

COLLEGE OF HUMAN MEDICINE

Aron Sousa, ACTING DEAN

MISSION

The College of Human Medicine was founded in 1964 to develop and implement programs in medical education, research, and service that improve the system of health care within the State of Michigan, both directly and through its learners and graduates. In the tradition of Michigan State University, the land grant University for the State of Michigan, the college is an educational institution and a social resource in service to the health of the people of the State. As part of this mission, the college seeks opportunities and mechanisms to integrate its academic work with major community health organizations and systems throughout the State, creating a network of education, research, and health services.

The primary mission of the college is the education of physicians who will bring the most sophisticated scientific knowledge to bear on medical problems and health status in a humane and compassionate way, and who will take leadership roles in bringing about changes directed toward achieving equal opportunities for health care for all.

A commitment to this mission is part of the education of all graduates of the college. Graduates take on the responsibility to pass this commitment to future generations. Corollaries of this mission are (1) to recruit a diversified student body, faculty, and staff to reflect society and (2) to develop and participate in systems of health care directed toward unmet needs.

The college has been organized to accomplish its mission in undergraduate, graduate, and postgraduate education by:

1. Educating physicians who can serve the needs of the State of Michigan in an exemplary fashion as characterized by: continued learning and professional renewal throughout their lives; concern for the biological, social, and emotional elements of all health problems; readiness to identify and respond to health care needs and problems in their communities; and use of the knowledge, skills, and concepts essential to quality health care and medical problem solving.
2. Generating new knowledge and assisting in its dissemination and application for the benefit of the people of the State of Michigan through education and support of faculty, students, and graduates who critically assess and contribute to the humanistic and scientific studies that are essential to the evolving basis of medical practice.
3. Helping to provide, to evaluate, and, where needed, to improve appropriate health care services and their associated delivery systems.

The College of Human Medicine provides several programs of study leading to health careers. In addition to the professional program that leads to the Doctor of Medicine degree, the College offers a Master in Public Health (M.P.H.) degree as well as Master of Science and Doctor of Philosophy programs through its basic science departments and interdepartmental programs. These departments are Biochemistry and Molecular Biology, Epidemiology and Biostatistics, Microbiology and Molecular Genetics, Pharmacology and Toxicology, Physiology, and Translational Neuroscience.

The clinical departments of the college are Emergency Medicine; Family Medicine; Medicine, Neurology and Ophthalmology; Obstetrics, Gynecology, and Reproductive

Biology; and Orthopedics, Pediatrics and Human Development; Psychiatry; Radiology; and Surgery. The College sponsors residency and fellowship programs in cardiology, child and adolescent psychiatry, family medicine, geriatric psychiatry, psychiatry, and vascular surgery.

Students who are enrolled in the professional program that leads to the Doctor of Medicine degree may elect specializations in Infancy and Early Childhood. For additional information, refer to the statement on *Interdepartmental Graduate Specializations in Infancy and Early Childhood* in the *College of Social Science* section of this catalog.

PROGRAM IN HUMAN MEDICINE

The professional program leading to the Doctor of Medicine degree has been accredited by the Liaison Committee on Medical Education of the American Medical Association/American Association of Medical Colleges.

To achieve its educational goals, the College will:

1. Recruit students from diverse academic, geographical, racial, and ethnic origins.
2. Enact a curriculum for medical students that:
 - (a) is strongly influenced by the focus of educating primary care physicians.
 - (b) utilizes the biopsychosocial model of medicine.
 - (c) is located, to the extent possible, in communities that closely approximate the environments in which students, as physicians, will ultimately provide health care.
 - (d) considers the needs of the population which its students will ultimately serve.
 - (e) emphasizes medicine as a helping profession as well as an applied science.
 - (f) fosters student responsibility for self-learning, peer evaluation, interactive professional discussion, and decision making in groups of health professionals.
 - (g) results in the preparation of graduates to enter and complete graduate medical education.
 - (h) can be evaluated in terms of its intended outcomes.
 - (i) can be modified based on assessment of its effectiveness.
 - (j) emphasizes preventive and health maintenance services in clinical practice.
3. Provide oversight to integrated and affiliated community residency and fellowship programs that stress goals similar to those of the medical student curriculum.
4. Promote and support graduate student and postgraduate programs in the disciplines basic to medicine.
5. Provide programs whereby physicians and other health professionals can acquire the conceptual background and skills in instruction, educational planning, evaluation, research, and administration needed to function as effective faculty members.
6. Conduct patient care programs that encourage and foster continued clinical excellence by the faculty and that provide students with examples of quality-evaluated and cost-effective patient care.
7. Sponsor, organize, and evaluate continuing education programs in medically related fields of biological, behavioral, social, educational, and clinical sciences to assist practicing physicians and other health

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professionals in pursuing lifelong learning objectives, often by collaborating with community organizations and physicians.

8. Collaborate with other colleges in providing educational programs and experiences that would expand the scope of health professions education in the University.

SHARED DISCOVERY CURRICULUM

The College of Human Medicine's Shared Discovery Curriculum is designed to be responsive to the health care needs of Michigan, the country, and in the educational best interests of diverse learners. The curriculum represents a significant departure from present educational models by emphasizing usefulness and experience as the motivating framework for adult medical education.

The design of the curriculum is based on a set of guiding principles which are divided into two categories. The core principles are envisioned as the foundation to all learning within the curriculum. The critical additional principles are central to the college's vision and mission and should be reflected in the experiences of any graduate of our program.

Core Principles

- Adult learning/student centered
- Competence and excellence
- Rational instructional design
- Humanism
- Integration
- Patient-centered
- Faculty development link to the curriculum

Critical Additional Principles

- Community medicine
- Chronic disease
- Compassion and empathy
- Innovative use of technology
- Problem-based
- Cultural competence
- Healthcare disparities
- Future oriented
- Liaison Committee on Medical Education (LCME) accreditation standards
- Multidisciplinary programming
- Safety science
- Continuous quality improvement model
- Teamwork
- Leadership

Learning Societies

Students and faculty are organized in an Academy through the creation of four learning societies spanning the geographic campuses and medical student years in the curriculum. The learning societies are the site of academic coordination of student learning plans as well as the home of post clinic groups that integrate and contextualize students' experiences in clinic with the programmed content of the curriculum. The learning societies provide student mentorship, exploration of

the social context of medicine and medical humanities, and peer-to-peer and near-peer support.

The college's curriculum is organized around a core group of competencies: service, care of patients, rationality, integration, professionalism, and transformation. The acronym is SCRIPT, and these are, with the exception of service, based on residency competencies adopted by the Accreditation Council for Graduate Medical Education (ACGME).

Major Curriculum Experiences

The curriculum will be organized around three major clinical experiences: the Early Clinical Experience, Middle Clinical Experience, and Late Clinical Experience. Between the clinical experiences there are intersessions which will provide an opportunity for students to focus on particular areas of strength, and interest.

Early Clinical Experience

The 24-week Early Clinical Experience begins with an 8-week lead-in preparation which emphasizes student and patient safety in clinical settings, communication and clinical skills, the social context of clinical decisions, and a survey of the necessary sciences underpinning common ambulatory clinical exam procedures, diagnostics tests, and clinical findings. Within the first few weeks of the Early Clinical Experience, students take the Progress Suite and develop a personal learning plan with their learning community faculty. Students begin orientation in their ambulatory clinic site and begin learning the clinic's processes by week 9 of the curriculum. In their clinical setting, students sequentially function as a medical assistant and then participate in care management activities before beginning to do focused histories and examinations on patients with common presenting conditions.

The weekly template for the Early Clinical Experience student workflow includes small group sessions, a large group activity, Post Clinic Group, necessary science laboratory, clinical simulation, and Guided Independent Learning time each week. The weekly template is programmed utilizing chief complaints and concerns end-competencies.

Topics in the early weeks of the Early Clinical Experience include: introductory gross anatomy and radiological correlates for the Core Physical Exam; and integrative molecular and cellular biology of common laboratory tests and host response to pathogen.

Intersessions

The Shared Discovery Curriculum includes intersessions between the Early and Middle Clinical Experiences and again between the Middle and Late Clinical Experiences designed to help students prepare for their next level of clinical work.

There are three blocks of intersessions between the Early and Middle Clinical Experiences. Each block is four weeks long and students takes two intersessions at a time. Students take required intersessions Students also have the opportunity to take foundational intersessions in basic sciences and clinical skills, topics of special interest as well as advanced topics.

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Between the Middle and Late Clinical Experiences there are two blocks of intersessions. Each block is four weeks long and students take three total intersession topics. Students are required to take an intersession preparing for the United States Medical Licensure Examination Step I exam.

Middle Clinical Experience

The 30-week Middle Clinical Experience in the curriculum further integrates clinical and necessary science and humanities experiences to a greater depth and with students in varied clinical settings. The learning society scholar groups of the Early Clinical Experience continue once a week in the Middle Clinical Experience in support of the weekly-programmed content. Students continue to participate in simulation every week, which integrate clinical skills and necessary sciences. They participate in necessary science laboratory experiences and their curriculum continues to be programmed utilizing Chief Complaints and Concerns end-competencies. The clinical experiences of the Middle Clinical Experience include 12 clinical rotations (Adult Wards, Care Management and Social Work, Emergency Medicine, Newborn Service, Nursing, Nutrition, Palliative Care and Pain, Pediatric Wards, Pharmacy, Physical Therapy, Respiratory Therapy, Women's Health) each of which have their own goals and objectives supported by a weekly rotation-based small group precepted by faculty.

Late Clinical Experience

The Late Clinical Experience provides disciplinary clerkships to prepare students for residency and a career of learning in the specialty of their interest. The major disciplines are included through four-week rotations in family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, surgery (1 and 2), and required selectives in primary care and critical care. A Human Medicine course series, Advanced Skills and Knowledge, including the recurring progress assessment suites, occurs throughout the Late Clinical Experience.

During the Late Clinical Experience, students are also required to complete 20 weeks of approved clinical electives as a part of meeting the college graduation requirements. At least 4 of the 20 weeks must be completed in the community to which the student is assigned. Students are encouraged to study broadly and/or to pursue intensively their special interests through elective programs. Elective programs may include a variety of courses offered by the college and university, research projects, and placements in clinical settings. Students may also take elective courses at other medical schools or be placed in clinical settings other than those associated with Michigan State University.

PROGRESS ASSESSMENT

From the first days of the curriculum, and at regular intervals throughout the curriculum, a suite of progress assessments enable students and their faculty to verify learners' achievement of competence and readiness to advance. Progress testing is a longitudinal competency assessment that

facilitates adult lifelong learning and represents the College of Human Medicine's graduation test for the M.D. degree. Students take the progress suite assessment and move through the curriculum as they demonstrate competency. With some slight variation for licensure preparation, every offering of the progress suite of assessments is equivalent and students are evaluated on these end-competency assessments many times in their College of Human Medicine career.

Pragmatism as an educational philosophical stance requires assessing thought, action and their interaction. The curriculum utilizes a group of assessments that include the nationally-normed multiple choice examinations associated with a professional education but do not stop at the determination of simply what our learners "know." A core assessment is the Progress Clinical Skills Examination of actual performance with standardized patients. Other assessments in the suite include a multi-source rating by their faculty, peers, health care team members and actual patients which indicates what our College of Human Medicine students "do." Portfolios of evidence containing essays, multimedia, reflections, scholarly products and projects are regularly reviewed by faculty to assure that acquisition of the necessary knowledge, skills and attitudes is taking place, and that learners can receive anticipatory guidance to achieve not only competence, but excellence. Ongoing data flow from these multiple types of assessments assures that students, faculty, staff, and administration are engaging in continuous quality improvement. Students are guided to focus on particular areas of challenge and opportunity.

Progress suite assessments are offered twice a semester to students of all levels of the curriculum. Students are required to pass the progress suite of assessments in order to advance through the curriculum.

ADMISSION TO THE PROGRAM IN HUMAN MEDICINE

The College of Human Medicine Committee on Admissions strives to select qualified applicants who are academically, emotionally, motivationally, and socially competent and ready for the rigors of medical school and for a career in medicine. These competencies creates graduates who meet the biopsychosocial needs of a diverse patient population. As a community-integrated medical school in Michigan, the college's mission focuses on educating physicians to meet the primary health care needs of the people of Michigan, including the state's underserved rural and inner-city areas. In preparation for serving a diverse patient population, the composition of the entering class of 190 students is representative of Michigan's general population. Students come from a variety of cultural, geographic, and ethnic backgrounds. In recent history, women have comprised more than 50 percent, underrepresented minority students 20 to 25 percent, and Michigan residents 75 to 80 percent of the entering class. Since there is no preference for academic majors, applicants with varied academic backgrounds are represented in each entering class, including those with

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degrees in the natural sciences, applied sciences, arts, business, engineering, humanities, and social sciences.

The College of Human Medicine uses the primary application services available through the American Medical College Application Service (AMCAS). Applicants may contact their premedical advisor, or contact AMCAS at <http://www.aamc.org> for application information. The Committee on Admissions encourages students to submit the AMCAS application in June of the year prior to anticipated enrollment, but no later than the November 1 deadline date. The Committee also requires that all applicants submit Medical College Admissions Test (MCAT) scores. The MCAT is administered multiple times throughout the year. MCAT scores are valid for three years. For more information about the MCAT, applicants should contact their premedical advisors, or the MCAT Program Office at www.aamc.org/students/applying/mcat. For further information about the College of Human Medicine, request a copy of the CHM Handbook for Premedical Students, by contacting the College of Human Medicine, at <http://www.chm.msu.edu/>

The admissions process will continue the college's traditional use of holistic review, which uses a balanced assessment of academic metrics, activities, and personal characteristics, and attributes when making admissions decisions. The College of Human Medicine Office of Admissions evaluates applicants' AMCAS applications, including life experiences and personal statements, and letters of recommendation (personal characteristics and attributes), and academic profile (major, classes, GPA trends, MCAT scores, undergraduate institution). Admission officers from the admissions office act on direction from the admissions committee to evaluate the applications to determine the most qualified applicants to advance to the next phase of the admissions process, the interview. Students are invited to Interview Day to learn more about the College of Human Medicine through a series of highly-structured interviews and programs. Applicant interviews consists of a one-on-one interview with a medical student and a 100-minute, eight-station multiple mini-interview that incorporates faculty, staff, students, alumni, and other vested individuals. Interviewers are trained to assess applicants on the qualities the College associates with becoming exemplar physicians consistent with the mission of the college.

The Committee on Admissions makes the final admissions decisions based on the following cognitive and non-cognitive considerations:

1. Academic competence including attributes such as fulfilling the premedical requirements, grades, trend in grades, degrees earned, rigors of the degree programs, MCAT scores, research experience, and cognitive skills.
2. Experiences consistent with a commitment and success within medicine, such as clinical experiences, non-medical community service experiences, experiences with people different from self, experiences showing commitment to a community of people, mentoring experiences, leadership experiences, and teamwork experiences.
3. Personal characteristics and attributes that are consistent with a commitment and success within medicine, such as

compassion, maturity, social responsibility, professional responsibility, morals and ethics, sociability, cultural competence, self-awareness calm-disposition, honesty, competence, and respect for others.

Minimum requirements which must be fulfilled prior to enrollment in the program in human medicine are:

1. Be a U.S. or Canadian citizen or permanent resident of the United States.
2. Have a valid U.S. or Canadian Driver's License and reliable vehicle upon matriculation.
3. Have completed at least a four-year high school education or equivalent.
4. Have completed all premedical requirements, including a bachelor's degree earned in the U.S. or Canada.
5. Have taken the Medical College Admission Test (MCAT).
6. Have taken the CASPer Test.

Michigan State University-College of Human Medicine has embraced a flexible approach in providing four options (or pathways) to meeting the premedical course requirements. A description of the four premedical course requirement options can be found here: <https://mdadmissions.msu.edu/applicants/prereq.html>.

Requirements for the Doctor of Medicine Degree

	CREDITS
1. All of the following courses (132 credits):	
FM 641 Family Medicine Clerkship in the Late Clinical Experience	6
HM 552 Medical School I	16
HM 553 Medical School II	16
HM 554 Medical School III	16
HM 555 Medical School IV	16
HM 556 Medical School V	16
HM 651 Advanced Skills and Knowledge in Medical School I	2
HM 652 Advanced Skills and Knowledge in Medical School II	2
HM 653 Advanced Skills and Knowledge in Medical School III	2
HM 654 Advanced Skills and Knowledge in Medical School IV	2
HM 655 Advanced Skills and Knowledge in Medical School V	2
MED 641 Internal Medicine Clerkship in the Late Clinical Experience	6
OGR 641 Obstetrics and Gynecology Clerkship in the Late Clinical Experience	6
PHD 641 Pediatric Clerkship in the Late Clinical Experience	6
PSC 641 Psychiatry and Behavioral Science Clerkship in the Late Clinical Experience	6
SUR 641 Surgery in the Late Clinical Experience I	6
SUR 642 Surgery in the Late Clinical Experience II	6
2. One of the following Critical Care Selective courses (6 credits):	
MED 643 Medicine Critical Care	6
PHD 643 Pediatric Critical Care	6
SUR 643 Surgical Critical Care	6
3. One of the following Primary Care Selective courses (6 credits):	
FM 610 Outpatient Family Medicine Clerkship	6
FM 611 Geriatric Clerkship	6
FM 616 Rural Family Practice Elective	6
FM 617 Sports Medicine Clerkship	6
FM 618 Palliative and End of Life Care Clerkship	6
MED 619 Advanced Internal Medicine-Ambulatory	6
MED 624 Geriatric Clerkship	6
MED 636 Advanced Internal Medicine: Medicine/Pediatrics	6
PHD 602 Ambulatory Pediatric Clerkship	6
4. Completion of 20 weeks of Elective Clerkships (30 credits):	
ANTR685 Directed Study in Clinical Prosecution	3 or 6
EM 630 Emergency Medicine Clerkship	6
EM 631 Clinical Experience in Emergency Medicine	3 or 6
EM 632 Senior Clinical Elective in Emergency Medicine	6
EM 633 Emergency Medicine Sub-Specialty Clinical Elective	3 or 6
FM 610 Outpatient Family Medicine Clerkship	3 or 6
FM 611 Geriatric Clerkship	3 or 6
FM 612 Inpatient Family Medicine Clerkship	3 or 6
FM 613 Clinical Research in Family Practice	6
FM 616 Rural Family Practice Elective	6
FM 617 Sports Medicine Clerkship	3 or 6

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FM 618	Palliative and End of Life Care Clerkship	3 or 6
FM 620	Family Practice Subinternship	6
HM 608	Sub-Specialty Clerkships	6
HM 609	Laboratory Medicine Clerkship	3 or 6
HM 610	Pathology Clerkship	3 or 6
HM 611	Hospice Clerkship	3 or 6
HM 612	Pain Medicine	3 or 6
HM 613	Complementary Medicine Clerkship	3 or 6
HM 614	Student-Designed Elective Clerkship	3 or 6
HM 615	Global Health Experience in India	3 or 6
HM 616	Radiation Oncology Clerkship	3 or 6
HM 622	Medical Partners in Public Health Community Resources and Wellness Programs	3 or 6
HM 623	Medical Partners in Public Health Capstone Project Elective	3 or 6
HM 629	Leadership in Medicine for the Underserved Community Elective	3 or 6
HM 631	Leadership in Medicine for Underserved Urban or Global Elective	3 or 6
HM 632	Rural Community Health	3 or 6
HM 633	Advanced Rural Community Health	3 or 6
HM 639	Northern Wilderness, Emergency and Sports Medicine	6
HM 691	Research Clerkship	3 or 6
MED 609	Hematology Clerkship	3 or 6
MED 610	Oncology Clerkship	3 or 6
MED 611	Cardiology Clerkship	3 or 6
MED 612	Nephrology Clerkship	3 or 6
MED 613	Dermatology Clerkship	3 or 6
MED 614	Pulmonary Clerkship	3 or 6
MED 615	Gastroenterology Clerkship	3 or 6
MED 616	Allergy Clerkship	3 or 6
MED 618	Infectious Disease Clerkship	3 or 6
MED 619	Advanced Internal Medicine - Ambulatory	3 or 6
MED 621	Advanced Internal Medicine - Inpatient	3 or 6
MED 622	Endocrinology and Metabolism Clerkship	3 or 6
MED 624	Geriatric Clerkship	3 or 6
MED 626	Physical Medicine and Rehabilitation Clerkship	3 or 6
MED 627	Rheumatology Clerkship	3 or 6
MED 628	Advanced Internal Medicine: Senior Medicine Sub-Internship	6
MED 632	Occupational Medicine Clerkship	3 or 6
MED 634	Advanced Internal Medicine: Intensive Care Medicine/Critical Care	3 or 6
MED 635	Advanced Internal Medicine: Women's Health	3 or 6
MED 636	Advanced Internal Medicine: Medicine/Pediatrics	3 or 6
NOP 617	Neurology Clerkship	6
NOP 620	Ophthalmology Clerkship	6
OGR 609	Advanced Gynecology Clerkship	3 or 6
OGR 610	Perinatology Clerkship	3 or 6
OGR 611	Reproductive Endocrinology and Infertility Clerkship	3 or 6
OGR 612	Gynecologic Oncology Clerkship	3 or 6
OGR 614	Advanced Obstetrics Clerkship	3 or 6
OGR 615	Obstetrics and Gynecology Sub-Internship	6
PHD 601	Human Development and Pediatric Sub-specialties	3 or 6
PHD 602	Ambulatory Pediatrics Clerkship	3 or 6
PHD 603	Pediatric Infectious Diseases Clerkship	3 or 6
PHD 604	Neonatology	6
PHD 605	Pediatric Cardiology Clerkship	3 or 6
PHD 606	Pediatric Endocrinology and Metabolism Clerkship	3 or 6
PHD 607	Pediatric Hematology and Oncology Clerkship	3 or 6
PHD 608	Pediatric Pulmonary Disease Clerkship	3 or 6
PHD 609	Pediatric Genetics Clerkship	3 or 6
PHD 610	Pediatric Allergy-Immunology Clerkship	3 or 6
PHD 611	Pediatric Critical Care Medicine Clerkship	3 or 6
PHD 612	Pediatric Gastroenterology Clerkship	3 or 6
PHD 613	Pediatric Emergency Medicine Clerkship	3 or 6
PHD 614	Pediatric Nephrology Clerkship	3 or 6
PHD 615	Pediatric Neurology Clerkship	3 or 6
PHD 616	Pediatric Physical Medicine and Rehabilitation Clerkship	3 or 6
PHD 617	Pediatric Adolescent Medicine Clerkship	3 or 6
PHD 618	Pediatrics Sub-Internship	3 or 6
PHD 619	Pediatric Hospital Medicine Clerkship	3 or 6
PHD 620	Child Abuse Pediatrics Clerkship	3 or 6
PHD 621	Pediatric Rheumatology Clerkship	3 or 6
PSC 609	Adult Psychiatry Clerkship	3 or 6
PSC 610	Child Psychiatry Clerkship	3 or 6
PSC 611	Addiction Psychiatry Clerkship	3 or 6
PSC 612	Geriatric Psychiatry Clerkship	3 or 6
RAD 609	Radiology Clerkship	3 or 6
RAD 612	Interventional Radiology	3 or 6
SUR 609	Otolaryngology Clerkship	3 or 6
SUR 610	Plastic Surgery Clerkship	3 or 6

SUR 611	Urology Clerkship	3 or 6
SUR 612	General Surgery Sub-Internship	6
SUR 613	Orthopedic Surgery Clerkship	3 or 6
SUR 614	Neurosurgery Clerkship	3 or 6
SUR 615	Ophthalmology Clerkship	3 or 6
SUR 616	Cardiothoracic Surgery Clerkship	3 or 6
SUR 617	Critical Care Clerkship	3 or 6
SUR 618	Anesthesia Clerkship	3 or 6
SUR 619	Sub-specialty Surgery Clerkship	3 or 6
SUR 622	Pediatrics Orthopedic Surgery Clerkship	3 or 6
SUR 623	Sports Medicine Orthopedic Surgery Clerkship	3 or 6
SUR 624	Vascular Surgery Clerkship	3 or 6
SUR 625	Hand Surgery Clerkship	3 or 6
SUR 626	Pediatric Surgery Clerkship	3 or 6
SUR 627	Burns Clerkship	3 or 6
SUR 628	Trauma Surgery Clerkship	3 or 6
SUR 629	Colorectal Surgery Clerkship	3 or 6
SUR 630	Surgical Wound Care Clerkship	3 or 6
SUR 631	Surgical Oncology Clerkship	3 or 6
SUR 632	Surgical Nutrition Clerkship	3 or 6

Transfer Credits

For a student who is pursuing a full-time M.B.A. degree from MSU jointly with a Doctor of Medicine (M.D.) degree from Michigan State University - College of Human Medicine, a maximum of 12 credits from the MSU College of Human Medicine may be transferred to the full-time M.B.A. degree program.

Student Rights and Responsibilities

Refer to the statement on *Student Rights and Responsibilities* in the *General Information, Policies, Procedures and Regulations* section of this catalog.

GRADUATE STUDY

The graduate programs of the college provide opportunities for advanced study with emphasis in a single discipline at the departmental level. Programs leading to the degrees of Master of Public Health, Master of Science and Doctor of Philosophy are offered. Graduate Certificates in Human Medicine Research, Leadership in Medicine for the Underserved, Leadership in Rural Medicine, Medical Partners in Public Health, and Public Health are available.

All graduate programs of the college are designed to develop independent effort, encourage creative thinking, and educate the student in the fundamentals of basic research. Each student's program is arranged to suit his or her individual needs within the restriction that the final program must conform to one of the general patterns approved by the faculties of the department, college and the university. The college administers master's degrees in biostatistics, clinical medicine, epidemiology and public health. Doctor of Philosophy degrees are offered through the basic biological science departments.

Several colleges and departments within Michigan State University cooperate in offering the interdepartmental Doctor of Philosophy degree program with a major in neuroscience, which is administered by the College of Natural Science. For additional information, refer to the statement on the doctoral program in neuroscience in the *College of Natural Science* section of this catalog.

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Students who are enrolled in master's or doctoral degree programs in the Department of Physiology and Department of Psychiatry may elect an Interdepartmental Specialization in Cognitive Science. For additional information, refer to the statement on *Interdepartmental Graduate Specializations in Cognitive Science* in the *College of Social Science* section of this catalog.

Master of Arts

The Master of Arts degree is offered by the College. In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

To be admitted to a Master of Arts degree in the College of Human Medicine on regular status, an applicant must have:

1. a bachelor's degree from a recognized educational institution.
2. a cumulative grade-point average of at least 3.0 in the junior and senior years of the bachelor's degree program.

Each applicant must submit a letter directly to the academic unit that administers the program to which admission is sought, giving the applicant's academic background and reasons for pursuing advanced study.

Requirements for the Master of Arts Degree

Candidates for the Master of Arts degree plan a program of study in consultation with a graduate advisor subject to the rules of the academic unit in which the degree is sought, the college, and the University. Two patterns of study are in general use: Plan A (with thesis) and Plan B (without thesis).

Master of Science

The Master of Science is the conventional degree for which programs are offered by the departments of Biochemistry and Molecular Biology, Epidemiology and Biostatistics, Microbiology and Molecular Genetics, Pharmacology and Toxicology, Physiology, and Surgery.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

Any student who possesses a bachelor's degree may apply for admission to a master's degree program. Admission is determined by the academic unit responsible for the program into which admission is sought and by the dean, after consideration of the student's record, experience, personal qualifications, and proposed program of study.

With the exception of the departments of Epidemiology and Biostatistics, and Surgery, those units of the college which offer master's degree programs are shared departments responsible to the College of Human Medicine and to other colleges such as Natural Science and Veterinary Medicine.

Whether a student's program is administratively associated with the College of Human Medicine depends on the character of the proposed program, the nature of the student's career aspirations, and the college of the student's mentor. A student accepted by a given department for admission to the graduate program may be identified with the College of Human Medicine upon recommendation of the chairperson of that department and the concurrence of the appropriate deans. This recommendation is contingent on the relevance of the student's program and/or career aspirations to the field of human medicine.

Requirements for the Master of Science Degree

All programs of study must include a thesis for which 4 credits in master's thesis research (course number 899) are required. A maximum of 10 credits may be authorized for thesis research. In addition, an oral examination over the thesis is required. A written examination may be required. The nature of the examination is at the discretion of the academic unit responsible for the program of study.

Academic Standards

The grades required for course credit toward the master or arts and master of science degrees are set by the academic unit responsible for the degree program. The accumulation of grades below 3.0 in more than three courses of three or more credits each removes the student from candidacy for the master of science degree. Candidates for the master of arts degree may accumulate no more than 6 credits with a grade below 3.0 in courses that are to be counted toward the degree. A student who fails to meet the standards set for any program may, on recommendation of the program director and the department chairperson, be required by the dean to withdraw at the end of any semester.

Time Limit

The time limit for completion of the master's degree is six years from the beginning of the first semester in which credit was earned toward the degree.

Doctor of Philosophy

The successful completion of the Doctor of Philosophy degree requires the development in the student of scholarly ability of a very high order. This degree emphasizes research in the various disciplines represented in the College of Human Medicine. The departments of the college which offer programs leading to this degree are Biochemistry and Molecular Biology, Microbiology and Molecular Genetics, Pharmacology and Toxicology, and Physiology.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

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Admission

Admission may be granted to a student who has a record acceptable to the department and to the college. A master's degree in an appropriate subject-matter field may be required, but the completion of a master's degree is not a guarantee of admission. Some of the departments require applicants to submit Graduate Record Examination scores. Normally, an average of 3.00 in all previous academic work is required for admission to regular status. Admission to provisional status may be used to indicate incomplete records, incomplete interpretation of available records, grade point average below 3.00 but with additional evidence of good capacity, or minor deficiencies in subject-matter training. Those units of the college which offer Doctor of Philosophy degree programs are shared departments responsible to the College of Human Medicine and to other colleges such as Natural Science and Veterinary Medicine. Whether a student's program is administratively associated with the College of Human Medicine depends on the character of the proposed program, the nature of the student's career aspirations and the college of the student's mentor. A student accepted by a given department for admission to the graduate program may be identified with the College of Human Medicine upon recommendation of the chairperson of that department and the concurrence of the appropriate deans. This recommendation is contingent on the relevance of the student's program and/or career aspirations to the field of human medicine.

Academic Standards

In the College of Human Medicine the minimum standards of academic performance for a doctoral candidate are:

1. A 3.00 average in all academic work is required for graduation.
2. Grades of 2.0 or lower in no more than three courses required for graduation.

Dual Degree Medical Scientist Training Program

The Dual Degree Medical Scientist Training Program is a special program for students who want to earn both a professional medical doctoral degree (Doctor of Medicine) and a graduate research doctoral degree (Doctor of Philosophy). The program seeks to meet a national need for physicians who are proficient in research as well as in medicine, and who will pursue careers as faculty members in medical schools and research institutions.

The program is designed to select, educate, and train highly motivated students having outstanding research and academic qualifications. Trainees pursue medical and graduate studies in parallel, meet regularly with peers in seminars, and engage in medical and graduate level courses and clerkships, as well as in research with highly qualified mentors.

A student who is interested in this program should contact the office of the associate dean for research and graduate study in the College of Human Medicine.

For additional information, refer to the statement on *Special Programs* in the *Graduate Education* section of this catalog.

CLINICAL MEDICINE

Master of Arts

The Master of Arts Degree in Clinical Medicine provides longitudinal clinical experiences with a robust integration of basic and clinical sciences, including significant patient contact and patient care experience, in addition to education in basic and medical sciences.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

To be considered for admission to the Master of Arts Degree in Clinical Medicine, students must:

1. be a currently enrolled College of Human Medicine medical student;
2. have successfully completed the first two years of medical school including HM 552, HM 553, and HM 554;
3. elect not to continue to completion of the M.D. degree.

Once a student transfers into the M.A. program, they cannot return to pursuing the M.D. degree at Michigan State University in the College of Human Medicine. Dual degrees will not be conferred to those who successfully complete the four-year curriculum and receive the Doctor of Medicine degree.

Students with critical deficiencies for the SCRIPT competency of professionalism as defined in the Student Manual for Assessment and Promotion are not eligible.

Requirements for the Master of Arts Degree in Clinical Medicine

The program is available under Plan B (without thesis). The student must complete a total of 35 credits distributed as follows:

	CREDITS
1. Both of the following courses (32 credits):	
HM 555 Medical School IV	16
HM 556 Medical School V	16
2. Completion of the following capstone course (3 credits):	
HM 895 Clinical Medicine Capstone Experience	3

The capstone experience must be completed within one full semester of entry into the program. Students qualifying for an incomplete grade would be expected to complete the capstone experience no later than the middle of the student's next semester, consistent with University policy.

MASTER OF PUBLIC HEALTH IN PUBLIC HEALTH

The Master of Public Health Degree in Public Health engages students in course work and practical training to obtain the knowledge, skills and abilities to successfully perform as a public health professional. Public health is a discipline that is distinct from clinical medicine. Public health focuses on the health status of communities and populations and emphasizes disease prevention and health promotion over treatment. Three major functions of public health include assessment, policy development and assurance. Core disciplines

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contributing to public health include biostatistics, epidemiology, health policy and management, social and behavioral sciences, and environmental health sciences. Prospective students are encouraged to review www.mph.msu.edu for additional information.

In addition to meeting the requirements of the University and of the College of Human Medicine, students must meet the requirements specified below.

Admission

To be considered for admission to the Master of Public Health in Public Health, an applicant must:

1. submit an Application to Graduate Study at Michigan State University with application fee;
2. have earned a bachelor's degree from a recognized, accredited educational institution;
3. submit Graduate Record Examination (GRE), Medical College Admission Test (MCAT), Graduate Management Admission Test (GMAT) or Law School Admission Test (LSAT) scores;
4. submit three letters of recommendation from professional or academic references;
5. submit a personal statement describing interest in and understanding of public health including professional career goals, and how their experiences, personal and professional, have influenced that interest;
6. submit official transcripts from all post-secondary institutions attended;
7. submit a resume or curriculum vitae.
8. submit official English language proficiency test scores to institution code 1465 (TOEFL, IELTS, MELAB) if applying as an international applicant.

The MPH Admission Committee integrates the academic information, letters of recommendation, and personal statement to make the final admissions decision based on the following considerations:

1. Academic: including attributes such as grades, trend in grades, degrees earned, rigors of the degree programs, graduate study placement scores, research experience, and cognitive skills;
2. Personal Motivation: including attributes such as public health experience and insights about public health competencies, health care reform, and other ethical, social, legal, political, and economic aspects of health;
3. Social Awareness: including attributes such as community service, experience with persons or groups unlike themselves, leadership, and mentoring experiences, as well as effective communication skills and sensitivity to community concerns.

Requirements for the Master of Public Health in Public Health

The Master of Public Health in Public Health is available under Plan B (non-thesis). Students must complete 43 credits as specified below.

	CREDITS
1. Complete all of the following courses (25 credits):	
HM 801 Introduction to Public Health	3
HM 802 Biostatistics for Public Health	3
HM 803 Epidemiology for Public Health	3
HM 804 Public Health Policy and Administration	3
HM 805 Social and Behavioral Aspects of Public Health	3

HM 806 Environmental Factors of Health	3
HM 827 Principles of Public Health Leadership	1
HM 828 Community Engagement in Public Health Practice	3
HM 854 Health Equity Framework for Public Health Practice	3
2. One of the following courses (3 credits):	
HM 807 Practical Application and Critical Thinking in Public Health	3
HM 853 Public Health Program/Intervention Evaluation	3
HM 880 Study Design and Research Methods for Public Health Practice	3
3. Complete 9 credits of elective course work from a list of approved courses available through the student's academic advisor or on the MPH Web site.	
4. Both of the following courses (6 credits):	
HM 892 Public Health Applied Practice Experience	3
HM 893 Public Health Integrative Learning Experience	3

GRADUATE CERTIFICATE IN APPLIED PARASITOLOGY FOR PUBLIC HEALTH

The Graduate Certificate in Applied Parasitology for Public Health provides students the knowledge necessary for augmenting existing graduate and medical programs by contributing to the development, implementation, and maintenance of field-based health programs aimed at controlling or eliminating parasitic infections. The Graduate Certificate in Applied Parasitology for Public Health is available only online.

Requirements for the Graduate Certificate in Applied Parasitology for Public Health

	CREDITS
Students must complete the following courses (15 credits):	
HM 863 Parasitic Diseases and Public Health in Developing Countries	3
HM 881 Pathogenesis of Parasitic Infections Important to Public Health	3
HM 886 Public Health Diagnosis and Interpretation of Parasitic Infections	3
HM 887 Control and Eradication of Parasitic Infections of Public Health Importance	3
HM 888 Field Methodology for Investigating Parasitic Diseases of Public Health Importance	3

GRADUATE CERTIFICATE IN CLINICAL TRIALS RESEARCH MANAGEMENT

The Graduate Certificate in Clinical Trials Research Management is a collaborative program offered by Michigan State University and Grand Valley State University. The program is offered only online and designed for experienced clinical researchers seeking additional course work or preparation for entering a clinical research trials career.

Admission

To be considered for admission to the Graduate Certificate in Clinical Trials Research Management, students must:

1. have a bachelor's or advanced degree.
2. submit official copies of transcripts from all post-secondary institutions attended.
3. provide three letters of recommendation.
4. submit a personal essay describing interest or experience in clinical trials research and career goals.
5. provide a resume or curriculum vitae.

International students must also:

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1. submit evidence of English language proficiency verified by an official Test of English as a Foreign Language (TOEFL).
2. provide proof of funding if requesting an I-20.

Students who have been admitted to a master's or doctoral degree program at either University must notify both the graduate studies office and the program coordinator if they intend to seek this certificate in addition to the program for which they have been admitted.

Requirements for the Graduate Certificate in Clinical Trials Research Management

	CREDITS
Students must complete 12 credits from the following courses: From Michigan State University, both of the following courses:	
HM 868 Integrated Research Study Design and Informatics	3
PHM 659 Regulatory Affairs and Project Management in Clinical Research	3
From Grand Valley State University, the following course:	
PSM 650 Ethics and Professionalism in Applied Science	3
From Grand Valley State University, one of the following courses:	
AHS 692 Clinical Research Trials Capstone	3
PA 535 Grant Writing	3
STA 610 Applied Statistics for Health Professionals	3
Students who do not have two or more years of professional experience related to clinical trials research are advised to select AHS 692 as part of their program of study. If selected, AHS 692 must be taken after completion of at least two of the required courses and may be taken concurrently with the third required course.	

Transfer Credit

Because of the collaborative nature of this program, the courses listed above are the only courses that can be used to satisfy the requirements of this certificate. Courses from institutions other than Michigan State University and Grand Valley State University cannot be used in this certificate program. The certificate awarded to students will include the following statement: Collaborative Program of Grand Valley State University and Michigan State University.

GRADUATE CERTIFICATE IN COUNTERFEIT PHARMACEUTICALS

The Graduate Certificate in Counterfeit Pharmaceuticals embodies the principles of prevention in public health and tackles the emerging threat of fake legal drugs.

Requirements for the Graduate Certificate in Counterfeit Pharmaceuticals

	CREDITS
Students must complete all of the following courses (15 credits):	
HM 801 Introduction to Public Health	3
HM 833 Introduction to Pharmaceutical Counterfeiting and Public Health	3
HM 834 Advanced Counterfeit Pharmaceuticals Readings	3
HM 875 Applications of Open Source Information in Public Health Intelligence	3
VM 813 Special Studies in Food Safety	3

GRADUATE CERTIFICATE IN HUMAN MEDICINE RESEARCH

The Graduate Certificate in Human Medicine Research trains students to possess a special set of knowledge, skills and abilities enabling them to become productive researchers during medical school. Students will engage in rigorous, long-

term research experience resulting in high-impact outcomes, positioning them for admittance to research-intensive residency programs and competitiveness for future research funding. The graduate certificate is available to students currently enrolled in the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

Admission

To be considered for admission to the Graduate Certificate in Human Medicine Research, an applicant must:

1. Be enrolled in the Professional Program in Human Medicine leading to the Doctor of Medicine degree.
2. Submit a university application.

Students will be chosen for the certificate program through a process outlined and managed by the Research Certificate Selection Committee.

Requirements for the Graduate Certificate in Human Medicine Research

	CREDITS
The student must:	
1. Complete 20 hours of Research Online Modules/Quizzes	
2. Complete 80 hours of Introduction to Biostatistics Intersession through enrollment in HM 553, HM 554, or HM 556 during their professional program requirements.	
3. Attend five enrichment activities as directed by the program director.	
4. Complete 6 to 10 weeks of full-time research activities or its equivalent. <ol style="list-style-type: none"> a. Presentation at a regional or national conference is required. b. Manuscript for publication will be submitted to certificate advisory committee, however publishing of manuscript is not required due to time constraints. 	
5. Complete 40 hours of research community involvement as approved by the program director.	
6. Complete 12 credits of HM 691 Research Clerkship.	

GRADUATE CERTIFICATE IN INTERNATIONAL PUBLIC HEALTH

The Graduate Certificate in International Public Health provides access to interdisciplinary study in global health issues with the opportunity to gain specific expertise in the unique challenges of international public health in the developing world, or among relevant international populations in the United States. The certificate is also designed to develop an intellectual environment that will foster the growth of research, teaching and practice in international public health.

Requirements for the Graduate Certificate in International Public Health

	CREDITS
Students must complete all of the following courses (15 credits):	
HM 832 Global Public Health	3
HM 836 Comparative Global Healthcare Systems	3
HM 837 Poverty and Public Health	3
HM 838 Cultural Aspects of Public Health Practice	3
HM 839 Water and Public Health: A Global Perspective	3

GRADUATE CERTIFICATE IN LEADERSHIP IN MEDICINE FOR THE UNDERSERVED

The Graduate Certificate in Leadership in Medicine for the Underserved prepares physicians to address the needs of medically underserved and vulnerable populations of the United States and abroad. The graduate certificate is available

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to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

Requirements for the Graduate Certificate in Leadership in Medicine for the Underserved

CREDITS

Students must successfully complete the following:

1. Participation in 100 hours of didactic/experiential learning in leadership in medicine for the underserved.
2. Participation in 100 self-directed volunteer or clinical service hours approved by the leadership in medicine for the underserved director.
3. Completion of the following courses (12 credits):

HM 629 Leadership in Medicine for Underserved - the Community Elective	6
HM 631 Leadership in Medicine - Urban or Global Elective	6
4. Successful completion of assigned projects and presentations.

GRADUATE CERTIFICATE IN LEADERSHIP IN RURAL MEDICINE

The Graduate Certificate in Leadership in Rural Medicine trains students to possess a special set of knowledge, skills and attitudes enabling them to better understand address the medical needs and provision of healthcare to individuals living in rural and remote communities. The graduate certificate is available to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

Requirements for the Graduate Certificate in Leadership in Rural Medicine

CREDITS

Students must successfully complete the following:

1. Participation in 100 hours of leadership in rural medicine didactic/experiential learning.
2. Participation in 100 self-directed volunteer or clinical service hours in a rural community as approved by the leadership in rural medicine director.
3. Completion of two of the following courses:

FM 616 Rural Family Practice Elective	6
HM 632 Rural Community Health	6
HM 633 Advanced Rural Community Health	6
4. Successful completion of the Rural Community Health Program Portfolio or the Rural Physician Community assignment and presentation.

GRADUATE CERTIFICATE IN MEDICAL PARTNERS IN PUBLIC HEALTH

The Graduate Certificate in Medical Partners in Public Health is designed for College of Human Medicine medical students who are interested in complementing their clinical medicine training with a rigorous population and community-focused approach to improving public health. The certificate helps fulfill the Center for Disease Control's vision of training physicians who do not yet have a public health degree.

Admission

Students must be in good academic standing to participate in the program. Students must apply for and be selected for the program by completing the application process which consists of essays and interviews. Students are not eligible for the certificate if they already possess a master's in public health degree or certificate.

Requirements for the Graduate Certificate in Medical Partners in Public Health

CREDITS

Students must successfully complete the following:

1. Participation in 100 hours of medical partners in public health didactic/experiential learning.
2. Participation in 100 self-directed volunteer or clinical service hours approved by the medical partners in public health director.
3. Completion of the following courses (12 credits):

HM 622 Medical Partners in Public Health Community Resources and Wellness Programs	6
HM 623 Medical Partners in Public Health Capstone Project Elective	6
4. Successful completion of assigned projects and presentations.

GRADUATE CERTIFICATE IN PUBLIC HEALTH

The Graduate Certificate in Public Health is designed to provide students with an overview of the core disciplines, a basis for understanding the breadth and scope of the public health field. Public health differs from clinical medicine in its focus on populations and emphasis on health promotion and disease prevention. Public health activities such as health education, control of communicable diseases, application of sanitary measures and environmental monitoring contribute to the health status of communities. Core public health disciplines include biostatistics, epidemiology, health policy and management, social and behavioral sciences, and environmental health sciences. The certificate is available only online.

Requirements for the Graduate Certificate in Public Health

CREDITS

1. Complete all of the following courses (18 credits):

HM 801 Introduction to Public Health	3
HM 802 Biostatistics for Public Health	3
HM 803 Epidemiology for Public Health	3
HM 804 Public Health Administration	3
HM 805 Social and Behavioral Aspects of Public Health	3
HM 806 Environmental Factors of Health	3

GRADUATE CERTIFICATE IN PUBLIC HEALTH ADMINISTRATION

The Graduate Certificate in Public Health Administration offers additional study in the area of public health administration which includes planning, organization, administration, management, evaluation and policy analysis of health and public health programs.

Requirements for the Graduate Certificate in Public Health Administration

CREDITS

Students must complete all of the following courses (18 credits):

- | | |
|--|---|
| HM 801 Introduction to Public Health | 3 |
| HM 804 Public Health Administration | 3 |
| HM 830 Practical Applications of Public Health Law | 3 |
| HM 840 Public Health Finance | 3 |
| HM 841 Public Health Policy | 3 |
| HM 853 Public Health Program/Intervention Evaluation | 3 |

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GRADUATE CERTIFICATE IN PUBLIC HEALTH INFORMATICS

The Graduate Certificate in Public Health Informatics provides a systematic application of information, computer science, and technology to public health practice, research and learning. Students who successfully complete the course work will be well positioned to compete for the Public Health Informatics Fellowship program sponsored by the Centers for Disease Control and Prevention.

Requirements for the Graduate Certificate in Public Health Informatics

	CREDITS
Students must complete all of the following courses (15 credits):	
HM 842 Introduction to Public Health Informatics	3
HM 843 Methods in Public Health Informatics	3
HM 844 Legal/Ethical Issues in Public Health Informatics	3
HM 845 Informatics and Information Technology	3
HM 846 Advanced Topics in Public Health Informatics Management	3

DEPARTMENT of ANESTHESIA

GRADUATE STUDY

The Department of Anesthesia is administered by the College of Human Medicine with the mission of providing medical students with vital experience in airway management and the care of patients during surgery. Faculty provide hands-on training for residents from other medical specialties and for students in other health fields involving the care of surgical patients (nurse anesthetists, physician assistants, anesthesia assistants, and emergency medical technicians). Outside the surgical suites, the department collaborates with community anesthesiologists in developing continuing education programs for the benefit of physicians around the state.

DEPARTMENT of BIOCHEMISTRY and MOLECULAR BIOLOGY

Eric Grotewold, Chairperson

GRADUATE STUDY

The Department of Biochemistry and Molecular Biology is administered jointly by the colleges of Human Medicine, Natural Science, and Osteopathic Medicine. These colleges offer Master of Science and Doctor of Philosophy degree programs with a major in biochemistry and molecular biology. In addition, the College of Natural Science offers a Doctor of Philosophy degree program in biochemistry and molecular biology—environmental toxicology along with options for dual majors in a variety of disciplines. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Biochemistry and*

Molecular Biology in the *College of Natural Science* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of EMERGENCY MEDICINE

Michael Brown, Chairperson

GRADUATE STUDY

The Department of Emergency Medicine is administered by the College of Human Medicine. The department's responsibilities include preclinical and clinical medical student teaching, emergency medicine residency training, and research. Areas of clinical research and education encompass the broad spectrum of acute care ranging from pediatric emergencies to geriatrics. The research program emphasizes collaboration with other clinical departments and communities in the areas of neurological emergencies, resuscitation and knowledge translation. The department is affiliated with graduate medical education programs in community hospitals where the department faculty train emergency medicine residents.

DEPARTMENT of EPIDEMIOLOGY and BIOSTATISTICS

Dawn P. Misra, Chairperson

The Department of Epidemiology and Biostatistics offers multiple graduate-level educational opportunities including Master of Science and Doctor of Philosophy degree programs in epidemiology, Master of Science and Doctor of Philosophy degree programs in biostatistics, postdoctoral research training in epidemiology and biostatistics, and an epidemiology certificate program as a non-degree graduate program. The department also offers an undergraduate Minor in Global Public Health and Epidemiology. In addition, the Department faculty teach epidemiology and biostatistics to students pursuing medical or other graduate degrees.

Epidemiology and biostatistics are population-oriented quantitative disciplines for medical science and biomedical

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research; both are concerned with public health. Epidemiologists and biostatisticians work to gain increasingly definitive evidence about how to promote health and to prevent or reduce risk of disease, to delay disease onset, and to shorten or ameliorate disease-related suffering and disability. They also help to shape the practice of evidence-based medicine through methodological and substantive contributions needed for cost effectiveness and decision analysis. Epidemiology and biostatistics are both multidisciplinary endeavors involving a mastery of biological science in health, as well as an understanding of mechanisms that link population health to societal factors and to individual-level health-related behaviors.

UNDERGRADUATE PROGRAM

MINOR IN GLOBAL PUBLIC HEALTH AND EPIDEMIOLOGY

The Minor in Global Public Health and Epidemiology, which is administered by the Department of Epidemiology and Biostatistics, provides an opportunity for sustained study of public health and epidemiology-related topics and research. It is available as an elective to students who are enrolled in bachelor's degree programs at Michigan State University. Applications are accepted starting in January of the freshman year.

The minor focuses on public health and epidemiologic methods, rather than clinical medicine, and treats public health from a global perspective. It addresses the core principles of public health and gives students applied tools for evaluating and analyzing health data.

With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree.

Requirements for the Minor in Global Public Health and Epidemiology

	CREDITS
1. All of the following courses (16 credits):	
EPI 200 A Multidisciplinary Approach to Problems in Global Public Health and Epidemiology	3
EPI 280 Applied Analytic Methods in Health Studies I	3
EPI 380 Applied Analytic Methods in Health Studies II	3
EPI 390 Disease in Society: Introduction to Epidemiology and Public Health	4
HM 101 Introduction to Public Health	3

GRADUATE STUDY

BIostatISTICS

Master of Science

The master's degree program in biostatistics is designed to provide graduate students with essential quantitative training necessary for public health and medical research. Students completing the program will be well prepared to design experimental studies and analyze data in important areas of clinical and biomedical investigations. Required courses concentrate on the principles of study design, methods for

analysis of biomedical data of the continuous, categorical and mixed types from clinical experiments and from observational studies. Elective courses are offered in analytic methods for longitudinal data, genomic and genetic data, and censored data.

In addition to meeting the requirements of the university, and of the College of Human Medicine, students must meet the requirements specified below.

Admission

To be considered for admission applicants must:

1. Have a bachelor's degree including undergraduate or graduate level quantitative methods with at least two semesters of college-level calculus, a course in matrix or linear algebra, and an introductory course in statistics.
2. Demonstrate interest or experience in a public health field by submitting a statement of purpose.
3. Provide an official transcript.
4. Submit Graduate Record Examination (GRE) scores. Test results should not be older than five years.
5. Submit three letters of recommendation, one of which must be from an academic advisor from a previous program.
6. Provide Test of English as a Foreign Language (TOEFL) scores, if an international applicant. A minimum score of 80 on the internet-based test, 550 on the paper-based test or 237 on the computer-based test, or passing grade on the MSU English Language Test (MSUFLT). Scores must be no older than two years. International students with full native fluency in English are exempt.

Students with less preparation may be provisionally admitted. Credits earned in collateral course work will not count towards the degree requirements.

Requirements for the Master of Science Degree in Biostatistics

The program is available under either Plan A (with thesis) or Plan B (without thesis). A total of 33 credits is required for both Plan A or Plan B, with no more than 6 credits at the 400-level. The student's program of study must be approved by the student's academic advisor and guidance committee with the approval of the Dean of the College of Human Medicine.

	CREDITS
Students must:	
1. All of the following courses (11 credits):	
EPI 808B Advanced Biostatistics	3
EPI 810 Introductory Epidemiology	3
EPI 826B Categorical Data Analysis	3
EPI 828 Seminar in Responsible Conduct of Research	1
EPI 856 Statistical Consulting in Public Health	1
2. One of the following courses (3 credits):	
EPI 853B Statistical Computing	3
STT 802 Statistical Computation	3
3. Complete 12 credits (Plan A) or 15 credits (Plan B) of additional credits in biostatistics electives from the following:	
EC 821A Cross Section and Panel Data Econometrics I	3
EC 821B Cross Section and Panel Data Econometrics II	3
EPI 851 SAS Programming I: Essentials	1
EPI 852 SAS Programming II: Data Management and Analysis	1
EPI 855 Biostatistical Modeling in Genomic Data Analysis	3
EPI 858 Clinical Trials	3
EPI 951 Latent Variable Modeling	3
EPI 952 Duration and Severity Analysis	3
EPI 953 Analytical Strategies for Observational Studies	3
FOR 875 R Programming for Data Sciences	3

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STT 464	Statistics for Biologists	3
STT 465	Bayesian Statistical Methods	3
STT 801	Design of Experiments	3
STT 814	Advanced Statistics for Biologists	4
STT 825	Sample Surveys	3
STT 847	Analysis of Survival Data	3
STT 861	Theory of Probability and Statistics I	3
STT 862	Theory of Probability and Statistics II	3
Additional elective courses may be chosen with advisor approval.		
4.	Complete 3 additional credits of epidemiology electives from the following:	
EPI 805	Readings in the Historical Roots of Epidemiological Thought	3
EPI 812	Causal Inference in Epidemiology	3
EPI 815	Epidemiology of Cardiovascular Disease	3
EPI 816	Perinatal Epidemiology	3
EPI 817	Epidemiology of Communicable Diseases	3
EPI 819	Spatial Epidemiology and Medical Geography	3
EPI 823	Cancer Epidemiology	3
EPI 835	Neuroepidemiology	3
EPI 890	Independent Study in Epidemiology and Biostatistics	1 to 3
EPI 910	Themes in Contemporary Epidemiology	3
EPI 977	Social Epidemiology	3
EPI 979	Advanced Topics of Infectious Disease Epidemiology	3
LCS 829	Design and Conduct of Epidemiologic Studies and Clinical Trials	3
5.	Attend all MSU Graduate School Responsible Conduct of Research (RCR) Workshops (Human).	

Additional Requirements for Plan A

- The following course (4 credits):
EPI 899 Master's Thesis Research 4
- Pass an oral defense of the thesis.

Additional Requirements for Plan B

- Complete a capstone project through enrollment in 1 credit of EPI 890 Independent Study in Epidemiology and Biostatistics.
- Pass a final oral examination or evaluation of the capstone project.

Doctor of Philosophy

The Doctor of Philosophy degree in Biostatistics provides students with the quantitative skills needed for the development, evaluation and application of novel methods for the analysis of modern biomedical data.

In addition to meeting the requirements of the university, and of the College of Human Medicine, students must meet the requirements specified below.

Admission

For admission to the doctoral degree in biostatistics on regular status, the student must:

- have a master's degree in biostatistics, statistics, or related field;
- submit Graduate Record Examination (GRE) scores, or MCAT scores;
- provide TOEFL scores if their native language is other than English;
- provide three letters of recommendation;
- provide a statement of purpose;
- provide official transcripts.

Applicants with strong academic records who are in the process of completing a master of science may be admitted on a provisional basis. The first 33 credits applied towards the completion of a master of science may not be counted toward the Ph.D. in Biostatistics.

Applicants who are admitted without a master's degree will be required to complete collateral course work to make up deficiencies. Collateral course work will not count towards the

fulfillment of degree requirements. It is strongly recommended that applicants have taken course work in multivariate calculus, advanced undergraduate linear algebra and probability, and numerical computing.

Requirements for the Doctor of Philosophy Degree in Biostatistics

The doctoral degree program offers three concentration areas: design and analysis of medical studies; big data and statistical genetics; and ad biometry, a flexible option for students with diverse interests. The concentration is selected in consultation with a faculty advisor and guidance committee.

		CREDITS
Students must:		
1.	Complete all of the following courses (13 credits):	
EPI 810	Introductory Epidemiology	3
EPI 828	Seminar in Responsible Conduct of Research	1
EPI 860	Advanced Inference for Biostatistics	3
STT 867	Linear Model Methodology	3
STT 868	Mixed Models: Theory, Methods and Applications	3
2.	Complete one of the following concentrations:	
Design and Analysis of Medical Studies		
1.	One of the following courses (3 credits):	
EPI 858	Clinical Trial I	3
EPI 952	Duration and Severity Analysis	3
Or		
STT 847	Analysis of Survival Data	3
2.	Complete 11 credits of elective course work:	
ANS 814	Advanced Statistics for Biologists	4
CSE 331	Algorithms and Data Structures	3
CSE 480	Database Systems	3
CSE 482	Big Data Analysis	3
CSE 847	Machine Learning	3
CSE 881	Data Mining	3
EC 821A	Cross Section and Panel Data Econometrics I	3
EC 821	Cross Section and Panel Data Econometrics II	3
EPI 812	Causal Inference in Epidemiology	3
EPI 855	Biostatistical Modeling in Genomic Data Analysis	3
EPI 880	Selected Topics in Biostatistics	3
EPI 920	Advanced Methods in Epidemiology and Applied Statistics	3
EPI 950	Advanced Biostatistical Methods in Epidemiology	3
EPI 952	Duration and Severity Analysis	3
EPI 953	Analytical Strategies for Observational Studies	3
EPI 990	Independent Study	3
STT 801	Design of Experiments	3
STT 825	Sample Surveys	3
STT 855	Statistical Genetics	3
STT 861	Theory of Probability and Statistics I	3
STT 862	Theory of Probability and Statistics II	3
STT 873	Statistical Learning and Data Mining	3
STT 874	Introduction to Bayesian Analysis	3
Additional courses may be chosen with advisor approval.		
Big Data and Statistical Genetics		
1.	One of the following courses:	
EPI 855	Biostatistical Modeling in Genomic Data Analysis	3
Or		
STT 855	Statistical Genetics	3
CSE 231	Introduction to Programming I	3
Or		
CSE 232	Introduction to Programming II	4
STT 456	Actuarial Models II	3
2.	Complete 11 credits of elective course work:	
ANS 814	Advanced Statistics for Biologists	4
CSE 331	Algorithms and Data Structures	3
CSE 480	Database Systems	3
CSE 482	Big Data Analysis	3
CSE 847	Machine Learning	3
CSE 881	Data Mining	3
EC 821A	Cross Section and Panel Data Econometrics I	3
EC 821	Cross Section and Panel Data Econometrics II	3
EPI 812	Causal Inference in Epidemiology	3
EPI 858	Clinical Trials	3
EPI 880	Selected Topics in Biostatistics	3
EPI 920	Advanced Methods in Epidemiology and Applied Statistics	3

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EPI 950	Advanced Biostatistical Methods in Epidemiology	3
EPI 952	Duration and Severity Analysis	3
EPI 953	Analytical Strategies for Observational Studies	3
EPI 990	Independent Study	3
STT 801	Design of Experiments	3
STT 825	Sample Surveys	3
STT 861	Theory of Probability and Statistics I	3
STT 862	Theory of Probability and Statistics II	3
STT 873	Statistical Learning and Data Mining	3
STT 874	Introduction to Bayesian Analysis	3

Additional courses may be chosen with advisor approval.

Biometry

- Complete 14 credits of elective course work:

ANS 814	Advanced Statistics for Biologists	4
CSE 331	Algorithms and Data Structures	3
CSE 480	Database Systems	3
CSE 482	Big Data Analysis	3
CSE 847	Machine Learning	3
CSE 881	Data Mining	3
EC 821A	Cross Section and Panel Data Econometrics I	3
EC 821	Cross Section and Panel Data Econometrics II	3
EPI 812	Causal Inference in Epidemiology	3
EPI 855	Biostatistical Modeling in Genomic Data Analysis	3
EPI 858	Clinical Trials	3
EPI 880	Selected Topics in Biostatistics	3
EPI 920	Advanced Methods in Epidemiology and Applied Statistics	3
EPI 950	Advanced Biostatistical Methods in Epidemiology	3
EPI 952	Duration and Severity Analysis	3
EPI 953	Analytical Strategies for Observational Studies	3
EPI 990	Independent Study	3
STT 801	Design of Experiments	3
STT 825	Sample Surveys	3
STT 847	Survival Analysis	3
STT 855	Statistical Genetics	3
STT 861	Theory of Probability and Statistics I	3
STT 862	Theory of Probability and Statistics II	3
STT 873	Statistical Learning and Data Mining	3
STT 874	Introduction to Bayesian Analysis	3
- Additional courses may be chosen with advisor approval.
- Attend all MSU Graduate School Responsible Conduct of Research (RCR) Workshops (human).
- Attend 80% of department-sponsored Seminars.
- Attend 80% of department Ph.D. Journal Club meetings.
- Present at one Ph.D. Journal Club meeting.
- Pass a comprehensive examination.
- Complete 24 credits of EPI 999 Doctoral Dissertation Research.
- Pass an oral defense of the doctoral dissertation.

Academic Standards

Students will sit for a comprehensive examination after the necessary course work is completed, typically at the end of the first year of study. A student who fails the comprehensive examination may repeat it only once. A retake examination will generally be given in January.

EPIDEMIOLOGY

Master of Science

The master's degree program is designed to provide students with the epidemiologic and biostatistical skills essential to engaging in clinical and population-based research.

Students are trained in a wide range of applications of epidemiologic methods, from investigation into the causes of disease to the means for prevention. The program prepares students to participate in public health activities sponsored by academic, government and non-governmental organizations such as health planning, disease control, and community health projects. Required core courses concentrate on the population approach to disease, quantification of disease frequency, approaches to acute disease outbreaks, relevant

biostatistical techniques, sources of health data, research design and analysis, and the development of skills in epidemiologic judgment. Specialized elective courses are offered in epidemiologic aspects of heart disease, cancer, reproductive health, and communicable diseases.

Admission

A bachelor's degree is required for admission to the program.

In addition to meeting the requirements of the University and the College of Human Medicine, students must meet the requirements specified below.

Requirements for the Master of Science Degree in Epidemiology

The program is available only under Plan A (with thesis). The distribution of credits within the student's program is determined by the student's academic advisor and guidance committee. The guidance committee determines the form, scope, and time of required examinations.

Students must complete 40 credits, with no more than 6 credits at the 400-level:

	CREDITS	
1. All of the following courses:	31	
EPI 808	Biostatistics I	3
EPI 809	Biostatistics II	3
EPI 810	Introductory Epidemiology	3
EPI 812	Causal Inference in Epidemiology	3
EPI 817	Epidemiology of Communicable Diseases	3
EPI 826	Research Methods in Epidemiology	3
EPI 828	Seminar in Responsible Conduct of Research	1
EPI 836	Practicum in Epidemiological Methods	3
EPI 851	SAS Programming I: Essentials	1
EPI 852	SAS Programming II: Data Management and Analysis	1
EPI 899	Master's Thesis Research	4
LCS 829	Design and Conduct of Epidemiological Studies and Clinical Trials	3
2. One of the following courses:	3	
EPI 815	Epidemiology of Cardiovascular Disease	3
EPI 823	Cancer Epidemiology	3
3. An additional 6 credits of elective course work from the following list of approved courses:		
EPI 805	Readings in the Historical Roots of Epidemiological Thought	3
EPI 815	Epidemiology of Cardiovascular Disease	3
EPI 816	Perinatal Epidemiology	3
EPI 823	Cancer Epidemiology	3
EPI 835	Neuroepidemiology	3
EPI 890	Independent Study in Epidemiology and Biostatistics	1 to 3
EPI 910	Themes in Contemporary Epidemiology	3
EPI 920	Advanced Methods in Epidemiology and Applied Statistics	3
EPI 950	Advanced Biostatistical Methods in Epidemiology	3
EPI 952	Duration and Severity Analysis	3
EPI 953	Analytical Strategies for Observational Studies	3
EPI 977	Social Epidemiology	3
EPI 979	Advanced Topics of Infectious Disease Epidemiology	3
STT 847	Analysis of Survival Data	3
Additional elective courses may be chosen with advisor approval.		
4. Attend all MSU Graduate School Responsible Conduct of Research (RCR) Workshops (human)		
5. Pass an oral examination in defense of the thesis.		

Doctor of Philosophy

The Ph.D. degree program is designed for students who plan to become independent researchers in epidemiology. Emphasis is on the development and mastery of epidemiologic and biostatistical skills required for the highest levels of

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scholarship investigation, and leadership in public health work. Students design and complete their own investigator-initiated research projects are prepared to compete for research grant awards supported by the National Institutes of Health and other agencies that fund epidemiology research. Learning experiences are pursued through course work and readings, apprenticeships with supervising faculty, participation on a research team, and completion of the dissertation research project.

Admission

To be considered for admission to the program:

1. an applicant must have earned a bachelor's or master of science or a master of public health in epidemiology degree with at least 40 credits.
2. applicants who earned their master of science or master of public health in epidemiology at an institution other than Michigan State University will be evaluated individually by the department to determine if any additional collateral course work will be required. Credits earned in collateral courses will not count toward the Ph.D. in Epidemiology.
3. submit GRE (Graduate Record Examination) scores, or MCAT scores.
4. present evidence of competency in English (TOEFL or MELAB scores) with their application if their native language is not English.
5. submit three letters of recommendation.
6. submit a statement of purpose.
7. submit official transcripts.

Applicants with strong academic records who are in the process of completing a master of science or a master of public health in epidemiology may be admitted on a provisional basis. The first 40 credits applied towards the completion of a master of science or a master of public health in epidemiology may not be counted toward the Ph.D. in Epidemiology.

In addition to meeting the requirements of the University and the College of Human Medicine, students must meet the requirements specified below.

Requirements for the Doctor of Philosophy Degree in Epidemiology

	CREDITS
Students must complete 51 credits for the degree with no more than 6 credits at the 400-level.	
1. All of the following courses (7 credits):	
EPI 805 Readings in the Historical Roots of Epidemiological Thought	3
EPI 828 Seminar in Responsible Conduct of Research	1
EPI 910 Themes in Contemporary Epidemiology	3
2. Two of the following courses (6 credits):	
EPI 855 Biostatistical Modeling in Genomic Data Analysis	3
EPI 920 Advanced Methods in Epidemiology and Applied Statistics	3
EPI 950 Advanced Biostatistical Methods in Epidemiology	3
EPI 952 Duration and Severity Analysis	3
EPI 953 Analytical Strategies for Observational Studies	3
3. Complete a minimum of 15 credits of elective course work from the following list of approved courses. Additional courses may be chosen with advisor approval.	
EPI 815 Epidemiology of Cardiovascular Disease	3
EPI 816 Perinatal Epidemiology	3
EPI 823 Cancer Epidemiology	3
EPI 835 Neuroepidemiology	3
EPI 890 Independent Study in Epidemiology and Biostatistics	1 to 3
EPI 910 Themes in Contemporary Epidemiology	3

EPI 920	Advanced Methods in Epidemiology and Applied Statistics	3
EPI 950	Advanced Biostatistical Methods in Epidemiology	3
EPI 952	Duration and Severity Analysis	3
EPI 953	Analytical Strategies for Observational Studies	3
EPI 977	Social Epidemiology	3
EPI 979	Advanced Topics of Infectious Disease Epidemiology	3
STT 847	Analysis of Survival Data	3
4.	Attend all MSU Graduate School Responsible Conduct of Research (RCR) Workshops.	
5.	Attendance at 80% of all presentations in the departmental epidemiology seminar series during the period of course work.	
6.	Attendance at 80% of Ph.D. Journal Club meetings.	
7.	Present at one Ph.D. Journal Club meeting.	
8.	Pass a Qualifying Examination at the end of the first year of study.	
9.	Pass a Comprehensive Examination.	
10.	Successfully complete 24 credits of Epidemiology 999 Doctoral Dissertation Research.	
11.	Successfully defend the oral defense of the doctoral dissertation.	

Academic Standards

A student who fails the Qualifying Examination may repeat it only once. A Remediation Examination will be given in late summer immediately following the failed examination. A student who fails the Comprehensive Examination may repeat in only once. A retake examination will be given at the beginning of the subsequent semester.

DEPARTMENT of FAMILY MEDICINE

John vanSchagen, Acting Chairperson

The Department of Family Medicine provides medical students in the College of Human Medicine (CHM) with classroom, virtual and clinical education reflecting the depth and scope of family medicine. Our goal is to provide students with a foundation for their future practice, one that incorporates the patient-centered, value-based, and population health-centered values and skills of family medicine, regardless of their future career choice. To accomplish this goal the department is staffed by experienced family physicians and other health, health systems, and environmental health professionals with interest and experience in many different aspects of medical practice and education. Interests and activities of the department faculty cover the spectrum of family medicine. The department includes Divisions of Geriatrics and Palliative Medicine.

The department participates in most of the college's interdisciplinary programs, directs a required clinical clerkship in family medicine, and offers a variety of electives including Sports Medicine, Geriatrics, Hospice and Palliative Medicine. The department provides leadership for many areas in the CHM curriculum including rural medicine, chronic pain, and virtual medicine.

Students in department clerkships attend active family medicine practices that are dedicated to medical education. The practices are located at clinical sites in and around CHM campuses.

The department is active in multiple family medicine residencies at community hospitals across the state. The Integrated Program (TIP) provides senior medical students an

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opportunity to work intensively with a College of Human Medicine affiliated family medicine residency program. Competitive scholarships are available to support TIP students.

Departmental faculty are engaged in extramurally supported research focusing on primary care, prevention, self-care, geriatrics, complex medical disorders, cannabis and chronic diseases, substance and use disorders, including opioids, and long-term care. In addition, the faculty is engaged in population health and environmental health research as well as health systems research, rural and primary care workforce research, provider well-being, and telehealth. Support for research includes grants from the National Institutes of Health (NIH), Health Resources and Services Administration (HRSA), Substance Abuse and Mental Health Services Administration (SAMHSA), major foundations, and insurance carriers.

DEPARTMENT of MEDICINE

Supratik Rayamajhi, Acting Chairperson

The Department of Medicine has major responsibilities for providing students with clinical knowledge and experience throughout all levels of the curriculum in areas including basic science correlations, clinical skills, physical and laboratory diagnosis, and problem solving. Department faculty are deeply involved in curricular delivery and development centrally as well as in our clinical communities throughout the state. The department also partners with graduate programs in medical education in a number of affiliated hospitals, making significant contributions to training medical residents and subspecialty fellows, and to continuing education for practicing physicians in the communities.

Faculty members are actively involved in research and collaborate actively with faculty in other departments and affiliated institutions in communities. These programs are based in university facilities including laboratories in the Life Science Building and the Clinical Center. Clinical research is also conducted at the MSU Breslin Cancer Center. The Department of Medicine is dedicated to advancing the practice of medicine while embracing diversity, challenge and opportunity.

DEPARTMENT of MICROBIOLOGY and MOLECULAR GENETICS

Victor J. DiRita, Chairperson

GRADUATE STUDY

The Department of Microbiology and Molecular Genetics is administered jointly by the colleges of Human Medicine,

Natural Science, Osteopathic Medicine, and Veterinary Medicine. All four of these colleges offer a Master of Science degree in microbiology and molecular genetics and a Doctor of Philosophy degree in microbiology and molecular genetics. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in microbiology—environmental toxicology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Microbiology and Molecular Genetics* in the *College of Natural Science* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the College of Natural Science section of this catalog.

DEPARTMENT of NEUROLOGY and OPHTHALMOLOGY

David Kaufman, Chairperson

The Department of Neurology and Ophthalmology, established July 1, 2000, is an outgrowth of the former neuro-ophthalmology unit that has existed on campus since 1986. The department lead is through the College of Osteopathic Medicine with participation with the College of Human Medicine. It offers dually accredited residency programs in neurology; fellowship programs in neuro-ophthalmology, stroke, neuro-intervention, neuro-physiology, epilepsy, and neuro-epidemiology; and clinical and research programs for medical and graduate students. The department has Accreditation Council for Graduate Medical Education (ACGME) approval for its neurology residency subspecialty fellowships. It also provides academic oversight for multiple ophthalmology residency programs statewide.

Its broad research portfolio is supported by multiple National Institutes of Health (NIH) grants and other extramural funding. Major themes of the department's research are to use the eyes as a model for brain disease. It also has major research interest in stroke, neuro-intervention, muscle and peripheral nerve disease, neuro-degenerative disease, epilepsy, sports concussion and demyelinating disease. The department shares research and clinical faculty with affiliated clinical and research laboratories on the MSU campus, state and worldwide including sub-Saharan Africa.

The clinical responsibilities of the department are fulfilled by on campus neurologists and neuro-ophthalmologists who have subspecialty training in a number of different disciplines of neurology. To enrich its research, clinical and educational

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programs, the department also collaborates with numerous clinicians statewide, nationally and internationally. MSU's International Neurology, Psychiatry and Epidemiology Programs (INPEP) are administered through this unit and has outposts in several countries in sub-Saharan Africa.

DEPARTMENT of OBSTETRICS, GYNECOLOGY, and REPRODUCTIVE BIOLOGY

Richard E. Leach, Chairperson

The vision for the Department of Obstetrics, Gynecology and Reproductive Biology at the Michigan State University College of Human Medicine is to be the leader in the clinical translation of cutting-edge innovation and research to improve the health of the patients and communities that we serve. Faculty members have achieved national recognition for research focused on the health care needs of women across their life spans and in diverse communities. The department has recruited accomplished researchers in women's health, including physicians, nurses, sociologists, clinical translational scientists and epidemiologists focused not only on the medical aspects, but on the social disparities that threaten women's health.

The department is comprised of a diverse faculty that participates in the educational, research and service goals of the College of Human Medicine to enhance understanding of women's health, including genetic, social, cultural and environmental influences.

Within this framework, the department's responsibilities are to provide educational experiences to medical students during the pre-clinical and clinical years, develop and contribute to programs of graduate and continuing medical education, conduct research, and promote optimal women's health within the community. To accomplish its educational goals, the department participates in the college's interdisciplinary programs and directs the required and elective clinical courses across its seven community campuses. The faculty participates in graduate obstetric-gynecologic education through its four affiliate residency programs across the state. Research activities in the areas of human reproduction, gynecologic oncology, prenatal and infant health, health services delivery, and community health problems related to women's health issues comprise the breadth of the department's research.

DEPARTMENT of ORTHOPEDICS

Douglas P. Dietzel, Chairperson

The Department of Orthopedics is administered jointly by the colleges of Osteopathic Medicine and Human Medicine. The College of Osteopathic Medicine is the primary administrative unit. The Department of Orthopedics aims to provide the best care with all aspects of bone, joint disorders, and orthopedic disease processes. We seek advanced understanding and treatment options of these conditions through research and other scholarly work, and educate the next generation of physicians, scientists, and providers in the field both locally and globally. The department's responsibilities include: preclinical and clinical medical student teaching, preclinical and clinical physician assistant student teaching, Primary Care and Orthopedic Surgery residency training, Primary Care Sports Medicine Fellowship training, Physical Medicine and Rehabilitation Sports Medicine Fellowship training, and Physician Extender Resident training.

DEPARTMENT of PEDIATRICS and HUMAN DEVELOPMENT

B. Keith English, Chairperson

The Department of Pediatrics and Human Development is comprised of a diverse faculty who share a common concern for all aspects of human growth and development, both normal and abnormal. The Department has a statewide footprint with faculty in Lansing, Grand Rapids, Flint, Southfield, Midland, Traverse City, and Marquette/Escañaba. The Department has educational responsibilities at all levels in the curriculum of the College of Human Medicine. Its faculty participate in courses which relate biological, behavioral, and clinical sciences to child health. Departmental faculty play major roles in the new College of Human Medicine Shared Discovery Curriculum and its Learning Societies. The department also has responsibility for general pediatric clerkships and pediatric subspecialty electives in the clinical medical curriculum. The department participates actively in graduate medical education with three affiliated pediatric residency programs (with Sparrow Hospital in Lansing, Helen DeVos Children's Hospital in Grand Rapids, and Hurley Children's Hospital in Flint), one affiliated Pediatric Neurology residency (with HDVCH in Grand Rapids), and six affiliated pediatric subspecialty fellowship programs (Perinatal-Neonatal Medicine in partnership with Sparrow Hospital in Lansing; Pediatric Hematology-Oncology, Pediatric Critical Care Medicine, Pediatric Hospital Medicine, Pediatric Cardiology, and Pediatric Pulmonology in partnership with HDVCH in Grand Rapids), and in CME. In addition, faculty members

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work with students in other graduate programs in the University. Individual faculty members of the Department participate in patient care and render medical consultation services in their respective subspecialty areas. The research endeavors of the departmental faculty are expanding in Grand Rapids, Lansing and Flint and aim to help create a healthier, better functioning society by improving the health and wellbeing of the child and family.

DEPARTMENT of PHARMACOLOGY and TOXICOLOGY

Anne McLaren Dorrance, Chairperson

The Department of Pharmacology and Toxicology is administered jointly by the colleges of Human Medicine, Osteopathic Medicine, and Veterinary Medicine. The College of Veterinary Medicine is the primary administrative unit. All three colleges offer a Master of Science degree program in Laboratory Research in Pharmacology and Toxicology, a Doctor of Philosophy degree program in Pharmacology and Toxicology, and a Graduate Certificate in Safety Pharmacology. The College of Osteopathic Medicine offers an online Master of Science degree program in Pharmacology and Toxicology, an online Master of Science degree program in Integrative Pharmacology, and an online Graduate Certificate program in Safety Pharmacology. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in pharmacology and toxicology—environmental toxicology.

The department is responsible for teaching the fundamental and applied aspects of pharmacology and toxicology and offers courses at the undergraduate, professional, and graduate levels.

A Minor in Pharmacology and Toxicology is available to undergraduates through the College of Veterinary Medicine.

GRADUATE STUDY

The graduate programs in Pharmacology and Toxicology are primarily designed to prepare students for careers in research, teaching, and related activities. Research interests range from the effects of drugs and chemicals on macromolecules to their actions in humans. Research strengths include neuropharmacology, neurotoxicology, cardiovascular pharmacology, cancer pharmacology and prevention, environmental toxicology, drug discovery, drug receptor pharmacology, gastrointestinal pharmacology, immunopharmacology, immunotoxicology, and integrative pharmacology.

The online Master of Science programs are designed for individuals who are seeking additional academic qualifications which will facilitate their advancement in their place of employment or enhance their competitiveness for admission to other advanced degree programs regardless of their

geographic location or work schedule. The principal objective of the departmental Doctor of Philosophy (PhD) program is to prepare students for pharmacology- and toxicology-related careers.

For additional information about the department and its graduate degree programs, refer to the statement on the Department of Pharmacology and Toxicology in the College of Osteopathic Medicine section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of PHYSIOLOGY

Charles Leroy Cox, Chairperson

GRADUATE STUDY

The Department of Physiology is administered jointly by the colleges of Human Medicine, Natural Science, Osteopathic Medicine, and Veterinary Medicine. All four of these colleges offer a Master of Science degree program in physiology and Doctor of Philosophy degree program in molecular, cellular, and integrative physiology. In addition, the College of Natural Science offers a Doctor of Philosophy degree program with a major in physiology—environmental toxicology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Physiology* in the *College of Natural Science* section of this catalog.

PHYSIOLOGY—ENVIRONMENTAL TOXICOLOGY

Doctor of Philosophy

For information about the Doctor of Philosophy degree program in physiology—environmental toxicology, refer to the statement on *Multidepartmental Doctoral Programs in Environmental Toxicology* in the *Graduate Education* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences,

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microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of PSYCHIATRY

Jed Gary Magen, Chairperson

The Department of Psychiatry is administered jointly by the colleges of Human Medicine and Osteopathic Medicine. The College of Human Medicine is the primary administrative unit. The department plays a major role in integrating the behavioral sciences with the biological sciences and with clinical science elements of the professional programs of these colleges. The department's responsibilities include: preclinical and clinical medical student teaching, psychiatry residency training, professional continuing medical education (CME), collaborating in graduate medical and psychiatric education with affiliated institutions, developing programs on CME for physicians, contributing to CME programs for other mental health care disciplines, patient care, and research. Areas of research emphasis include: neurocognitive dysfunctions secondary to malaria and AIDS, trace minerals in HIV-infected individuals, and developing research programs including some in collaboration with other clinical departments. The department has extensive telepsychiatry services to multiple sites around the state of Michigan.

DEPARTMENT of RADIOLOGY

Kevin Robinson, Chairperson

The Department of Radiology is jointly administered by the Colleges of Osteopathic Medicine and Human Medicine. The Department provides basic and clinical education in anatomy and diagnostic imaging including radiology, ultrasound, magnetic resonance, CT, women's imaging and nuclear medicine. Department faculty have special skills and interests in management, health policy, and medical decision-making. In the College of Osteopathic Medicine, faculty participate in the Systems sequence, deliver RAD 610 as a required course, and provide radiology and anatomy content for several statewide campus system residency courses. Other electives are offered in both colleges, including clerkships in radiology and nuclear medicine at affiliated hospitals. The department sponsors a visiting professor program for residents, interns and medical students. The department directs an osteopathic residency program through a hospital in Garden City, Michigan. Research interests include molecular imaging, imaging physics, bioengineering, fMRI, sports physiology and regenerative medicine. More information about the department can be found at www.rad.msu.edu.

DEPARTMENT of SURGERY

The Department of Surgery is dedicated to providing state of the art, evidence-based and cost-effective surgical care. We strive to put patients and their families first. Our updated surgical curriculum is built to provide a solid foundation for medical students in all our clinical campuses, including Flint, Grand Rapids, Lansing, Midland Region, Southeast Michigan, Traverse City, and the Upper Peninsula. Our postgraduate general surgery training programs strive to provide a broad clinical experience to our residents and launch their surgical career. The department also offers several postgraduate surgical specialty training in critical care, cardiothoracic, colorectal, plastic and reconstructive and vascular surgery. We foster a culture of scientific curiosity and seek new discoveries through clinical and basic science research. The faculty is involved in several clinical trials and actively participates in regional and national clinical outcomes research. The surgical faculty is involved in all aspects of clinical care, education, simulation and research, and is committed to educate the surgeons of the future.

DEPARTMENT of TRANSLATIONAL NEUROSCIENCE

Jack Lipton, Chairperson

GRADUATE STUDY

The Department of Translational Neuroscience is a research-intensive department focused on the study and treatment of neurodegenerative diseases. The current faculty study Alzheimer's disease, Parkinson's disease and Traumatic Brain Injury/Neuroinflammation. For first year College of Human Medicine medical students, the department offers Molecular Neuropathology of Neurodegenerative Diseases which provides advanced study of the pathological hallmarks, pathological molecules, symptomatology, diagnostic criteria, genetic and environmental risk factors, and the epidemiology and socioeconomics of neurodegenerative diseases. Faculty members also participate in mentor-based education for students pursuing doctoral degrees through the Neuroscience and the Biomolecular Science graduate programs. The department strives to provide research opportunities and resources to students in pursuing translational neuroscience research. The faculty also have a comprehensive program of community outreach and education for patients and the lay public.

DIVISION OF HUMAN PATHOLOGY

The Division of Human Pathology is administered by the colleges of Human Medicine and Osteopathic Medicine.

OFFICE of MEDICAL EDUCATION RESEARCH and DEVELOPMENT

Randi Stanulis, Director

The Office of Medical Education Research and Development (OMERAD) is a multidisciplinary unit within the College of Human Medicine. The mission of OMERAD is to provide innovative educational opportunities for faculty to promote scholarship, develop curriculum, improve teaching effectiveness, lead learner assessment and program evaluation, and integrate educational technology to advance medical education. OMERAD faculty work collaboratively with educators and health care professionals in the College of Human Medicine's affiliated community campuses.

OMERAD faculty are committed to providing excellent instruction for undergraduate, graduate and postgraduate learners. OMERAD faculty develop and evaluate college educational programs, and serve as a college leader in teaching and learning. The unit's consultation mission involves collaborating with health care professionals to design, assess and disseminate educational innovations. OMERAD's research mission is to advance knowledge in medical education. The unit's faculty serve in leadership roles in college, university, and national professional organizations. OMERAD faculty and support staff have expertise in adult education, teacher education, educational technology, program evaluation and measurement.

The CENTER for BIOETHICS and SOCIAL JUSTICE

Sean A. Valles, Director

The Center for Bioethics and Social Justice (BSJ) is part of the College of Human Medicine. BSJ brings together a multidisciplinary team of scholars to address conceptual, theoretical, and practical aspects of the field of bioethics. BSJ faculty develop and deliver curriculum content on the social context of clinical decisions for the college's Shared Discovery Curriculum. BSJ educates researchers, clinicians, policymakers, and communities around shared interests in the attainment of a healthier and more just world.

Since its founding in 1977, BSJ has engaged in bioethics teaching, research and outreach that has helped shape bioethics scholarship, as well as related policies and clinical practices. In 2021, BSJ adopted a revised mission and name, becoming a social justice-centered bioethics unit. In its research efforts, BSJ examines the nature of bioethics and enhances its applications to the pursuit of equitable, inclusive, and just healthy societies. In its outreach mission, BSJ engages researchers, clinicians, policymakers, and communities around shared interests in the attainment of a healthier and more just world.