COLLEGE OF HUMAN MEDICINE

Aron Sousa, 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, Genetics, and Immunology; Pharmacology and Toxicology; Physiology; Charles Stewart Mott Department of Public Health; and Translational Neuroscience.

The clinical departments of the college are Anesthesia; Emergency Medicine; Family Medicine; Medicine, Neurology and Ophthalmology; Obstetrics, Gynecology, and Reproductive Biology; Orthopedics, Pediatrics and Human Development; Psychiatry; Radiology; and Surgery. The College sponsors residency and fellowship programs in child and adolescent psychiatry, family medicine, geriatric psychiatry, and psychiatry.

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 exemplary 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 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 design of the curriculum is based on a set of core principles that are envisioned as the foundation to all learning within the curriculum.

Core Principles

1. The Virtuous Professional
   a. Competence, Compassion, Honesty, Social Responsibility, Professional Responsibility, Respect for Others
   b. Acting with Courage, Humility, Mercy
   c. Professional Growth (Dialogue, Reflection, Practice)
2, Diversity, Equity, Inclusion, and Justice
   a. Building a sense of belonging in and amongst students, staff, and faculty
   b. Addressing health disparities
   c. A focus on community
3. Competence and Mastery
   a. Supporting and achieving competence
   b. Supporting and recognizing excellence/mastery
4. Lifelong Learning for students, faculty, and staff
5. Rational design and implementation
   a. Scaffolded learning
   b. Decision-making based in educational theory or data
   c. Helping students become master adaptive learners
   d. Alignment of objectives, instruction, and assessment leading to curricular coherence
   e. Longitudinal integration of basic, clinical, and social science themes
6. Authenticity
   a. Experiential learning
   b. Authentic assessments
7. Collaboration
   a. Among faculty, staff, and students
   b. Within the profession
   c. With allied professionals
   d. With patients

Learning Societies

Students at CHM are assigned to one of four learning societies, each named after an historical figure who represents the values of the college. Within each learning society students develop a longitudinal relationship with a group of faculty. Over the first two years, these faculty will serve as coaches, advisors and mentors. Students meet regularly over the first two years within smaller units called scholar groups. Within the scholar groups, students develop collaborative problem-solving skills, reflect on their experiences and learning through debriefing and creation of ongoing learning plans, integrate their clinical experiences with underlying necessary science, and develop an identity within the profession of medicine.

The college's curriculum is organized around a core group of competencies based on residency 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).

Educational Program Objectives

The college's curriculum is created around core educational program objectives that are organized into six groupings:

Serving the People
Care of Patients
Reflective and Rational Approach to Learning
Integrating into Systems
Professionalism
Transforming Knowledge

Major Curricular Phases

Students engage in clinical experiences in each phase of the curriculum. The first two semesters comprise the M1 phase, and includes an early clinical experience. The next semesters comprise the M2 phase, including a middle clinical experience. Following this phase, students complete their USMLE Step 1 licensing exam. Students then transition to their M3/M4 community campus for their late clinical experience, where they complete their clinical clerkships in their M3 year, and then focus on electives, selectives, and remaining requirements during their M4 year. They complete their USMLE Step 2 licensing exam prior to graduation.

M1 Phase, including the Early Clinical Experience

The M1 (1 year student) curriculum intentionally integrates a strong foundation of necessary basic and social sciences with clinical skills and patient and health care team interactions. Students learn skills of patient-centered interviewing, core physical exam, clinical reasoning, and a variety of patient care skills.

The weekly activities for an M1 student includes scholar group (learning society) sessions, basic science sessions, anatomy and integrative biomedical laboratory sessions, and clinical simulation each week. In addition, students regularly engage in assessment activities to assess their understanding and skill development, as well as sessions focused on topics such as career advising, health and wellness, and optimizing academic skills.

For the Early Clinical Experience, students engage in a focused clinical block where they participate as part of the team at a primary care clinic.

M2 Phase, including the Middle Clinical Experience

The M2 (2 year student) curriculum further integrates clinical and necessary basic science and social sciences. Students continue to meet with their learning society small groups and engage in clinical simulation and basic science-focused large group sessions.

The Middle Clinical Experience as a part of the M2 curriculum includes multiple clinical rotations. Each of these rotations have their own goals and objectives, supported by a weekly rotation-based small group session precepted by faculty.

In addition, the M2 curriculum has six non-clinical rotations, where students learn in classroom, lab, and clinical simulation settings, and engage with patient's stories while learning the underlying basic, social, and clinical sciences.

M3 and M4 Phases, which constitute the Late Clinical Experience

At the start of the M3 phase, students complete a Transition to Clerkships course as they prepare to enter their clerkships. The M3 year of 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 rotations in family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery. A two-semester course series, Advanced Skills and Knowledge, occurs during the M3 year.

During the M4 year of the Late Clinical Experience, students complete a required selective in critical care, as well as a Transition to Residency course and remaining electives.

Electives

Before graduation, students are required to complete 28 weeks (42 credits) of approved electives. At least 4 weeks must be clinical electives completed in the community to which the student is assigned for M3/M4. At least 16 weeks (24 credits) must be clinical electives involving direct patient care, and at least 4 weeks (6 credits) of clinical electives must be completed during the final two semesters of medical school. One 4-week (6 credits) clinical elective must specifically engage in the care of medically underserved patients, and the student must obtain approval and submit reflective work associated with this experience to be approved for graduation. Students are encouraged to study broadly and/or to pursue intensively their special interests through elective programs. Varied elective courses are offered, and may include research projects, courses on varied topics, 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 semester 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 are evaluated on these end-competency assessments many times in their College of Human Medicine career, and must pass these assessments in order to advance through the curriculum.

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 assessing actual performance with standardized patients. Other assessments include multi-source feedback by their faculty, peers, and health care team members 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.

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 bio-psycho-social 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 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 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.
7. Be immunized per the CDC recommendations for health care providers.

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 (90 credits):			
FM	641	Family Medicine Clerkship	9
HM	552	Medical School I	16
HM	553	Medical School II	13
HM	603	Transition to Clerkships	1
HM	651	Advanced Skills and Knowledge in Medical School I	3
HM	652	Advanced Skills and Knowledge in Medical School II	3
HM	673	Transition to Residency	3
MED	641	Internal Medicine Clerkship	9
OGR	641	Obstetrics and Gynecology Clerkship	9
PHD	641	Pediatric Clerkship	9
PSC	641	Psychiatry and Behavioral Science Clerkship	6
SUR	651	Surgery Clerkship	9
2. One of the following combinations (32 credits):			
a. Two (2) semester series			
HM	565	Integrated Medical School III	16
HM	566	Integrated Medical School IV	16
b. Three (3) semester series			
HM	562	Medical School III	13
HM	563	Medical School IV	13
HM	564	Integrated Topics in Human Medicine	6
3. 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
4. Completion of 28 weeks of Elective Clerkships (42 credits):			
ANES	619	Introduction to Anesthesiology - An Anesthesia Primer	3
ANES	620	Chronic Pain Management	6
ANES	621	Concepts in Clinical Anesthesiology I	6
ANES	622	Concepts in Clinical Anesthesiology II	6
ANTR	685	Directed Study in Clinical Prosection	3 or 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 Medicine	6
FM	614	Breastfeeding and Lactation	3
FM	615	Addiction Medicine	3
FM	616	Rural Family Medicine Elective	6
FM	617	Sports Medicine Clerkship	3 or 6
FM	618	Palliative and End of Life Care Clerkship	3 or 6
FM	619	Telemedicine Medicine Experiences in Rural Clinical Settings	3
FM	620	Family Practice Subinternship	6
FM	621	Advanced Addition Medicine	3
HM	606	Student-Designed Non-Clinical Elective	3 or 6
HM	607	Medical Reading Elective	3 or 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 Clinical Elective	3 or 6
HM	615	Global Health Experience in India	3 or 6
HM	616	Radiation Oncology Clerkship	3 or 6
HM	617	Introduction to Simulation Education Elective	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	627	Interdisciplinary Exploration with Special Populations: Veterans Affairs	6
Hm	628	Racism and Other Health Disparities	3
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	634	Indigenous Community Health	3 or 6
HM	638	Lifestyle Medicine	3 or 6
HM	639	Northern Wilderness, Emergency and Sports Medicine	6
HM	648	Care of Migrant and Seasonal Agricultural Workers Elective	3 or 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	617	Sleep Medicine	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	636	Advanced Internal Medicine: Medicine/Pediatrics	3 or 6
NOP	617	Clinical Experience in Neurology	3 or 6
NOP	620	Ophthalmology Clerkship	6
NOP	630	Senior Clinical Elective in Neurology	6 to 12
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	3 to 12
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	610	Advanced Imaging	3
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
SUR	634	Neurosurgery Sub-Internship	6
SUR	635	Perioperative Trauma Medicine	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.

Oral Maxillofacial Surgery Admission Pathway

MSU-CHM provides an Oral Maxillofacial Surgery (OMFS) Pathway for students accepted to the College of Human Medicine who have successfully completed a D.D.S degree and have been accepted to the Henry Ford Hospital Oral Maxillofacial Surgery Residency Program. These students will begin the M2 year upon matriculation, and will complete the remainder of the M.D. program credits through the MD/OMFS residency track program, receiving a waiver for 41 credits. OMFS students must complete all listed Requirements for the Doctor of Medicine degree except for the differences outlined here:

- Exempted from taking HM 552 and HM 553.
- Instead of HM 562, must complete HM 544 Med School III, 10 credits.
- Instead of HM 564, must complete HM 549 Integrated Topics in Human Medicine, 9 credits.
- From the Critical Care Selectives, OMFS students must complete MED 643 Medicine Critical Care, 6 credits.
- Must complete a total of 30 credits of electives for graduation, and are exempted from 12 credits. One elective must be SUR 635 Perioperative Trauma Medicine, 6 credits.

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 and the Department of Epidemiology and Biostatistics.

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.

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, Genetics, and Immunology, 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, Genetics, and Immunology, 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.

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 M.D./Ph.D. Program Director 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.	

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.	
	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 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 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.		

DEPARTMENT of ANESTHESIA

Michael Clarence Lewis, Chairperson

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

Olorunseun O. Ogunwobi, 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. 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 seeking a doctoral degree in biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology, genetics and immunology, pharmacology and toxicology, or molecular, cellular, and integrative physiology should apply through the BioMolecular Science Gateway—First Year for admission to any of these Ph.D. programs. Students should select the Ph.D. program in which they have the greatest interest. During the first two semesters of enrollment, students will have the opportunity to choose and complete at least four courses in appropriate disciplinary subjects. In the spring semester of the first year, they will have the opportunity to continue with the Ph.D. program initially selected or change to one of the other five programs that aligns most closely with their educational goals.

For additional information about the individual Ph.D. programs, refer to the statements in the Departments of Biochemistry and Molecular Biology, Microbiology, Genetics, and Immunology, and Physiology in the *College of Natural Science* section of this catalog, statements on the programs in Cell and Molecular Biology and Genetics and Genome Sciences in the *College of Natural Science* section of this catalog, and statement on the Department of Pharmacology and Toxicology in the *College of Osteopathic Medicine* 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 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 (MSUELT). 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.

Students must: CREDITS

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
   - 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

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

Additional Requirements for Plan B

1. Complete a capstone project through enrollment in 1 credit of EPI 890 Independent Study in Epidemiology and Biostatistics.
2. 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:

1. have a master's degree in biostatistics, statistics, or related field;
2. submit Graduate Record Examination (GRE)scores, or MCAT scores;
3. provide TOEFL scores if their native language is other than English;
4. provide three letters of recommendation;
5. provide a statement of purpose;
6. 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.

Students must: CREDITS

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
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

1. 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.

2. Attend all MSU Graduate School Responsible Conduct of Research (RCR) Workshops (human).
3. Attend 80% of department-sponsored Seminars.
4. Attend 80% of department Ph.D. Journal Club meetings.
5. Present at one Ph.D. Journal Club meeting.
6. Pass a comprehensive examination.
7. Complete 24 credits of EPI 999 Doctoral Dissertation Research.
8. 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 ad biostatistical skills required for the highest levels of 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

Julie Patricia Phillips, 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 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

Charles Hong, 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, GENETICS, and IMMUNOLOGY

Victor J. DiRita, Chairperson

GRADUATE STUDY

The Department of Microbiology, Genetics, and Immunology 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, Genetics, and Immunology and a Doctor of Philosophy degree in Microbiology, Genetics, and Immunology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Microbiology, Genetics, and Immunology* in the *College of Natural Science* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students seeking a doctoral degree in biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology, genetics and immunology, pharmacology and toxicology, or molecular, cellular, and integrative physiology should apply through the BioMolecular Science Gateway—First Year for admission to any of these Ph.D. programs. Students should select the Ph.D. program in which they have the greatest interest. During the first two semesters of enrollment, students will have the opportunity to choose and complete at least four courses in appropriate disciplinary subjects. In the spring semester of the first year, they will have the opportunity to continue with the Ph.D. program initially selected or change to one of the other five programs that aligns most closely with their educational goals.

For additional information about the individual Ph.D. programs, refer to the statements in the Departments of Biochemistry and Molecular Biology, Microbiology, Genetics, and Immunology, and Physiology in the *College of Natural Science* section of this catalog, statements on the programs in Cell and Molecular Biology and Genetics and Genome Sciences in the *College of Natural Science* section of this catalog, and statement on the Department of Pharmacology and Toxicology in the *College of Osteopathic Medicine* section of this catalog.

DEPARTMENT of NEUROLOGY and OPHTHALMOLOGY

Jayne Ward, 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 (NH) 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 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

Micah Ephraim Lissy, 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/Escanaba. 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 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.
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, Genetics, and Immunology, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of PHYSIOLOGY

Karl Olson, 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 molecular, cellular, and integrative physiology and Doctor of Philosophy degree program in molecular, cellular, and integrative physiology. 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.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students seeking a doctoral degree in biochemistry and molecular biology, cell and molecular biology, genetics and genome sciences, microbiology, genetics and immunology, pharmacology and toxicology, or molecular, cellular, and integrative physiology should apply through the BioMolecular Science Gateway—First Year for admission to any of these Ph.D. programs. Students should select the Ph.D. program in which they have the greatest interest. During the first two semesters of enrollment, students will have the opportunity to choose and complete at least four courses in appropriate disciplinary subjects. In the spring semester of the first year, they will have the opportunity to continue with the Ph.D. program initially selected or change to one of the other five programs that aligns most closely with their educational goals.

For additional information about the individual Ph.D. programs, refer to the statements in the Departments of Biochemistry and Molecular Biology, Microbiology, Genetics, and Immunology, and Physiology in the *College of Natural Science* section of this catalog, statements on the programs in Cell and Molecular Biology and Genetics and Genome Sciences in the *College of Natural Science* section of this catalog, and statement on the Department of Pharmacology and Toxicology in the *College of Osteopathic Medicine* 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 PUBLIC HEALTH

Jennifer Johnson, Chairperson

The Charles Stewart Mott Department of Public Health is unique as the first academic department to be co-developed and co-governed in partnership with the communities it serves. This collaborative approach aims to enhance academic success and real-world impact. Based at the College of Human Medicine's Flint campus, the department focuses on population health. Its close ties to the Flint community enable faculty and researchers to gain insights into the community's strengths and needs while addressing its most urgent public health issues. Spartans work side-by-side with community partners and health care providers in a community-identified and community-participatory public health focus model.

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 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 only online and under Plan B (non-thesis). Students must complete 43 credits as specified below.

				CREDITS
1.	Complete all of the following courses (25 credits):			
	PH	801	Introduction to Public Health	3
	PH	802	Biostatistics for Public Health	3
	PH	803	Epidemiology for Public Health	3
	PH	804	Public Health Policy and Administration	3
	PH	805	Social and Behavioral Aspects of Public Health	3
	PH	806	Environmental Factors of Health	3
	PH	827	Principles of Public Health Leadership	1
	PH	828	Community Engagement in Public Health Practice	3
	PH	854	Health Equity Framework for Public Health Practice	3
2.	One of the following courses (3 credits):			
	PH	807	Practical Application and Critical Thinking in Public Health	3
	PH	853	Public Health Program/Intervention Evaluation	3
	PH	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):			
	PH	892	Public Health Applied Practice Experience	3
	PH	893	Public Health Integrative Learning Experience	3

OPTIONAL CONCENTRATIONS

Public health careers will be some of the fastest growing in the country over the next decade. To provide students with a path to better compete for in-demand careers in public health there is the option of pursuing a concentration. Completing the course work for one or more concentrations will fulfill the elective requirements for the Master in Public Health listed above under item 3. All completed concentrations will be listed on the student's transcript.

Data Management and Analytics Concentration

Provides students with the data management and analytic skillset needed to effectively utilize a variety of public health and health care data sources for applied public heath practice and research purposes, while integrating a data equity framework into all aspects of this work. Students completing this concentration will possess the skills to access, manage, assess, analyze, and report findings from a myriad of data sources commonly used in public health such as, vital records, surveys, surveillance, and in the healthcare delivery setting such as, administrative claims data, electronic medical records data. These concentration courses will prepare MPH students with the applied skills needed to pursue careers in public health positions which require skills in data management and analyses.

			CREDITS
All the following courses (9 credits):			
PH	826	Data Management in Public Health Practice	3
PH	878	Applied Biostatistics for Public Health Practitioners	3
PH	829	Public Health and Healthcare Delivery Data	3

Rural Public Health Concentration

Provides students with sufficient skills and knowledge to effectively work as public health leaders and practitioners in rural communities, both globally and domestically. Students completing this concentration will develop an understanding of how unique social, cultural, political, and environmental characteristics of rural communities, as well as structural, systemic, and historical influences, affect everything from rural health and well-being to public health and health care delivery, policy development, collaborative opportunities, and advocacy strategies. Courses in the concentration will prepare MPH students with a unique set of applied skills needed to pursue careers in rural public health.

CREDITS

All the following courses (9 credits):

PH	830	Foundations of Rural Public Health	3
PH	834	Drivers of Rural Health	3
PH	839	Rural Public Health Policy and Advocacy	3

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

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

			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

DEPARTMENT of RADIOLOGY

Mark C. Delano, 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

Srinkivas Kavuturu, Chairperson

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

Sean A. Valles, 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.