601. Osteopathic Manipulative Medicine Clerkship
Fall, Spring, Summer. 1 to 20 credits. A student may earn a maximum of 30 credits in all enrollments for this course.
R: Open only to graduate-professional students in the College of Osteopathic Medicine upon completion of Units I and II.
Advanced training in the diagnosis of musculoskeletal dysfunction and application of osteopathic manipulative techniques.
QA: BIM 601

620. Directed Studies
Fall, Spring, Summer. 1 to 30 credits. A student may earn a maximum of 30 credits in all enrollments for this course.
Individual or group work on special problems related primarily to the biomechanics of the musculoskeletal system.
QA: BIM 620

800. Special Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course.
Directed study in topics of biomechanics.
QA: BIM 800

810. Tissue Biomechanics
Fall. 3(2-2)
Integrate concepts of tissue mechanics and microstructure, develop experimental methods to study connective tissue mechanics using engineering principles.
QA: BIM 812, BIM 871

811. Biomechanical Analysis
Fall. 2(2-0)
Methods for analysis of biokinematic and biokinetic data.
QA: BIM 805

812. Experimental and Analytical Biodynamics
Spring. 3(2-2)
P: BIM 811.
Experimental and analytical methods to measure and interpret biodynamics of musculoskeletal system.
QP: BIM 805 QA: BIM 811, BIM 873

813. Kinanthropometry and Biomechanics
Spring. 3(2-2)
P: BIM 811.
Size, position, and mobility of the human body as a mechanical linkage system. Detailed study of body joints and kinematic models.
QP: BIM 805 QA: BIM 810, BIM 872

840. Theory of Connective Tissue Mechanics
Spring of odd-numbered years. 2(2-0)
P: BIM 810.
Mechanical properties, chemical content, and anatomical structure in connective tissues.
QP: BIM 812 QA: BIM 812

841. Theory of Neuromuscular Mechanics
Fall of even-numbered years. 2(2-0)
Neurological control of joint mechanics.
QA: BIM 810, BIM 805

842. Theory of Joint Mechanics
Spring. 2(2-0)
P: BIM 811.
Motion and force transmission, and their relationship to anatomical structure and tissue function in joints.
QP: BIM 810 QA: BIM 810, BIM 805

860. Occupational Biomechanics
Fall. 3(3-0)
Applications of biomechanics in ergonomics with emphasis on the whole body.
QP: BIM 810 QA: BIM 810

861. Clinical Biomechanics
Spring of even-numbered years. 3(3-0)
Application of biomechanics to medicine.

890. Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 22 credits in all enrollments for this course.
R: Approval of department.
Individual or group work related to biomechanics and/or neuromuscular system.
QA: BIM 890

895. Experimental Research Methods
Fall, Spring, Summer. 1(0-2)
R: Open only to Biomechanics graduate students.
Methods of experimental research in biomechanics.
QA: BIM 871, BIM 872, BIM 873

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 25 credits. A student may earn a maximum of 25 credits in all enrollments for this course.
QA: BIM 899

BIOMEDICAL ENGINEERING BME

College of Engineering

311. Introduction to Biomedical Engineering
Fall. 3(3-0) Interdepartmental with Materials Science and Mechanics, Mechanical Engineering, and Electrical Engineering.
P: BS 111, MTH 235, PHY 184.
Physical and mechanical properties of soft and hard tissues. Biomaterials. Biocompatibility. Biochemical processes, biological transport, and thermodynamics. Bioelectronics and instrumentation.
QP: MTH 310, PHY 289, BS 210

405. Biomedical Electronics
Fall of even-numbered years. 3(3-0) Interdepartmental with Electrical Engineering.
P: MTH 132, PHY 184.
Electronic components and circuits. Physiological measurements, transduction of physiological events to electrical signals. Ultrasonic techniques, biomedical applications of lasers, x-ray and magnetic resonance imaging.
QP: MTH 112, PHY 238 QA: BME 410

424. Biomaterials and Biocompatibility
Spring of odd-numbered years. 3(3-0) Interdepartmental with Materials Science and Mechanics.
P: BME 311, PSL 250.
Materials science of human implants. Design requirements imposed by the body's milieu and the need to protect the body.
QP: PSL 240, PSL 430 QA: BME 424

435. Biological Transport Mechanisms
Fall of odd-numbered years. 3(3-0) Interdepartmental with Chemical Engineering and Mechanical Engineering.
P: BME 311, MTH 235.
Mechanisms of transport of momentum, heat and mass. Mathematical description of transport processes in biological systems. Solution of biomedical problems.
QP: BS 210, MTH 310, PHY 289 QA: BME 431

441. Tissue Mechanics
Spring of even-numbered years. 3(3-0) Interdepartmental with Materials Science and Mechanics.
P: BME 311.
Application of solid mechanics to understanding mechanical responses of biological tissues. Microstructure and biological function for soft and hard connective tissues and muscle.
QP: ANT 316 QA: BME 481

491. Special Topics (MTC)
Fall, Spring. 3 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: BME 311.
Special topics in biomedical engineering or bioengineering such as biochemical design, occupational biomechanics, biological surface science, or low temperature biotechnology.
QA: BME 499

BOTANY AND PLANT PATHOLOGY BOT

Department of Botany and Plant Pathology
College of Natural Science

105. Plant Biology
Fall, Spring. 3(3-0)
Plant structure, function, development, genetics, diversity and ecology.
QA: BOT 205

106. Plant Biology Laboratory
Fall, Spring. 1(0-3)
P: BOT 105 or concurrently.
Cell structure, anatomy, physiology, growth and development, and diversity of plants.
QA: BOT 206

202. The Form and Evolution of Plants
Spring. 4(2-4)
P: BS 110 or BOT 105.
Divergent and convergent evolution throughout the plant kingdom. Basic principles underlying the structure, function, and reproduction of plants.
QP: BS 212, BOT 205 QA: BOT 302

218. Plants of Michigan
Fall. 3(2-3)
P: BS 110 or BOT 105.
Plant taxa of Michigan and the Great Lakes region and the major habitats in which they occur. Principles and rationale of classification. Relationships between life histories, morphology and environment.
QP: BOT 205, BS 212

301. Introductory Plant Physiology
Fall, Spring. 3(2-3)
P: CEM 141 or CEM 151; CEM 161; BOT 105 or BS 111 or LBS 145.
General principles of plant physiology relating plant structure to function. Cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.
QP: CEM 141, CEM 151, CEM 161, BOT 205, BS 210, LBS 141 QA: BOT 301

335. Plants Through Time
Spring of even-numbered years. 3(3-0) Interdepartmental with Geological Sciences.
P: BS 110 or BOT 105 or GLG 201. R: Juniors and above.
Evolutionary history of plants, the development of ecosystems, and the use of plant fossils in the reconstruction of ancient environments and climate.
QP: BOT 205, BS 212, LBS 140 QA: GLG 335

336. Useful Plants
Spring. 3(3-0)
P: CEM 142 or CEM 143 or CEM 152; BOT 105 or BS 110, BS 111 or LBS 144, LBS 145.
Ways in which plants are used for myriad purposes from food and construction materials to medicines and perfumes. The potential for expanding the uses of plants through biotechnology will be explored.
QP: BOT 205, BS 212 QA: BOT 336

402. Biology of Fungi
Fall. 3(2-3)
P: BS 110, BS 111 or BOT 105 or LBS 140 or MPH 302.
Major groups of fungi: characteristics, habitats and diversity. Significance of fungi in nature and their economic importance.
QP: BOT 205, LBS 140, BS 212 QA: BOT 402, BOT 320

405. Introductory Plant Pathology
Spring. 4(2-4)
P: BS 110, BS 111 or BOT 105 or LBS 140. R: Not open to students with credit in BOT 407.
Important plant diseases and the organisms that cause them. Principles of disease management including application of chemicals, plant breeding, biological control, and genetic engineering.
QP: BOT 302, BS 212, LBS 140 QA: BOT 405