credits and a minimum of 33 M.P.H. credits, for a total of 78 semester credit hours. During the third and last year of study, the dual-degree students are placed in internships through the School of Social Work that focus on public health; the internship placement is approved by both the M.P.H. program director and the director of social work field instruction. A final capstone project that examines a relevant public health topic is required for the M.P.H.

For additional information, see www.epidemiology.vcu.edu/education/mph/dual.html.

Curriculum

Year 1, fall

SLWK 601 Human Behavior in the Social Environment I
SLWK 602 Policy, Community and Organizational Practice I
SLWK 603 Social Work and Social Justice
SLWK 604 Social Work Practice with Individuals, Families and Groups I
SLWK 693 Foundation Field Instruction I

Year 1, spring

SLWK 605 Social Work Practice with Individuals, Families and Groups II
SLWK 606 Policy, Community and Organizational Practice II
SLWK 609 Foundations of Research in Social Work Practice
SLWK 610 Human Behavior in the Social Environment II
SLWK 694 Foundation Field Instruction II

Year 1, summer
BIOS/STAT 543 Statistical Methods I (or fall, year 2)
SLWK 703 Mental, Emotional and Behavioral Disorders (or fall, year 2)

Year 2, fall
EPID 560 SAS Programming for Public Health
EPID 571 Epidemiology I: Principles of Epidemiology
EPID 602 Public Health Organization and Management
EPID 604 Principles of Occupational and Environmental Health
SLWK 703 Mental, Emotional and Behavioral Disorders or
SLWK 711 Strategies for Social Work Planning and Administrative Practice

Year 2, spring
EPID 612 Community-based Program Planning and Evaluation* or
SBHD 608 Health Communication
SBHD 605 Introduction to Social and Behavioral Health
SLWK 704 Clinical Social Work Practice I or
SLWK 712 Social Work Planning and Administration Practice I
EPID Elective(s) (one or two)

* Alternates spring and summer semesters annually.

Year 2, summer
EPID elective (or fall, year 3)

Year 3, fall
EPID 695 MPH Practice Project
SLWK 704 Clinical Social Work Practice I or
SLWK 712 Social Work Planning and Administrative Practice I
SLWK 793 Concentration Field Instruction
EPID elective (if needed)

Year 3, spring
EPID 695 MPH Practice Project
SLWK 705 Clinical Social Work Practice II or
SLWK 713 Social Work Planning and Administrative Practice I
SLWK 794 Concentration Field Instruction

(Students choose either SLWK 703, 704 and 705 for the clinical concentration or SLWK 711, 712 and 713 for the administration, planning and policy practice concentration; SLWK 793-794 is required for both concentrations.)

Rehabilitation and Movement Science, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Rehabilitation and Movement Science, Doctor of Philosophy (Ph.D.)			
Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
Ph.D.	Fall preferred	Applications received prior to Jan 9 will be given priority consideration	GRE

The Ph.D. in Rehabilitation and Movement Science is an interdisciplinary degree program developed through a collaborative partnership of the departments of Health and Human Performance, Physical Therapy, and Physical Medicine and Rehabilitation. The mission of this collaborative degree program is to prepare applied scientists capable of approaching multifaceted health care, preventive medicine and rehabilitation initiatives from an integrative rather than competitive perspective, and to prepare graduates to assume leadership positions in higher education teaching, research and management within rehabilitation and movement science.

There are two program tracks: exercise physiology and neuromusculoskeletal dynamics. The exercise physiology track prepares individuals to teach, conduct research and direct external funding initiatives in the area of cardiopulmonary rehabilitation and physiology, particularly in areas associated with metabolic and chronic disease states. The neuromusculoskeletal dynamics track prepares individuals for teaching, research and clinical initiatives associated with the identification and rehabilitation of movement disorders.

Admission requirements

Admission decisions are made by an admissions committee comprised of faculty members from each of the major collaborating departments: Exercise Science, Physical Therapy and Physical Medicine and Rehabilitation. Applicants must have completed at least one of the following: a master's degree in a related area, 30 hours of postbaccalaureate work (e.g. course work at 500 level or greater), or a first professional degree program. Admission decisions are made only on the basis of a completed application packet.

Applicants for admission to the program must complete an admission packet that includes the VCU Application for Graduate Study as well as supplementary program materials. Admission packets are available from:

Graduate School
Virginia Commonwealth University
Moseley House
P.O. Box 843051
Richmond, VA 23284-3051
(804) 828-6916
www.graduate.vcu.edu

or

Office of Doctoral Studies
Virginia Commonwealth University
P.O. Box 842020
Richmond, VA 23284-2020
(804) 827-2657
www.soe.vcu.edu

The entrance requirements fall into the following three categories. All criteria must be completed for consideration for admission.

Academic criteria

- A completed VCU Graduate School Application.
- Two official and up-to-date copies of all transcripts of the applicant's undergraduate and graduate record indicating that the applicant has completed the minimum required prerequisite course work.
- Official and current scores (within the past five years) for the general test of the GRE. Older scores may be submitted and consideration will be based upon the time elapsed since last formal schooling, occupation success and research ability.
- Priority for admission will be given to the applicants who have attained at least 3.5 in all graduate work attempted and a combined verbal and quantitative score on the GRE of a minimum of 1,000. If the TOEFL is required, a minimum of 600 is expected (250 on the computer-based test).

External criteria

- A professional resume indicating an applicant's educational and career experience as well as evidence of research potential.
- Completed reference forms from three individuals capable of evaluating the applicant's academic and research potential.

Written expression

- A personal statement in which the applicant discusses his or her personal career goals and the manner in which this doctoral program would enhance those goals.
- A summary of motivation, education and aims in pursuing an interdisciplinary degree in rehabilitation and movement science.

Applicants being considered for admission must complete an interview with a Ph.D. admissions committee representative and/or research faculty member with whom the student would like to work.

The applicant is encouraged to check the status of his or her application packet to ensure that all components of the packet have been received. Inquiries should be

made to the Office of Doctoral Studies. The Admissions Committee will not review incomplete packets.

Transfer credit

Students in the program may transfer up to nine credit hours into the program, including courses taken at VCU prior to being admitted to the program. Note that credits earned for one degree cannot be applied to another degree.

Curriculum

The Ph.D. in Rehabilitation and Movement Science will require a minimum of 38 credit hours of course work and 12 credit hours of dissertation research. Students will be required to complete:

- 12 credit hours of research core courses comprised of a research design class, two classes in statistical application and an elective in the area of research design or statistics.
- 18 credit hours in a concentration comprised of a focus on course work in a specific discipline formulated with the major adviser and approved by the Admissions Committee of the degree program.
- Three credit hours comprised of laboratory rotations in a minimum of two laboratories within the Rehabilitation and Movement Science program; each credit hour requires a minimum of 50 contact hours in the laboratory selected.
- Five credit hours minimum of professional development comprised of an interdisciplinary research/journal club seminar (0.5 credit hour per semester), a teaching practicum (one credit hour) and a presentation delivered at a regional, national or international conference of a related discipline (one credit hour).
- 12 credit hours of dissertation research comprised of a focused line of research over a three-to-four-year period of doctoral work.

Required research courses for the program (nine credit hours) – both tracks:

	Credits
STAT 543 Statistical Methods I	3
STAT 544 Statistical Methods II	3
ALHP 761 Health Related Sciences Research Design (or other approved course in research design)	3
Approved research design alternatives:	
HADM 761 Health Services Research Methods I	3
SOCY 626 Applications of Advanced Research Methods	3
EDUS 710 Educational Research Design	3

Elective research courses for the program (three credit hours) – both tracks:

	Credits
BIOS 531 Clinical Epidemiology	3
BIOS 553-554 Applied Statistics	3
BIOS 571 Clinical Trials	3
BIOS 572 Statistical Analysis of Biomedical Data	3
BIOS 655 Quantitative Epidemiology	3
ALHP 716 Grant Writing and Project Management in Health Related Sciences (or elective research course in consultation with adviser)	3

Required concentration courses for the Ph.D. program tracks

	Credits
Exercise physiology track	
HEMS 701 Advanced Exercise Physiology I	3
HEMS 702 Advanced Exercise Physiology II	3
PHIS 501 Mammalian Physiology	5
PHIS 512 Cardiovascular Exercise Physiology	3
PHIS 612 Cardiovascular Physiology	3
REMS/HEMS 610 Laboratory Techniques in Rehabilitation and Movement Science	3
	20

Neuromusculoskeletal dynamics track (select 18 credits from the following):	
HEMS 611 Biomechanics of Human Motion	3
REMS/HEMS 660 Neuromuscular Performance	3
REMS 665 Instrumentation in Motion Analysis	3
REMS/HEMS 692 Independent Study or elective course	3
PHTY 605 Foundations of Pathokinesiology	3
PHTY 606 Therapeutic Kinesiology	3
PHTY/REMS 608 Advanced Musculoskeletal Sciences	3
PHTY/REMS 612 Advanced Biomechanics	3
Laboratory rotations (three credit hours) – both tracks:	
REMS 710 Research Techniques in Rehabilitation and Movement Science	1-3
Professional development core (five credit hours minimum) – both tracks	
REMS 690 Research Seminar in Rehabilitation and Movement Science	1
REMS 793 Teaching Practicum in Higher Education	1
REMS 794 Research Presentation Seminar	3-4
Research in rehabilitation and movement science (12 credit hours) – both tracks	
REMS 798 Research in Rehabilitation and Movement Science	12

Advisory committee

Adviser

Incoming students will identify a faculty member in the program with whom they would like to pursue their academic program and research endeavors. Every effort will be made to accommodate the student's first choice of a faculty adviser. If the student is unsure of a research interest and adviser selection, the Admissions Committee will assign an adviser. Within the first two semesters of attendance, a permanent adviser should be identified. The adviser, together with the student, will develop a plan of study for the student's didactic and scholarly program and will be responsible for guiding the student's academic progress such that the adviser will supervise the student's research work and dissertation preparation.

Advisory committee

The student, in consultation with the adviser, will identify faculty members to serve on the advisory committee. The committee shall be appointed no later than the end of the spring semester following matriculation into the program. The student's advisory committee shall be comprised of five faculty members to include the adviser, two members from the rehabilitation and movement science faculty and two faculty members from other related departments. The student's adviser, who is active in the field of research the student has selected, will chair the committee.

Comprehensive examination

Once core courses are successfully completed, students must pass written and oral comprehensive examinations before transitioning to candidacy. These examinations will test students on their basic knowledge of rehabilitation and movement science principles (primarily in their chosen track) and research

methods as obtained through core, research and elective courses of the curriculum. The student must demonstrate a firm grasp of the material and the potential to become an independent researcher.

The written exam will be given to students during their second spring semester in the program. The written exam will consist of an area paper pertinent to the student's area of interest. The student's adviser and advisory committee must approve the topic and an outline of the area paper. The student's adviser is responsible for grading the area paper. If a student receives a less than satisfactory grade on the area paper, he/she will be afforded the opportunity to make appropriate revisions. Students will only be allowed to revise the area paper once. The area paper should be a minimum of 15 double-spaced pages in 12-point font. The area paper must be in a form suitable for submission for publication to a journal whose content addresses topics consistent with the area paper. The student's adviser and advisory committee must approve the journal selection and manuscript prior to submission. A passing grade on the written exam is not contingent upon the manuscript being accepted for publication.

Following acceptance of the area paper, the student will write a research proposal. The structure of the proposal will follow federal grant submission guidelines such as those specified by the National Institutes of Health or the Centers for Disease Control. The analytical research proposal must be submitted to and approved by the student's advisory committee prior to the oral examination.

The oral exam should be conducted within three to six months of successful completion of the written exam with the goal of proceeding to candidacy by the end of the fall semester of the student's third year. The oral exam will be based on, but not primarily limited to, the student's proposed analytical research project. The student must receive a satisfactory grade from each committee member to pass the oral exam. The student may proceed to candidacy and begin the research outline in the proposal once successful completion of the oral examination is achieved.

Exit requirements

Dissertation defense

Upon completion of all required course work and the research project, the student must prepare a dissertation to describe the research. A dissertation manual is available for download from the VCU Web site. Students are highly encouraged to become familiar with this manual and use it as a guide for preparation of their dissertation. All committee members must approve the written dissertation and the student must orally defend this dissertation in a publicly advertised seminar prior to graduation.

Students are expected to meet all university graduate school requirements regarding minimal GPA and limitation on credits achieved with a grade of "C" or below.

Time to degree

The doctoral degree must be obtained within seven years of matriculation. It is expected that full-time students will satisfy all requirements within four to five years. Part-time students may take the full seven years to complete all courses and the research project.

Social and Behavioral Health, Doctor of Philosophy (Ph.D.)

Admission requirements summary

Social and Behavioral Health, Doctor of Philosophy (Ph.D.)			
Degree:	**Semester(s) of entry:**	**Deadline dates:**	**Test requirements:**
Ph.D.	Fall preferred	Applications received prior to Jan 31 given priority consideration	GRE
Special requirements: M.P.H. or equivalent M.A. or M.S. degree			

The Ph.D. program in social and behavioral health, the only one of its kind in Virginia, prepares students to conduct theoretically based research and interventions on the social and behavioral determinants of health and disease. The program includes a minimum of 49 required credit hours. Course work in research methods and the social and behavioral sciences includes nine credits of applied research internship. Students then work under the supervision of an experienced faculty adviser to conduct original research for a dissertation for nine additional credit hours.

Sample curriculum

Fall 1	Credits
BIOS 553 Applied Statistics	3
SBHD 630 Theoretical Foundations of Social and Behavioral Health	3
SBHD 632 Health Disparities and Social Justice	3
SBHD 690 Departmental Seminar	1
Total	**10**
Spring 1	
BIOS 554 Applied Statistics	3
SBHD 690 Departmental Seminar	1
Electives	6
Total	**10**
Fall 2	
SBHD 631 Disseminating, Adopting and Adapting Evidence-based Prevention Programs	3
SBHD 633 Structural Equation Modeling	3
SBHD 690 Departmental Seminar	1
[Qualitative Methods Core Course TBD]	3
Total	**10**
Spring 2	
SBHD 693 SBHD Internship	9
SBHD 690 Departmental Seminar	1
Total	**10**
Fall 3 - Spring 4	
SBHD 697 Directed Research in Social and Behavioral Health	9
Total	**9**